California Energy Commission
DOCKETED
11-AFC-04
TN # 67723
OCT 15 2012

# Rio Mesa Solar Electric Generating Facility

## Preliminary Staff Assessment - Part B

CALIFORNIA
ENERGY COMMISSION
Edmund G. Brown, Jr., Governor

OCTOBER 2012
CEC-700-2012-006-PSA-PTB

DOCKET NUMBER 2011-AFC-04

**CALIFORNIA**
**ENERGY COMMISSION**
1516 Ninth Street
Sacramento, CA 95814

http://www.energy.ca.gov/sitingcases/riomesa/

PIERRE MARTINEZ, AICP
***Project Manager***

CHRIS DAVIS
***Siting Office Manager***

ERIC KNIGHT
***Environmental Office Manager***

MATT LAYTON
***Engineering Office Manager***

ROGER E. JOHNSON
***Deputy Director***
***Siting, Transmission and***
***Environmental Protection Division***

ROBERT P. OGLESBY
***Executive Director***

# RIO MESA SOLAR ELECTRIC GENERATING FACILITY (11-AFC-04)
# PRELIMINARY STAFF ASSESSMENT – Part B

# EXECUTIVE SUMMARY

Pierre Martinez, AICP

## INTRODUCTION

This Preliminary Staff Assessment (PSA) is being published by California Energy Commission staff for the Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF). This PSA contains staff's independent, objective evaluation of the BrightSource Energy, Inc. (applicant) Rio Mesa SEGF Application for Certification (11-AFC-04). The PSA is being filed in two parts. PSA Part A was published on September 28, 2012, while this PSA Part B contains analysis of those sections not included in PSA Part A. Generally, the PSA examines engineering, environmental, public health, and safety aspects of the proposed Rio Mesa SEGF project, based on the information provided by the applicant, government agencies, interested parties and other sources available at the time the PSA was prepared. This PSA Part B includes staff's environmental and engineering evaluation of the Rio Mesa SEGF project in the following technical areas: **Biological Resources**, **Cultural Resources**, and **Land Use**, as well as staff's **Alternatives** analysis.

PSA Part A contained staff's environmental and engineering, analysis of the Rio Mesa SEGF project for the balance of remaining technical sections: **Air Quality**, **Hazardous Materials Management**, **Noise and Vibration**, **Public Health**, **Socioeconomics**, **Water Supply**, **Soil and Surface Water**, **Traffic and Transportation**, **Transmission Line Safety and Nuisance**, **Visual Resources**, **Waste Management**, **Worker Safety and Fire Protection**, **Facility Design**, **Geology and Paleontology**, **Efficiency**, **Reliability**, and **Transmission System Engineering**. In addition to the technical areas noted in PSA Part A, PSA Part A included the following sections that are not included in PSA Part B: **Introduction**, **Project Description**, and, **General Conditions**.

The PSA contains analyses similar to those normally contained in an Environmental Impact Report (EIR) required by the California Environmental Quality Act (CEQA). When considering a project for licensing, the Energy Commission is the lead state agency under CEQA, and its process provides the environmental analysis that satisfies CEQA requirements as a certified regulatory program. The Energy Commission staff provides an independent assessment of the project's engineering design and its potential effects on the environment, the public's health and safety, and whether the project conforms with all applicable local, state, and federal laws, ordinances, regulations and standards (LORS). Energy Commission staff also recommends measures to mitigate potential significant adverse environmental effects, which take the form of conditions of certification for construction, operation, maintenance and eventual decommissioning of the project, if approved by the Energy Commission.

This PSA is not the decision document for these proceedings, nor does it contain findings of the Energy Commission related to environmental impacts or the project's compliance with local, state, and federal LORS. The PSA will serve as a pre-cursor to the Final Staff Assessment (FSA), which will serve as staff's testimony in evidentiary hearings to be held by the assigned Committee of two Energy Commissioners and a Hearing Officer. The Committee will hold evidentiary hearings and will consider the recommendations presented by staff, the applicant, intervenors, governmental agencies, and the public prior to proposing its proposed decision (Presiding Member's Proposed Decision (PMPD)) to the full Commission. Following a public hearing(s), the full Energy Commission will make a final decision.

## STATE AND FEDERAL JURISDICTION

The Energy Commission has exclusive permitting jurisdiction for the siting of thermal power plants of 50 MW or more and related facilities in California. The Energy Commission also has responsibility for ensuring compliance with the California Environmental Quality Act (CEQA) through the administration of its certified regulatory program and as the lead agency under CEQA.

However, because the project transmission tie line, emergency and construction electrical power supply line, and primary access road will be located on public lands managed by the BLM, approval of a Right of Way Grant, issued by the BLM, is required as well. A Right of Way Grant authorizes rights and privileges for a specific use on administered lands for a set period of time and subject to certain terms and conditions. The BLM will be conducting its own environmental review of the entire project – as a connected action – even though only a relatively small portion is on public lands. This environmental review process falls under the requirements of the National Environmental Policy Act (NEPA) and will result in the publication of an Environmental Impact Statement (EIS). The BLM's federal process under NEPA is anticipated to occur concurrently with the Energy Commission's siting and environmental review process. A Notice of Intent to prepare a draft EIS was filed by the BLM, Palm Springs South Coast Field Office on August 29, 2012.

## PROPOSED PROJECT LOCATION AND DESCRIPTION

The Rio Mesa SEGF is proposed for development by Rio Mesa I, LLC and Rio Mesa II, LLC. Each entity would hold an equal one half ownership interest of certain shared facilities while separately owning each respective power plant. Both entities are wholly owned subsidiaries of Rio Mesa Holdings, LLC, which in turn is a wholly owned subsidiary of BrightSource Energy, Inc. The site is located in eastern Riverside County, approximately 13 miles southwest of Blythe, California (see **Project Description Figure 1 in PSA Part A at http://www.energy.ca.gov/2012publications/CEC-700-2012-006/CEC-700-2012-006-PSA-PTA.pdf**). The project site is generally bounded on the east by the 161 kV Western Area Power Authority (WAPA) transmission lines, with undeveloped desert lands and active agriculture further east, on the south by undeveloped desert lands located in Imperial County, on the west by undeveloped desert lands and the Mule Mountains, and on the north by undeveloped public desert lands administered by the U.S. Bureau of Land Management (BLM).

As proposed, the Rio Mesa SEGF would encompass a total of approximately 3,805 acres. This area would include the two proposed power plants, associated heliostat fields, and support facilities located within a common area. Off-site project components, including a temporary construction area, transmission line corridors, and access roads encompass approximately 2,188 acres, for a total of approximately 5,993 acres. The component areas of the proposed development are shown in **Table 3-1** of the **Project Description** section. Approximately 3,805 acres, on which the two power plants are proposed, would be on land leased from the Metropolitan Water District of Southern California (MWD). The Right of Way corridor for the gen-tie transmission lines primarily traverses public lands administered by the BLM, although some properties within the gen-tie transmission corridor are private lands.

The Rio Mesa SEGF would comprise two solar concentration thermal power plants, associated solar fields, and an approximate 19.5-acre common area to accommodate a combined administrative, control, maintenance, and warehouse building; evaporation ponds; groundwater wells; a water treatment plant; and a common switchyard. An approximate 103-acre construction logistics area (CLA) would be established to accommodate construction parking, office equipment, and conference trailers; equipment staging assembly and material storage; a tire cleaning station; and other construction support facilities.

Each solar plant would generate 250 megawatts (MW) (net), for a total net output of 500 MW and would use heliostats – elevated mirrors guided by a tracking system mounted on a pylon – to focus the sun's rays on a receiver located atop a 750-foot-tall solar power tower near the center of each solar field. Each solar field would use approximately 85,000 heliostats. Rio Mesa I, the southernmost plant site, would occupy approximately 1,828 acres, and Rio Mesa II, the northernmost plant site, would occupy approximately 1,977 acres.

Each power plant would use a solar power boiler, located atop a dedicated concrete tower, and a solar field based on heliostat mirror technology developed by BrightSource Energy, Inc. The heliostat fields would focus solar energy on the solar power boiler, referred to as "solar receiver steam generator" (SRSG), which converts the solar energy into superheated steam.

Each power plant would generate electricity using solar energy as its primary fuel source. However, auxiliary boilers would be used to operate in parallel with the solar fields during partial load conditions and occasionally in the afternoon when power is needed after the solar energy has diminished to a level that no longer would support solar-only generation of electricity. These auxiliary boilers would also assist with daily start-up of the power generation equipment and night time preservation.

Auxiliary equipment supporting each power plant's SRSG, solar field, and turbine/generator would include the following:

- Boiler feed water and condensate pumps
- Feed water heaters
- Deaerator
- Condensate polisher
- Wet-surfaced air cooler (WSAC) (hybrid auxiliary cooler)
- Air-cooled condenser for main process steam
- Transformers
- Emergency diesel generators

- Diesel and motor-driven fire pumps

The Rio Mesa SEGF is proposed to be interconnected to the Southern California Edison (SCE) grid through a new 220kV line that would be built as part of the project and would run north approximately 9.7 miles to connect to the Colorado River Substation.

Access to both plants would be via Bradshaw Trail (primary) – paved or unpaved – and a new secondary access road directly north and parallel to 34th Avenue off of State Route 78. The portion of Bradshaw Trail that would be used for the primary access route is currently a two-lane, east-west paved road for one mile west of Rannells Avenue. Beyond the paved segment it becomes a graded dirt road. The applicant proposes to improve the segment to a point where it connects to the northerly boundary of the northern plant, however, that portion of Bradshaw Trail traverses BLM land and how it is improved is at the discretion of BLM. The secondary access route would be improved and provide access to the southerly power plant north of the proposed metering station. In addition to the access roads, each plant would have perimeter access/maintenance.

## PUBLIC AND AGENCY COORDINATION AND OUTREACH EFFORTS

Energy Commission certification is in lieu of any permit required by state, regional, or local agencies, and federal agencies to the extent permitted by federal law (Pub. Resources Code, §25500). However, the Energy Commission typically seeks comments from and works closely with other regulatory agencies that administer LORS that may be applicable to proposed projects. These agencies may include, but are not limited to, the U.S. Bureau of Land Management, the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, State Water Resources Control Board/Regional Water Quality Control Board, California Department of Fish and Game, the California Air Resources Board, the Mojave Desert Air Quality Management District, and Riverside County.

On October 28, 2011, the Energy Commission staff sent a notice of receipt and a copy of the Rio Mesa SEGF Application for Certification (AFC) to all local, state, and federal agencies that might be affected by the proposed project, as well as to a comprehensive list of agencies and libraries. Additionally, the notice of receipt of the AFC was sent to property owners within 1,000 feet of the proposed project and those located within 500 feet of the linear facilities. In addition to providing notice of receipt of the AFC, the notices provided a brief description of the project, discussion of the Energy Commission's siting certification process, and information on how agencies and the public can comment and participate in the proceeding. Staff continues to seek cooperation and/or comments from regulatory agencies that administer LORS that are applicable to the proposed project as well as comments from the public.

On July 23, 2012, the applicant submitted an amended AFC, described by the applicant as an "Environmental Enhancement Proposal". The primary differences between the original AFC and the amended AFC included: eliminating a proposed power plant north of the current project, located on BLM lands; moving the location of the project switchyard and common area facilities to another area within the same overall project site; and moving the location of the natural gas tap/meter station. On August 6, 2012, the Energy Commission staff sent the Rio Mesa SEGF amended AFC to the same comprehensive list of agencies and libraries alluded to above, as well as notice of receipt of the amended AFC to members of the public within 1,000 feet of the project or 500 feet of linear facilities.

## PUBLIC WORKSHOPS

Energy Commission staff conducted several public workshops and/or hearings to facilitate public, agency, and intervenor participation. Furthermore, these workshops allowed a transparent and comprehensive discussion of several technical issues related to the proposed project and allowed for further staff, agency, and public understanding. The Energy Commission issued notices for all these workshops and hearings prior to each meeting. These workshops and hearings were conducted on the following dates:

- January 6, 2012 (Workshop on Biological Resources)
- February 1, 2012 (Informational Hearing, Environmental Scoping Meeting and Public Site Visit)
- February 13, 2012 (Data Request and Issues Resolution Workshop)
- March 1, 2012 (Data Request and Issues Resolution Workshop)
- March 13, 2012 (Data Request and Issues Resolution Workshop)
- March 19, 2012 (Status Conference Hearing)
- May 24, 2012 (Data Response Workshop)
- June 20, 2012 (Status Conference Hearing)
- August 2, 2012 (Workshop on Cultural and Paleontological Resources)
- August 28, 2012 (Joint Workshop with Hidden Hills Solar Electric Generating System Project to Discuss Potential Impacts Associated with Solar Power Convective Heat and Radiant Flux)

## LIBRARIES

As alluded to above, copies of the AFC and amended AFC were sent to the following libraries in the vicinity of the project site for public inspection:

| | |
|---|---|
| **Palo Verde Valley District Library**<br>125 West Chanslor Way<br>Blythe, CA 9225-1245 | **Riverside Main Library**<br>3581 Mission Inn Avenue<br>Riverside, CA 92501 |
| **Lake Tamarisk Library**<br>43880 Lake Tamarisk Drive<br>Desert Center, CA 92239 | **Coachella Branch Library**<br>1538 Seventh Street<br>Coachella, CA 92236 |
| **Imperial County Free Library**<br>1125 Main Street<br>El Centro, CA 92243 | |

In addition to the above-noted local libraries, copies of the AFC and amended AFC were made available at the Energy Commission’s library in Sacramento, the California State library in Sacramento, and state libraries in Eureka, Fresno, Los Angeles, San Diego, and San Francisco.

## NOTIFICATION TO THE LOCAL NATIVE AMERICAN COMMUNITY

On January 4, 2012, a request was sent to the Native American Heritage Commission (NAHC) advising them of submittal of the project AFC and requesting that they provide a list of Native American groups or individuals in the project area who may have information regarding the project site. In response to staff's request, on January 25, 2012, the NAHC provided a list of local tribes and interested Native Americans that they advised Energy Commission staff to consult with in order to determine if the proposed project might impact Native American cultural resources.

On February 22, 2012, Energy Commission staff provided notice to all the tribes and individuals listed in the NAHC's response letter noted above, advising them of the proposed project and how they could participate in the Energy Commission's licensing process. Since then, Energy Commission staff has met with and continues to meet with tribal representatives and individuals regarding potential impacts to cultural resources. Details of ongoing tribal consultation are discussed in the **Cultural Resources** section of this PSA Part B.

## PUBLIC ADVISER'S OFFICE

The Energy Commission's outreach program is primarily facilitated by its Public Adviser's Office (PAO). This is an ongoing process that provides a consistent level of public outreach, regardless of outreach efforts conducted by the applicant or other parties.

The PAO's public outreach work is an integral part of the Energy Commission's AFC review process. The PAO reviewed information provided by the applicant and also conducted its own outreach efforts to identify certain local officials, as well as interested entities, within a six-mile radius of the proposed site for the project. These entities included, but were not limited to, schools, local service organizations (e.g. Rotary Clubs, Kiwanis, and Soroptomists), cultural/ethnic groups, special service districts, environmental organizations and certain staff and elected officials from the City of Blythe, Riverside County, Imperial County, and La Paz County (Arizona).

The PAO provided notification by letter and enclosed notice of the February 1, 2012 Informational Hearing and Site Visit, held at the Blythe City Hall Council Chambers in Blythe, California. Notices were distributed to local residences and entities referenced above. Additionally, the notice was placed in the Palo Verde Valley Times.

## ENVIRONMENTAL JUSTICE

California law defines justice as "the fair treatment of people of all races, cultures, and income with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (Government Code Section 65040.12 and Public Resources Code Section 72000).

All Departments, Boards, Commissions, Conservancies and Special Programs of the Resources Agency must consider environmental justice in their decision-making process if their actions have an impact on the environment, environmental laws, or policies. Such actions that require environmental justice consideration may include:

- adopting regulations;
- enforcing environmental laws or regulations;
- making discretionary decisions or taking actions that affect the environment;
- providing funding for activities affecting the environment; and
- interacting with the public on environmental issues.

In considering environmental justice in energy facility siting cases, staff uses demographic screening analysis to determine whether a low-income and/or minority population exists within the potentially affected area of the proposed site. The demographic screening is based on information contained in two documents: *Environmental Justice: Guidance Under the National Environmental Policy Act* (Council on Environmental Quality, December, 1997) and *Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses* (U.S. Environmental Protection Agency, April, 1998). Due to the change in the sources and methods of collection used by the U.S. Census Bureau, the screening process relies on Year 2010 U.S. Census data to determine the number of minority populations and data from the 2006-2010 American Community Survey (ACS) to calculate the population below-poverty-level. Staff's demographic screening is designed to determine the existence of a minority or below-poverty-level population or both within a six-mile area of the proposed project site.

*Environmental Justice: Guidance Under the National Environmental Policy Act*, defines minority individuals as members of the following groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population is identified when the minority population of the potentially affected area is:

1. greater than 50 percent;
2. or when the minority population percentage of the area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

In addition to the demographic screening analysis, staff follows the steps recommended by the U.S. EPA's guidance documents in regard to outreach and involvement; and if warranted, a detailed examination of the distribution of impacts on segments of the population.

**Socioeconomics Figure 1 in PSA Part A at http://www.energy.ca.gov/2012publications/CEC-700-2012-006/CEC-700-2012-006-PSA-PTA.pdf** shows the total population in the six-mile buffer of the proposed site to be 273 persons with a minority population of 85 persons, or about 31 percent of the total population (US Census 2010c). When compared with minority populations in the city of Blythe, the Blythe CCD, and Riverside County, the minority population in the six-mile buffer totals about half of the minority populations of these reference geographies (**Socioeconomics Table 2).** Based on the comparisons, staff concludes that the minority population in the six-mile project buffer is not meaningfully greater than the minority populations in the general population in the local area or Riverside County. Therefore, the minority population in the six-mile buffer does not constitute an environmental justice population as defined by *Environmental Justice: Guidance Under the National Environmental Policy Act* and would not trigger further scrutiny for purposes of an environmental justice analysis.

## CUMULATIVE EFFECTS

Staff conducted a search of past, present, and reasonably foreseeable “probable” future projects in the area of the proposed project (see **Executive Summary Figure 1**). Staff reviewed recent environmental reports and various resources, including focusing on projects along the I-10 corridor near the project as well as projects provided by the applicant in the AFC. **Executive Summary Table 1** below presents a master list of the projects considered as part of the Rio Mesa SEGF cumulative setting.

CEQA Guidelines define cumulative impacts as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.” (Cal. Code Regs., tit. 14, § 15355.) The Guideline continues: (a) “[t]he individual effects may be changes resulting from a single project or a number of separate projects” and (b) “[t]he cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.” (*Ibid*.)

Accordingly, staff in each technical section of this PSA determined which of the projects from the Cumulative Projects list could create impacts specific to their technical area. Using unique sets of criteria specific to each area, staff then evaluated whether the cumulative effect were significant, and if so, whether the project’s contribution to that combined effect would be “cumulatively considerable[1]”. Therefore, this PSA will identify and analyze the impacts of all aspects and phases of the proposed project, including the combined effect the proposed project will have in conjunction with other projects.

[1] “Cumulatively considerable” means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. (Cal.Code Regs., tit. 14, section 15064, subd. (h)(1).)

**Executive Summary Table 1**
**Rio Mesa Solar Electric Generating Facility Cumulative Projects**

| Project Name | Location | Ownership | Status | Project Description |
|---|---|---|---|---|
| Four Commercial Projects | Blythe | Various | Approved | Four commercial projects have been approved by the Blythe Planning Department, including the Agate Road Boar & RV Storage, Riverway Ranch Specific Plan, Subway Restaurant and Motel, and Agate Senior Housing Development. Dates of construction are unknown at this time |
| Intake Shell | Blythe | Shell | Under Construction | Reconstruction of a Shell facility located at Intake & Hobson Way |
| Three Residential Developments | Blythe | Various | Under Construction | 3 residential development projects are under construction: River Estates at Hidden Beaches, The Chanslor Place, Mesa Bluffs. 125 single family homes are currently being built |
| Twelve Residential Developments | Blythe | Various | Approved or under construction | 12 residential development projects have been approved by the Blythe Planning Department: Vista Palo Verde, Van Weelden, Sonora South, Ranchette Estates, Irvine Assets, Chanslor Village, St. Joseph's Investments, Edgewater Lane, The Chanslor Place Phase IV, Cottonwood Meadows, Palo Verde Oasis. A total of 1,005 single family residences are proposed |
| Devers-Palo Verde No. 2 Transmission Line Project | From the Midpoint Substation to Devers Substation | SCE | CPUC petition to modify request to construct CA-only portion approved by CPUC 11/2009 Under Construction | New 500 kV transmission line parallel to the existing Devers-Palo Verde Transmission Line from Midway Substation, approximately 10 miles southeast of Blythe, to the SCE Devers Substation, near Palm Springs. The ROW for the 500 kV transmission line would be adjacent to existing DPV ROW |
| Colorado River Substation Expansion | 10 miles southwest of Blythe | SCE | Approved 7/2011 Under Construction | 500/230kV substation, constructed in an area approximately 1000 ft by 1900 ft |
| Desert Southwest Transmission Line | 118 miles primarily parallel to DPV | Imperial Irrigation District | Approved | 118 mile 500kV transmission line from a new substation/switching station near the Blythe Energy Project to the existing Devers Substation located approximately 10 miles north of Palm Springs. |
| Blythe Energy Project II | Near Blythe Airport | Blythe Energy | Approved | 520 MW combined-cycle power plant located entirely within the Blythe Energy Project site boundary, located on 30 acres of a 76-acre site. |

| Project Name | Location | Ownership | Status | Project Description |
|---|---|---|---|---|
| Eagle Mountain Pumped Storage Project | Eagle Mountain iron ore mine, north of Desert Center | Eagle Crest Energy | FERC draft EIS published 12/2010 | 1,300 MW pumped storage project on 2,200 acres of public and private land, designed to store off-peak energy to use during peak hours. |
| Palen Solar Energy Project | North of I-10, 10 miles east of Desert Center | Solar Millennium Project Purchased by BrightSource | Approved Amendment anticipated to be filed to convert the project to a power tower | 500 MW solar trough project on 5,200 acres Project will be converted to a power tower |
| Blythe Solar Power Project | North of I-10, north of Blythe Airport | Solar Millennium | Approved Amendment anticipated to be filed to convert the project to a power tower | 1,000 MW solar trough facility on 7,540 acres Project will be converted to photovoltaic |
| NextEra (FPL) McCoy | 13 miles northwest of Blythe | McCoy Solar | NOI to prepare an EIS 8/29/11 | Up to 750 MW solar PV project on 7,700 acres of BLM land, 470 acres of private land, with a 16 mile gen-tie |
| McCoy Soleil Project | 10 miles northwest of Blythe | EnXco | Plan of Development to Palm Springs BLM | 300 MW solar power tower project located on 1,959 acres. Requires a 14 mile transmission line to proposed SCE Colorado Substation south of I-10 |
| Genesis Solar Energy Project | North of I-10, 25 miles west of Blythe, 27 miles east of Desert Center | NextEra (FPL) | Approved, under construction | 250 MW solar trough power project on 1,950 acres north of the Ford Dry Lake. 6 mile natural gas pipeline and 5.5 mile gen-tie line to the Blythe Energy Center to Julian Hindes Transmission Line |
| Rice Solar Energy Project | Rice Valley, Eastern Riverside County | Rice Solar Energy | 3rd Quarter 2013 | 150 MW solar power tower project with liquid salt storage. Project located on 1,410 acres; includes a power tower approximately 650 feet tall and 10- mile long interconnection with the WAPA Parker-Blythe transmission line |
| Blythe Airport Solar I Project | Blythe Airport | Riverside County | Approved | 100 MW solar PV project located on 640 acres of Blythe airport land |
| Desert Quartzite | South of I-10, 8 miles southwest of Blythe | First Solar | POD in to BLM | 600 MW solar PV project located on 7,724 acres, adjacent to DPV transmission line and SCE Colorado Substation |
| Desert Sunlight Project | 6 miles north of Desert Center | First Solar | Approved | 550 MW PV project on 4,144 acres of BLM land, requiring a 12-mile transmission line to the planned Red Bluff Substation |

| Project Name | Location | Ownership | Status | Project Description |
|---|---|---|---|---|
| SCE Red Bluff Substation | South of I-10 at Desert Center | SCE | Approved | A proposed new 500/220 kV substation, 2 new parallel 500 kV transmission lines of about 2,500 to 3,500 feet each |
| Desert Center 50 | Desert Center | US Solar Holdings | Under review | A planned 49.5 MW fixed flat panel photovoltaic solar power plant |
| Sol Orchard | Desert Center | Sol Orchard | Approved | A planned 1.5 MW fixed flat panel PV solar power plant north of I-10, east of SR-177, west of Desert Center Airport |
| Blythe Mesa Solar I | Blythe | Renewable Resources Group | Under review | A planned 485 MW solar PV project on private land in Blythe |
| Blythe Solar Power Generation Station 1 | Blythe | Southwestern Solar Power | Approved | A planned 4.76 MW solar PV facility, including 69 PV panels that stand 50 feet tall and 72 feet wide |
| Eagle Mountain Landfill Project | Eagle Mountain , North of Desert Center | Mine Reclamation Corporation and Kaiser Eagle Mountain | Court of Appeals | Project proposed to be developed on a 4,000 acre portion of the Kaiser Eagle Mountain Mine in Riverside County |
| Wiley's Well Communication Tower | East of Wiley's Well Road just south of I-10 | Riverside County | Final EIR | Expansion of Riverside County's fire and law enforcement agencies approximately 20 communication sites to provide voice and data transmission |
| Eagle Mountain Wind Project Met Towers | South of Eagle Mountain, north of Joshua Tree National Park | LH Renewable | Wind testing pending | Met towers for wind testing |
| Gestamp Asetym Solar | Northwest of Blythe | Gestamp Asetym Solar | EPA review | 37 MW solar power plant |
| Blythe Energy Project Transmission Line | From the Blythe Energy Project to Devers Sub | Blythe Energy | Under Construction | 67.4 miles of new 230 kV transmission line between Buck Sub and Julian Hinds Sub |
| Green Energy Express Transmission Line Project | Eagle Mountain Sub to So. California | Green Energy Express | Approved | 70 mile double circuit 500 kV transmission line from Eagle Mt. Sub to So. California |
| EnXco | North of Wiley's Well Rd, east of Genesis Solar Project | EnXco | POD in to BLM | 300 MW solar PV project |
| Desert Lily Soleil Project | 6 miles north of Desert Center | EnXco | POD in to BLM | 100 MW PV plant on 1,216 acres of BLM land |
| Big Maria Vista Solar Project | North of I-10, 12 miles nw Blythe | Bullfrog Green Energy | POD in to BLM | 500 MW PV project on 2,684 acres |

| Project Name | Location | Ownership | Status | Project Description |
|---|---|---|---|---|
| Chuckwalla Solar I | 1 mile north of Desert Center | Chuckwalla Solar I | POD in to BLM | 200 MW solar PV project on 4,083 acres |
| Mule Mountain Solar Project | South of I-10, 4 miles west of Blythe | Bullfrog Green Energy | POD in to BLM | 500 MW solar PV project located on 2,684 acres |
| Quartzsite Solar Energy | 10 miles north of Quartzsite | Solar Reserve | Draft EIS released | 100MW, 653 foot tall power tower located on 1,500 acres of BLM land |
| Desert Harvest | 6 miles north of Desert Center | EnXco | DEIS published | 100MW PV project located on 930 acres |
| Ogilby Solar | Chocolate Mountain | Pacific Solar Investments | Revised POD 8/26/11 | 1,500 MW Solar Thermal Trough |
| Mule Montain III | Chuckwalla Valley | EnXco | Pending | 200 MW Solar PV |
| La Posa Solar Thermal | Stone Cabin, AZ | Pacific Solar Investments | Pending | 2,000 MW Solar |
| Nexlight Quartzsite | Quartzsite, AZ | Nextlight Renewable Power | Pending | 50 MW CSP Trough |
| Quartzsite Solar | Quartzsite, AZ | Quartzsite Solar Energy | Pending | 600 MW CSP Trough |
| Wildcat Quartzsite | Quartzsite, AZ | Wildcat Quartzsite Solar | Pending | 800 MW CSP Tower |
| Oro Valley Wind | Black Mountain, CA | Oro Valley Power | Pending | 180 MW Wind Project |
| IMPERIAL WIND | BLACK MOUNTAIN, CA | IMPERIAL WIND | AUTHORIZED | 48-65 MW |
| LH Renewables Riverside County Type II | Eagle Mountain, CA | LH Renewables | Pending | Unknown |
| Graham Pass Wind Project | Riverside County | Graham Pass Inc. | Pending | 175 MW Wind Project |
| Palo Verde Mesa Solar Project | N/W of Blythe | Renewable Resources Group | NOP Filed | 486 MW Solar PV |

## PRELIMINARY STAFF ASSESSMENT CONCLUSIONS /ADDITIONAL INFORMATION STAFF REQUIRES FROM THE APPLICANT IN ORDER TO COMPLETE THE FSA

Based upon the information provided, discovery achieved and analyses completed to date, staff concludes that, for the technical areas covered in PSA Part B, the project will result in unmitigable significant, adverse impacts in the areas of Biological and Cultural resources and will not conform with applicable laws, ordinances, regulations, and standards in these two areas as well. These conclusions are discussed in detail below. Please refer specifically to each technical section for a more detailed discussion. **Executive Summary Table 2**, below, summarizes these conclusions in a tabular format.

## BIOLOGICAL RESOURCES

- Construction and operation of the Rio Mesa SEGF would result in long-term degradation and, in many areas, permanent elimination of native vegetation and wildlife habitat on the project site, and would cause indirect impacts such as weed introductions to surrounding vegetation and habitat. These impacts would affect all plant and wildlife species on the site, including special-status species. The majority of this habitat is creosote bush scrub, which is the predominant shrubland throughout the California deserts. However, five vegetation or habitat types totaling 799.6 acres within the project area are ranked as special-status plant communities. Staff recommends compensating direct impacts to vegetation and habitat at the following ratios: 1:1 for creosote bush scrub (i.e., most of the impacts) and 3:1 for special-status plant communities and habitats. Additionally, groundwater pumping for the project also may affect offsite vegetation and habitat that is dependent on groundwater availability within the root zone.
- Although construction and operation would not cause the complete loss of vegetation and habitat at the solar generator site, staff concludes that project activities would eliminate or degrade most habitat values for all but the most disturbance-tolerant native species. Disturbance to native vegetation along the transmission line alignments and at the temporary construction area adjacent to the proposed solar generator site would cause long-term degradation to affected vegetation and habitat. To minimize project effects to vegetation and habitat, staff has proposed mitigation measures, in the form of conditions of certification, to minimize impacts. Staff concludes that these measures would reduce the project's impacts to native vegetation and wildlife habitat to a level of less than significant. However, staff is uncertain whether compensation for impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible. Desert dry wash woodland is relatively rare, due to restriction to wash landforms with suitable surface or groundwater hydrology, and large parcels predominantly covered by this habitat may not be available. Feasibility will depend upon availability from willing sellers of privately owned desert woodland habitat. Staff will coordinate with the applicant and public or private entities specializing in compensation habitat acquisition and management to determine feasibility.
- The project would affect numerous state and federally jurisdictional desert washes and ephemeral channels on the solar generator site and along the transmission line, as well as a small area of state and federally jurisdictional wetlands. In addition, the state holds jurisdiction over impacts to riparian vegetation adjacent to state-jurisdictional streambeds. Desert dry wash woodland is the regional riparian vegetation. The applicant reports that a total of 817.37 acres of state waters are located within the project area. Staff has recommended Condition of Certification **BIO-9** that would require implementation of Best Management Practices (BMPs) to minimize impacts to state waters on the project site and to adjacent and downstream state waters that could be affected by the project. In addition, **BIO-9** would require the project owner to offset the loss of state-jurisdictional waters and adjacent riparian vegetation through off-site habitat compensation at a 3:1 ratio. Staff anticipates that compensation would largely be concurrent with recommended compensation of impacts to blue palo verde – ironwood woodland. With implementation of Condition of Certification **BIO-9** staff concludes that project impacts to state-jurisdictional

waters and adjacent riparian vegetation would be less than significant according to CEQA. However, if 3:1 compensation for these impacts is found infeasible then the project's impacts to waters of the state may be significant and unavoidable.

- The project would adversely affect common wildlife and nesting birds due to habitat loss and degradation, off-site disturbances such as noise, lighting, weed introductions, and altered off-site hydrology. Gen-tie line construction would degrade habitat at work sites and would cause short-term noise and disturbance impacts to wildlife in the construction area. All native birds, including species with no other conservation status, and including their nestlings and eggs, are protected from take under the California Fish and Game Code and the federal Migratory Bird Treaty Act (MBTA). To reduce project effects to common wildlife and nesting birds, staff is recommending measures, in the form of conditions of certification, to minimize impacts. With implementation of these measures, staff concludes that most project impacts to common wildlife and nesting birds, with the exception of bird mortality during project operations, would be reduced below a level of significance.
- Operation of the project is expected to result in bird collisions with the heliostat mirrors and bird mortality or injury from exposure to concentrated solar energy surrounding the central tower. Staff at this time cannot quantify the expected impact, but believes this impact would be significant according to CEQA. Staff recommends a measure, in the form of a condition of certification, to minimize impacts. However, staff concludes that it is not feasible to mitigate this impact below a level of significance, and that collision with heliostats and injury or mortality from exposure to concentrated solar energy would be a significant and unavoidable adverse impact. The collision and burning hazards are applicable for all bird species that may fly over the site or near the gen-tie line, including the special-status species. Staff will continue coordinating with the applicant and resource agencies to review any potential for off-site habitat protection and enhancement, particularly in wetland areas and wildlife refuges, where habitat expansion or improvement may offset anticipated loss of migrating or overwintering birds.
- Operation of the project may result in eagle collisions with the heliostat mirrors and mortality or injury from exposure to concentrated solar energy surrounding the central towers. Staff proposes a condition of certification, which would require an Eagle Conservation Plan, to specify the project owner's anticipated take of golden eagles or other large special-status raptors (if any) and would require retrofitting of existing off-site electrical distribution lines to reduce electrocution risk to remediate any take of eagles or other large special-status raptors that may exceed the estimated take (even if estimated take is zero). Staff cannot quantify the expected mortality for bald or golden eagles at this time, but believes that the Rio Mesa SEGF has the potential to take one or more bald or golden eagles over the life of the project, due either to collision with project facilities or to injury or mortality caused by flying through concentrated solar energy over the heliostat field. Staff is coordinating with the US Fish and Wildlife Service to quantify expected take of eagles (if any) and hopes to include that estimate in its FSA. Staff concludes that the take of a bald or golden eagle, should it occur, would be significant according to CEQA. Staff's recommended condition of certification would mitigate this impact to a level less than significant according to CEQA. However, take of bald or golden eagles could violate the California Fish and Game Code, due to the status of both species as migratory

birds and fully protected species, and unauthorized take of either species could violate the federal MBTA and Bald and Golden Eagle Protection Act (BGEPA). Staff's conclusion regarding CEQA significance of this impact does not imply conformance with these other LORS.

- Swainson's hawk is listed as threatened under CESA and protected under the federal MBTA and California Fish and Game Code. Swainson's hawks do not nest or over-winter in the project region, but migrate through the region en route to breeding and wintering ranges. There is a low potential for take of Swainson's hawk due to collision with heliostats or other project facilities, or injury by concentrated solar energy surrounding the central towers. Mortality or other take would be significant under CEQA and may violate CESA. Staff's recommended condition of certification would mitigate this impact to a level less than significant according to CEQA and fully mitigate the impact according to CESA. However, take of Swainson's hawks also could violate the California Fish and Game Code, due to its status as a migratory bird and unauthorized take could violate the federal MBTA. Staff's conclusion regarding CEQA significance of this impact does not imply conformance with these other LORS.
- The elf owl and Gila woodpecker are listed as endangered under CESA. The project site is near the western margin of both species' geographic ranges, and desert woodland habitat on the site is marginally suitable nesting habitat for them both. Both species have been observed at the proposed solar generator site, but neither has been documented nesting on the site. Staff concludes that 708.9 acres of desert microphyll woodlands on the site would be lost by construction of the project. This habitat is suitable as migratory stopover habitat, foraging habitat, and perhaps occasionally as breeding habitat for both species. Implementation of staff's recommended conditions of certification would minimize overall project impacts to this habitat, including compensation and management of offsite lands at a 3:1 ratio. Staff concludes that these conditions of certification would avoid any potential construction phase take of elf owl and Gila woodpecker according to CESA and would reduce or avoid construction phase impacts to both species to a level less than significant according to CEQA. However, staff is uncertain whether offset of impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible (as noted above and further discussed in the **Biological Resources** section). If 3:1 compensation for this habitat is found infeasible then the project's impacts to elf owl and Gila woodpecker habitat may be significant and unavoidable. In addition, project operation may cause take of Gila woodpecker or elf owl by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers. If so, staff concludes that this impact would be significant and unavoidable.
- Construction and operation of the Rio Mesa SEGF would cause long-term degradation, and in many areas permanent elimination of seasonally occupied burrowing owl habitat, and adverse indirect impacts such as weed introductions to surrounding vegetation and habitat. The project also could cause mortality to any burrowing owls that may be found on the site during construction, should they retreat into burrows to avoid construction equipment, where they may be crushed or entombed. The burrowing owl is a BLM sensitive species and a California Species of Special Concern. With implementation of staff's recommended conditions of

certification, staff concludes that the project's potential construction phase impacts to burrowing owl would be less than significant. However, project operation may cause take of burrowing owl by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers. If so, staff concludes that this impact would be significant and unavoidable.

- Several other special-status birds of prey are found in the region seasonally, especially during winter, or as year-around residents. These include osprey, ferruginous hawk, Cooper's hawk, sharp-shinned hawk, northern harrier, prairie falcon, peregrine falcon, merlin, Harris hawk, short-eared owl, and long-eared owl. Staff concludes that the project would not affect nest sites for these species, and that the project's adverse impacts to foraging habitat for wintering and migratory species would be less than significant. However, all of these species may be vulnerable to operations impacts including collision with heliostats or other project facilities and injury or mortality from exposure to concentrated solar energy. Take, if any, of large special-status raptor species can be offset through retrofitting of distribution lines that present electrocution hazards to large birds. Staff concludes that implementation of Condition of Certification **BIO-12** would offset any potential take of large special-status raptors to below a level of significance according to CEQA. Smaller special-status raptors are less vulnerable to power line electrocution and staff concludes that distribution line retrofitting would not mitigate take, if any, of those birds. For these species, staff concludes that this impact would be significant and unavoidable.
- Several special-status upland perching bird species are present or have the potential to occur at the project site. With implementation of recommended conditions of certification, staff concludes that any potential take of these species during project construction and would reduce impacts to their habitat to a level less than significant according to CEQA. Project operation may cause take of these species by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers. If so, staff concludes that this impact would be significant and unavoidable.
- Several special-status species have been observed on and around the project site during winter or migration, including greater sandhill crane, bank swallow, willow flycatcher, American white pelican, Vaux's swift, and yellow-headed blackbird. These species would not use the site regularly, but they are likely to fly over the site either during migration through the area or during shorter flights among regional wetland habitats. Project operation may cause take of these species by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers. If so, staff concludes that this impact would be significant and unavoidable. However, staff will continue coordinating with the applicant and resource agencies to review any potential for off-site habitat protection and enhancement, particularly in wetland areas and wildlife refuges, where habitat expansion or improvement may offset anticipated loss of migrating or overwintering birds. The greater sandhill crane, bank swallow, and willow flycatcher are listed under CESA, and the greater sandhill crane is fully protected under the state Fish and Game Code; therefore mortality or other take (as defined in the Code) may violate CESA and the regulations for fully protected species.

- Documented roosting areas for several special-status bats are found in caves and mines in the Mule Mountains, east of the proposed project site. Important foraging habitat is found over agricultural lands and desert woodland on-site and to the east. No special-status bats are expected to roost on-site, but several species could forage over the site or fly across the site en route between roosting areas in the Mule Mountains to agricultural lands to the east. Staff's recommended conditions of certification would minimize or compensate for habitat loss, including offset for blue palo verde – ironwood woodland at a 3:1 ratio. Staff concludes that these measures would effectively mitigate habitat impacts for special-status bats. However, staff is uncertain whether offset of impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible. If 3:1 compensation for this habitat is found infeasible then the project's impacts to special-status bat habitat may be significant and unavoidable.
- Staff concludes that without mitigation, the Rio Mesa SEGF would contribute to the cumulatively significant loss of regional resources, including the state and federally threatened desert tortoise and other special-status species discussed above. Impact avoidance and minimization measures described in staff's analysis and included in the conditions of certification would help reduce impacts to these resources. These and additional compensatory measures are necessary to offset project-related losses, and to assure compliance with state and federal laws such as CESA and the federal ESA. With the implementation of recommended conditions of certification, staff concludes that the Rio Mesa SEGF's contributions to cumulative significant impacts to biological resources would not be considerable, with three possible exceptions:

    1. Desert microphyll woodlands as these woodlands also meet jurisdictional criteria as waters of the state, and the cumulative impacts conclusion for waters of the state is the same; if the prescribed 3:1 compensation for impacts to jurisdictional waters and habitats is found infeasible, then the project's incremental contribution to cumulative impacts to blue palo verde – ironwood woodland and the wildlife species which depend on them may remain cumulatively considerable.

    2. Operational impacts to native birds including special-status birds and raptors; and

    3. Foraging habitat for golden eagles.

<u>Additional Information Staff Requires from the Applicant in Order to Complete the FSA</u>

- The Renewable Energy Action Team (REAT), consisting of the U.S. Fish and Wildlife Service, California Department of Fish and Game, U.S. Bureau of Land Management, and Energy Commission staff, requested that the applicant provide a full year of bird and bat surveys for the Rio Mesa SEGF to better determine the scope and scale of use at the site, beginning in early 2012. This information is essential to characterize risk during project operation, and to provide information needed for the applicant's Bird and Bat Conservation Strategy and Eagle Conservation Plan, according to staff's proposed Condition of Certification **BIO-12**. The applicant recently submitted a quarterly report summarizing its spring 2012 migratory bird survey, which is under review by staff and will be incorporated in the FSA. Staff anticipates that the full year of field work will be completed in the first quarter of 2013 and the applicant is expected to provide the full data set promptly following completion of the field work for inclusion in the FSA.

- The applicant's Biological Resources Technical Report noted that late summer or fall botanical surveys should be completed in a future year. The summer of 2012 was a strong monsoonal season, providing adequate rainfall throughout the area to allow for germination and growth of late-season special-status plants. The applicant has indicated that it was monitoring late-season growth and flowering, and would conduct botanical surveys during late summer or fall 2012. Staff will incorporate that survey data into its analysis of the project's impacts to special-status plants and, if necessary, revise proposed Condition of Certification **BIO-10**.
- Clarification of the total acreages of permanent and temporary, direct and indirect impacts by vegetation type (including all project features identified in **Project Description Table 3-1** in the **Project Description** section of PSA – Part A). Staff's estimates of the project's direct impacts to native vegetation and wildlife habitat are based on data presented in the Biological Resources section of Applicant's Environmental Enhancement proposal, which apparently does not include several project components noted in **Project Description Table 3-1.** In order to finalize the analysis of impacts to biological resources and several recommended conditions of certification, staff will need a full accounting by vegetation type of all project disturbance to native vegetation and wildlife habitat, including all permanent or temporary disturbance on the gen-tie alignment, temporary logistics area, proposed 33-kV service line, and Colorado River Substation gen-tie area.
- The Energy Commission's responsibilities and authority pursuant to the Warren-Alquist Act include Lake and Streambed Alteration Agreement (LSAA) and California Endangered Species Act (CESA) authorization under the California Fish and Game Code. Energy Commission staff will be reluctant to make any recommendation to the Commissioners on either issue until after conferring with CDFG to ensure consistency with CDFG's LSAA and Incidental Take Permit (ITP) programs. CDFG will review the project upon receipt of the applicant's documentation with both programs. Therefore, staff has requested that the applicant (1) provide to CDFG a complete LSAA Notification with up-to-date state waters delineation, project impacts, proposed mitigation, and any other supporting documents, (2) provide to CDFG an ITP Application for desert tortoise, including an impact assessment, proposed mitigation, and supporting documents, (3) provide to CDFG the appropriate filing fee(s) for both documents, and (4) docket copies of both documents with the Energy Commission.
- In order to fully evaluate whether the applicant's facility closure measures will reduce the environmental impacts of site closure (i.e., dust, erosion, and weed infestation and spread) below a level of significance, staff will need to review a draft Facility Closure, Revegetation, and Reclamation Plan and Financial Security prior to completing its analysis for the FSA. Therefore, staff requests that the applicant prepare and submit a draft plan, including its estimate of the necessary financial security to implement the plan.

## CULTURAL RESOURCES

- Staff has identified prehistoric archaeological resources that may be contributors to a region-wide cultural landscape/district, the Prehistoric Trails Network Cultural Landscape (PTNCL) or Prehistoric Quarries Archaeological District (PQAD), as well as individual archaeological resources. These resources are historical resources for the purposes of CEQA. However, due to lack of complete information needed to evaluate their California Register of Historic Resources (CRHR) eligibility, staff is unable to finalize conclusions on the project's potential impacts on prehistoric archaeological resources. The proposed project may destroy some or all of these resources. Once the Phase II archaeological field and laboratory work is complete, staff can analyze the additional data requested from the applicant, and can determine whether there are prehistoric archaeological resources located on and near the project that may be contributors to the PTNCL and/or the PQAD and may therefore also be assumed eligible for the CRHR.
- Staff has identified three ethnographic resources in the project's ethnographic PPA: the Salt Song Trail Landscape, the Keruk Trail/Xam Kwatcan/Earth Figures Landscape, and the Palo Verde Mesa Ethnographic Landscape. Staff has concluded that the impacts from the project to all three ethnographic landscapes would be significant. Implementation of recommended conditions of certification would only mitigate impacts to the Palo Verde Mesa Ethnographic Landscape to a less-than-significant level. The project would still have significant and unmitigable impacts on the Salt Song Trail and Keruk Trail/Xam Kwatcan/Earth Figures Landscapes and on Native American spiritual practices dependent on these resources.
- Staff identified seven historic-period built-environment resources in the project built-environment Project Area of Analysis (PAA). The full impact to one of these resources, the Bradshaw Trail, is unknown due to an incomplete project description for the access road, which would require modifications or improvements to portions of Bradshaw Trail. Additionally, staff has concluded that one additional resource, the Palo Verde Irrigation District (PVID), is potentially eligible for the CRHR. Elements of the PVID are in the built-environment PAA, and analysis is ongoing as to eligibility and potential impacts. Once the information staff has requested from the applicant is received, staff will be able to reach a conclusion regarding the potential for impacts on the Palo Verde Irrigation District and the Bradshaw Trail.

<u>Additional Information Staff Requires from the Applicant in Order to Complete the FSA and Additional Information Staff Continues to Gather to Complete the FSA</u>

- Results of Phase II subsurface geoarchaeological field investigations, pursuant to a plan that staff and the applicant are currently finalizing the details of. Staff needs this information to establish on which landforms known surface archaeological deposits would require archaeological excavation to support determinations of CRHR eligibility. The same information is critical to establishing whether monitoring related to construction or facility operational activity would be warranted on particular landforms. When staff receives this information, evaluation of prehistoric sites, assessment of project impacts, and recommendations for impact mitigation can be completed and will be provided in the FSA.

- Results of a Phase II archaeological field and laboratory study is required to supplement the very basic description information collected during the applicant's pedestrian surveys. Without these additional field and laboratory studies, staff cannot adequately identify potential impacts to resources or design project-specific mitigation measures.
- The applicant has been requested, through Data Requests 186 and 187, to provide additional information regarding the proposed use and improvements to Bradshaw Trail. Staff anticipates this information to be submitted in October of 2012. Once this information is received, it will assist staff in determining the potential impacts on the Bradshaw Trail and PVID.
- Staff continues to conduct Native American consultation on potential project impacts to the Palo Verde Mesa Ethnographic Landscape and potential mitigation. The prehistoric archaeological resources that staff is not able to evaluate for CRHR eligibility due to the absence of the applicant's field data, may have potential associative values for Native Americans that could qualify them as CRHR eligible and thus may also be contributors to the Palo Verde Ethnographic Landscape.

**Executive Summary Table 2**
**Summary of Impacts of the Rio Mesa SEGF PSA Technical Analyses**

| Technical Area | Complies with local, state and federal LORS | Impacts mitigated to level below significant |
|---|---|---|
| Alternatives | Not Applicable | Not Applicable |
| Biological Resources | No | No |
| Cultural Resources | No | No |
| Land Use | Yes | Undetermined |
| **Summary of Impacts of the Rio Mesa SEGF PSA – Part A Technical Analyses** | | |
| Air Quality | Yes | Yes |
| Efficiency | Not Applicable | Not Applicable |
| Facility Design | Yes | Yes |
| Geology and Paleontology | Yes | Undetermined |
| Hazardous Materials Management | Yes | Yes |
| Noise and Vibration | Yes | Yes |
| Public Health | Yes | Yes |
| Reliability | Not Applicable | Not Applicable |
| Soil and Surface Water | Undetermined | Undetermined |
| Traffic and Transportation | Yes | Undetermined |
| Transmission Line Safety and Nuisance | Yes | Yes |
| Transmission System Engineering | Undetermined | Undetermined |
| Visual Resources | No | No |
| Waste Management | Yes | Yes |
| Water Supply | Yes | Undetermined |
| Worker Safety and Fire Protection | Yes | Yes |

# WORKER SAFETY AND FIRE PROTECTION

In staff's PSA section on **Worker Safety and Fire Protection**, staff relied upon a letter from the Riverside County Fire Department (RCFD) stating that although the department expected to have increased demands placed on it resulting from the construction and operation of the proposed project, the project's expected participation in Riverside County's Development Impact Fee Program and the Solar Policy B-29, as adopted by the Riverside County Board of Supervisors, would mitigate the impacts. Staff concluded that compliance with B-29 would mitigate for the project's impacts on local emergency service providers. Since the submission of the **Worker Safety and Fire Protection** section in the PSA Part A publication, staff has concluded that because B-29 is currently the subject of litigation and the purposes of most of the fees identified in that provision (as well as those of the Development Impact Fee Program) are already being addressed by other Energy Commission staff-proposed mitigation measures, it would be best not to rely on B-29 for any of staff's conditions of certification.

As a response to staff's data request (DR 43-1, and -2), the applicant provided its Fire and Emergency Services Risk Assessment and its Fire and Emergency Services Needs Assessment, both of which concluded that the risks of the project requiring responses from the RCFD during construction and operation were "extremely low probability," a view that is contradicted by the aforementioned letter from RCFD. Although the RCFD has not yet delineated particular direct and cumulative impacts, staff believes that there is potential for the project to impact emergency services. The potential impacts must be analyzed in detail in order for appropriate mitigation to be determined.

Therefore, staff has determined that the fulfillment of the requirements that were listed as Condition of Certification **WORKER SAFETY-9** in the **Worker Safety and Fire Protection** section of the PSA Part A publication, **PSA Part A at http://www.energy.ca.gov/2012publications/CEC-700-2012-006/CEC-700-2012-006-PSA-PTA.pdf** would be needed before staff can make a determination of appropriate mitigation of any identified potential impacts on the local emergency services provided under the jurisdiction of RCFD.

Staff will need the applicant to complete one of the following actions at least 30 days before publication of the Final Staff Assessment (FSA):

(1) Reach an agreement with the Riverside County Fire Department (RCFD) regarding funding of its project-related share of capital and operating costs to improve fire protection/emergency response infrastructure and provide appropriate equipment as mitigation of project-related impacts on fire protection/emergency response services within the jurisdiction; ***or***

(2) If no agreement can be reached, the project applicant should fund a study (the "independent fire needs assessment and risk assessment") conducted by an independent contractor who shall be selected by the applicant and approved by staff, in consultation with Riverside County Fire Department. The study shall evaluate the project's proportionate funding responsibility for any identified impacts and necessary mitigation measures, with particular attention to emergency response and equipment/staffing/location needs.

The study should also evaluate the following:

(a) the project's proportionate (incremental) contribution to potential cumulative impacts on the RCFD and the project allocated costs of enhanced fire protection/emergency response services including the fire response, hazardous materials spill/leak response, rescue, and emergency medical services necessary to mitigate such impacts;

(b) the extent that the project's contribution to local tax revenue will reduce impacts on local fire protection and emergency response services; and

(c) recommend an amount of funding (and corresponding payment plan) that represents the project's proportional payment obligation for the above-identified mitigation measures.

Protocols should be as follows:

(a) the study should be conducted by an independent consultant selected by the project owner and approved by staff. The project owner shall provide staff with the names of at least three consultants, whether entities or individuals, from which to make a selection, together with statements of qualifications;

(b) the applicant should provide the protocols for conducting the independent study for review and comment by the RCFD and review and approval by staff prior to the independent consultant's commencement of the study;

(c) the consultant should not communicate directly with the applicant or RCFD without express prior authorization from staff. When such approval is given, staff should be copied on any correspondence between or among the applicant, RCFD, and the consultant (including emails) and included in any conversations between or among the applicant, RCFD and consultant.

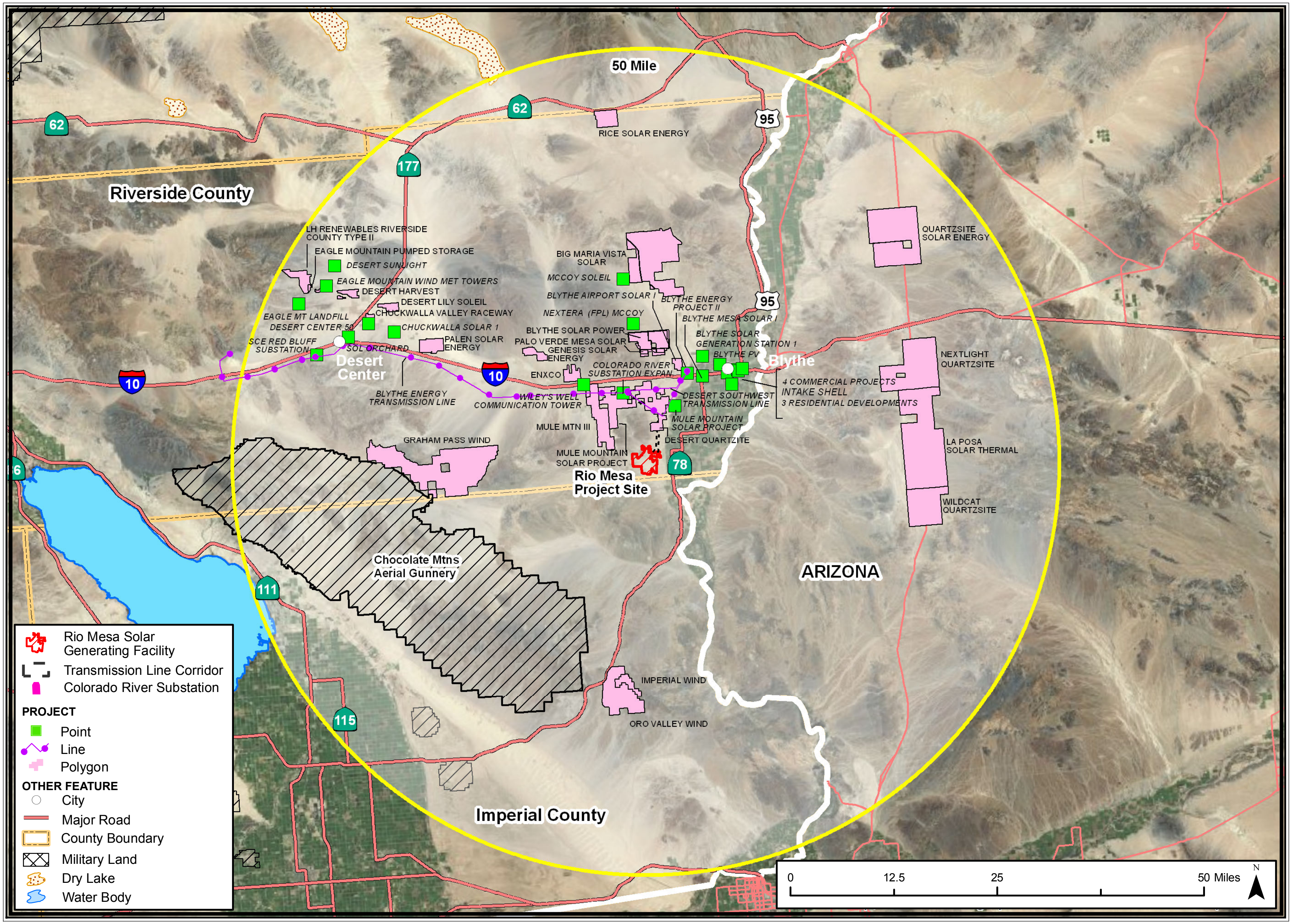
## SUMMARY

Based on the preliminary staff conclusions noted above and further supported by the detailed review of each technical section included in this PSA Part B, the Rio Mesa SEGF will result in unmitigable significant, adverse impacts in the areas of biological and cultural resources. Additionally, the project will not comply with all applicable LORS in these technical areas. Staff continues to analyze the project's potential impact to a significant, adverse, cumulative impact resulting from loss of open space. Staff will incorporate the significance determinations of other technical areas in the FSA and reach a conclusion regarding whether those impacts lead to a significant impact in land use as well.

A public workshop on the PSA is anticipated to be conducted on October 29, 2012 in Sacramento at the California Energy Commission. A second public workshop is anticipated in the City of Blythe in early November. Others may be conducted if warranted, and based on the outstanding information identified in the PSA and provided by the applicant, comments received on the PSA, and any other pertinent information, staff will prepare an FSA, which will represent staff's final analysis, conclusions, and recommendations regarding the Rio Mesa Project.

# EXECUTIVE SUMMARY - FIGURE 1

Rio Mesa Solar Electric Generating Facility - Area Map




EXECUTIVE SUMMARY

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION

SOURCE: BLM, ESRI, Tele Atlas Data 2010, and Bing Aerial Image

# ENVIRONMENTAL ASSESSMENT

# BIOLOGICAL RESOURCES

Scott D. White and Jennifer Lancaster

## INTRODUCTION

This section of the Preliminary Staff Assessment (PSA) provides California Energy Commission staff's analysis of anticipated impacts to biological resources from the Rio Mesa Solar Electric Generating Facility project (Rio Mesa SEGF) as proposed by Rio Mesa Solar I, LLC and Rio Mesa Solar II, LLC (together referred to as "applicant"). This analysis describes the biological resources at the proposed project site and at the locations of ancillary facilities, and evaluates the project's expected impacts to them. This section explains the need for mitigation, evaluates the adequacy of the applicant's proposed mitigation, and identifies additional mitigation to reduce impacts. These additional measures are specified in staff's "Proposed Conditions of Certification" for the Energy Commission to consider in its decision. Where applicable, staff concludes whether these conditions would reduce the project's impacts to less-than-significant levels according to the California Environmental Quality Act (CEQA). This section of the PSA also describes applicable laws, ordinances, regulations, and standards (LORS) and indicates whether the project, with staff's recommended conditions of certification as applicable, would conform to applicable LORS. In some cases, staff has recommended all known feasible mitigation, but concludes that certain impacts would not or may not be reduced to a level less than significant even with the recommended conditions of certification.

This analysis is based, in part, on information provided in the Rio Mesa SEGF Application for Certification (AFC) (BS 2011a), the project revisions described in the Environmental Enhancement Proposal (BS 2012v), the applicant's follow-up presentations and responses to staff data requests (BS 2012a, BS 2012b, BS 2012c, BS 2012h, BS 2012i, BS 2012l, BS 2012m, BS 2012n, BS 2012o , BS 2012p, BS 2012r, BS 2012t, BS 2012u, ESH 2012a, URS 2011, URS 2012a, URS 2012b, URS 2012c, URS 2012d, URS 2012h, URS 2012i), staff workshops, site visits by staff in November 2011 and April 2012; communications with representatives from the California Department of Fish and Game (CDFG), Bureau of Land Management (BLM), and the U.S. Fish and Wildlife Service (USFWS); and staff's independent research.

## SUMMARY OF CONCLUSIONS

The summary provides an overview of the Rio Mesa SEGF's expected impacts to biological resources, staff's proposed conditions of certification that may mitigate those impacts, and staff's conclusions with regard to significance of the impacts with incorporation of the recommended mitigation. Staff's recommended conditions of certification were developed cooperatively by Energy Commission, Bureau of Land Management (BLM), California Department of Fish and Game (CDFG) and US Fish and Wildlife Service (USFWS) staff.

<u>Habitat Compensation</u>: Several of staff's recommended conditions of certification would require the acquisition and protection of offsite lands to offset the project's impacts to native vegetation, wildlife habitat (including habitat for listed threatened species) and

jurisdictional waters of the state. Staff's recommended criteria for selecting the compensation lands, management in perpetuity for biological resource values, and depositing a financial security to ensure protection of these lands are described in Condition of Certification **BIO-3** (Offset for Loss and Degradation of Native Vegetation and Wildlife Habitat). Additional selection criteria to ensure habitat compensation for each of the affected resources are provided in staff's recommended Conditions of Certification **BIO-9, BIO-13**, and **BIO-17**, which would compensate for impacts to waters of the state, desert tortoise habitat, golden eagle foraging habitat, and burrowing owl habitat (respectively). Compensation lands designated as offset for each resource impact may also serve to offset other impacts (i.e., wherever applicable and appropriate, compensation land for a given resource impact may be "nested" or "layered" on compensation lands designated for other resources). Thus, each given compensation land parcel may serve to compensate more than one impact.

<u>Native Vegetation and Wildlife Habitat:</u> Staff has considered impacts to vegetation and habitat based on information provided by the applicant in the Environmental Enhancement Proposal (BS 2012v); however, staff is coordinating with the applicant to provide greater clarity with regard to temporary and permanent impacts to vegetation and habitat. For the purposes of this PSA, the following acreages are considered in the analysis of impacts to biological resources:

- **Project solar generator site** (within the permanent fenceline) = 3,805 acres
- **Total permanent impacts on project site** (solar generator site, gen-tie line, and access roads) = 3,840 acres
- **Permanent impacts to native vegetation** (not including areas mapped as ruderal, agricultural, or developed/open channel) = 3,834 acres

Construction and operation of the Rio Mesa SEGF would result in long-term degradation and, in many areas, permanent elimination of 3,834 acres of native vegetation and wildlife habitat on the 3,840-acre project site, and would cause indirect impacts such as weed introductions to surrounding vegetation and habitat. These impacts would affect all plant and wildlife species on the site, including special-status species. The majority of this habitat is creosote bush scrub, which is the predominant shrubland throughout the California deserts. However, five vegetation or habitat types totaling 799.6 acres within the project area are ranked as special-status plant communities. These include 713.7 acres that BLM and CDFG identify as important regional habitats in the Northern and Eastern Colorado Desert Management Plan (blue palo verde – ironwood woodland, desert dunes, and bush seepweed scrub – mesquite bosque). Staff recommends compensating direct impacts to vegetation and habitat at the following ratios: 1:1 for creosote bush scrub (i.e., most of the impacts) and 3:1 for special-status plant communities and habitats. Additionally, groundwater pumping for the project also may affect offsite vegetation and habitat that is dependent on groundwater availability within the root zone.

Although construction and operation would not cause the complete loss of vegetation and habitat at the solar generator site, staff concludes that project activities would eliminate or degrade most habitat values for all but the most disturbance-tolerant native species. Disturbance to native vegetation along the transmission line alignments and at the temporary construction area adjacent to the proposed solar generator site would cause long-term degradation to affected vegetation and habitat. To minimize project effects to vegetation and habitat, staff proposes the following conditions of certification:

**BIO-1** Designated Biologist, Authorized Desert Tortoise Biologist, and Biological Monitors: Selection, Qualifications, Responsibilities, and Authority;

**BIO-2** Biological Resources Mitigation Implementation and Monitoring Plan;

**BIO-3** Compensatory Mitigation: Offset For Loss and Degradation of Native Vegetation and Wildlife Habitat;

**BIO-4** Worker Environmental Awareness Program;

**BIO-5** Impact Avoidance and Minimization Measures;

**BIO-6** Revegetation Plan;

**BIO-7** Integrated Weed Management Plan; and

**BIO-8** Desert Dry Wash Woodland Monitoring Plan and Off-site Impact Compensation.

Staff concludes that these measures would reduce the project's impacts to native vegetation and wildlife habitat to a level of less than significant. However, staff is uncertain whether compensation for impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible. Desert dry wash woodland is relatively rare, due to restriction to wash landforms with suitable surface or groundwater hydrology, and large parcels predominantly covered by this habitat may not be available. Feasibility will depend upon availability from willing sellers of 2,126.7 acres of privately owned desert woodland habitat. There is an estimated 40,000 acres of this habitat in private ownership in the region. If 3:1 compensation for the impacts to blue palo verde – ironwood woodland is found infeasible then the project's impacts to special-status vegetation may be significant and unavoidable. Staff will coordinate with the applicant and public or private entities specializing in compensation habitat acquisition and management to determine feasibility and, if necessary, identify alternate mitigation.

<u>State and Federal Jurisdictional Waters</u>: The project would affect numerous state and federally jurisdictional desert washes and ephemeral channels on the solar generator site and along the transmission line, as well as a small area of state and federally jurisdictional wetlands. In addition, the state holds jurisdiction over impacts to riparian vegetation adjacent to state-jurisdictional streambeds. Desert dry wash woodland is the regional riparian vegetation. The applicant reports that a total of 817.37 acres of state waters are located within the project area. Staff's recommended Condition of Certification **BIO-9** (State Waters Impact Minimization and Compensation Measures) would require implementation of Best Management Practices (BMPs) to minimize impacts to state waters on the project site and to adjacent and downstream state waters that could be affected by the project. In addition, **BIO-9** would require the project owner to offset the loss of state-jurisdictional waters and adjacent riparian vegetation through off-site habitat compensation at a 3:1 ratio. Staff anticipates that compensation would largely be concurrent with recommended compensation of impacts to blue palo verde –

ironwood woodland (Native Vegetation and Wildlife Habitat, above). With implementation of Condition of Certification **BIO-9** staff concludes that project impacts to state-jurisdictional waters and adjacent riparian vegetation would be less than significant according to CEQA. However, if 3:1 compensation for these impacts is found infeasible then the project's impacts to waters of the state may be significant and unavoidable. As discussed above, feasibility will depend upon availability from willing sellers of 2,126.7 acres of privately owned desert woodland habitat. Staff will coordinate with the applicant and public or private entities specializing in compensation habitat acquisition and management to determine feasibility and, if necessary, identify alternate mitigation. Staff will coordinate with CDFG upon the applicant's submission of a Lake and Streambed Alteration Agreement (LSAA) Application to the CDFG to determine whether Condition of Certification **BIO-9** also would conform to the state's LSAA program according to sections 1600-1616 of the state Fish and Game Code.

<u>Special-Status Plants</u>: One special-status plant species, Harwood's milk-vetch, was reported on the proposed solar generator site and another, Harwood's eriastrum, was reported near the northern segment of the generator tie-line alignment. Field surveys are in progress to identify any additional late-season special status species that may also occur on the site. Potentially significant impacts to Harwood's milk-vetch and other special-status plants can be reduced below a level of significance with the implementation of staff's proposed impact avoidance and minimization measures. These measures are detailed in staff's proposed Conditions of Certification **BIO-1** through **BIO-9** (above) and **BIO-10** (Special-Status Plant Impact Avoidance and Minimization). **BIO-10** would require avoidance of impacts to special-status plants to the extent feasible, and would require mitigation of any unavoidable impacts though one or a combination of additional measures, such as off-site compensation, plant salvage, horticultural propagation, or enhancement of off-site occurrences. Staff concludes that, with mitigation as recommended, impacts to special-status plants would be less than significant.

<u>Common Wildlife and Nesting Birds</u>: The project would adversely affect common wildlife and nesting birds due to habitat loss and degradation, off-site disturbances such as noise, lighting, weed introductions, and altered off-site hydrology. Gen-tie line construction would degrade habitat at work sites and would cause short-term noise and disturbance impacts to wildlife in the construction area. All native birds, including species with no other conservation status, and including their nestlings and eggs, are protected from take under the California Fish and Game Code and the federal Migratory Bird Treaty Act (MBTA). To reduce project effects to common wildlife and nesting birds, staff recommends Conditions of Certification **BIO-1** through **BIO-5** (above). Among their other requirements, these conditions would require minimization of disturbance areas, monitoring by trained and qualified biologists, worker training to avoid or minimize impacts to wildlife, including common wildlife and nesting birds, and a series of measures to minimize or avoid hazards to wildlife including gen-tie design to minimize or avoid electrocution hazard for birds. In addition, staff recommends Condition of Certification **BIO-11** (Pre-Construction Nest Surveys and Impact Avoidance Measures) which would require the project owner to avoid or minimize disturbance to nesting birds throughout the construction phase and the life of the project by locating and avoiding active nests. With implementation of these measures, staff concludes that most project

impacts to common wildlife and nesting birds, with the exception of bird mortality during project operations, would be reduced below a level of significance.

Operation of the project is expected to result in bird collisions with the heliostat mirrors and bird mortality or injury from exposure to concentrated solar energy surrounding the central tower. Staff at this time cannot quantify the expected impact, but believes this impact would be significant according to CEQA. Staff proposes Condition of Certification **BIO-12** (Mitigating and Monitoring Operational Impacts to Birds and Bats), which would require a Bird Monitoring Study to monitor the death and injury of birds. However, staff concludes that it is not feasible to mitigate this impact below a level of significance, and that collision with heliostats and injury or mortality from exposure to concentrated solar energy would be a significant and unavoidable adverse impact. The collision and burning hazards are applicable for all bird species that may fly over site or near the gen-tie line, including the special-status species summarized below. Staff will continue coordinating with the applicant and resource agencies to review any potential for off-site habitat protection and enhancement, particularly in wetland areas and wildlife refuges, where habitat expansion or improvement may offset anticipated loss of migrating or overwintering birds.

<u>Desert Tortoise</u>: Construction and operation of the Rio Mesa SEGF would result in long-term degradation, and in many areas permanent elimination, of 3,834 acres of occupied desert tortoise habitat on the project site; adverse indirect impacts such as weed introductions to surrounding vegetation and habitat; and would necessitate translocation of all desert tortoises from the proposed solar generator site. The desert tortoise is listed as a threatened species under the state and federal Endangered Species Acts. To mitigate project impacts to desert tortoises and habitat, staff proposes Conditions of Certification **BIO-1** through **BIO-8** (above), which would serve to mitigate many of the project's impacts to native vegetation and wildlife habitat, including desert tortoise habitat. Staff also recommends Conditions of Certification **BIO-13** (Desert Tortoise Clearance Surveys, Exclusion Fencing, and Translocation) and **BIO-14** (Desert Tortoise Habitat Compensation), which are specific to desert tortoise. **BIO-13** would require pre-construction clearance surveys and exclusion fencing, to remove desert tortoises from the solar generator site and prevent tortoises from entering the site in the future; preparing and implementing a translocation plan, to locate all desert tortoises on the site prior to construction and translocate them to suitable off-site habitat. **BIO-14** would require acquisition, protection, and enhancement of compensation desert tortoise habitat, at a 1:1 ratio, for all permanent and long-term habitat loss. Compensation for desert tortoise habitat would be according to the conditions for all habitat compensation in **BIO-3** (above) and according to selection criteria listed in **BIO-14**. The compensation lands would be protected under a conservation easement and managed in perpetuity as desert tortoise habitat. Financial security is required to cover the costs to acquire, protect, and manage the compensation lands in perpetuity, as described in **BIO-3**. Staff's recommended Condition of Certification **BIO-15** (Raven Monitoring, Management, and Control Plan) would require (1) management actions to prevent any project-related increase in common raven predation on desert tortoises, and (2) contribution on a per-acre basis to a region-wide raven management strategy. This suite of mitigation measures was developed cooperatively by Energy Commission, BLM, CDFG, and USFWS staff. Staff concludes that, with mitigation as recommended, the project's impacts to desert tortoises would be less than significant according to CEQA

and would be fully mitigated as required under the California Endangered Species Act (CESA). BLM will formally consult with the USFWS under Section 7 of the federal ESA to obtain a Biological Opinion indicating the USFWS's determination whether the project would jeopardize the continued existence of the desert tortoise.

<u>Other Special-Status Amphibians and Reptiles</u>: The project could impact Couch's spadefoot toad, Mojave fringe-toed lizard, rosy boa snake, or Banded Gila monster lizard. None of these species has been observed on the solar generator site, though Mojave fringe-toed lizard occurs in the northern portion of the proposed gen-tie line. Staff concludes that project impacts to the first two species, should they occur, could be significant but would be mitigated below a level of significance through recommended Conditions of Certification **BIO-1** through **BIO-5** (above). Staff also concludes that impacts, if any, to rosy boa or Banded Gila monster would be less than significant according to CEQA.

<u>Bald and Golden Eagle</u>: The bald eagle is protected by the federal Bald and Golden Eagle Protection Act (BGEPA) and MBTA and fully protected under the California Fish and Game Code. The golden eagle is a BLM sensitive species, also protected under the federal BGEPA and MBTA, and is designated as fully protected under the California Fish and Game Code. There is no suitable bald or golden eagle nesting habitat on the proposed project site. The entire project is suitable golden eagle foraging habitat year-around, and bald eagles may fly over the area or (rarely) forage on the site during winter or migration seasons. Staff's recommended Conditions of Certification **BIO-1** through **BIO-8** (above) would serve to mitigate many of the project's impacts to native vegetation and wildlife habitat, including eagle foraging habitat. Staff believes that all compensation land meeting recommended selection criteria as desert tortoise habitat (**BIO-14**, above) also would serve as suitable eagle foraging habitat. Staff concludes that the project's impacts to eagle foraging habitat would be less than significant with incorporation of these recommended conditions of certification.

The project also would present long-term operational phase hazards to bald and golden eagles. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** (above) would minimize adverse impacts to eagles. Among their other requirements (above), **BIO-3** would require a series of measures to minimize or avoid hazards to wildlife including gen-tie design to minimize or avoid electrocution hazard for birds. Operation of the project may result in eagle collisions with the heliostat mirrors and mortality or injury from exposure to concentrated solar energy surrounding the central towers. Staff proposes Condition of Certification **BIO-12** (Mitigating and Monitoring Operational Impacts to Birds and Bats), which would require an Eagle Conservation Plan, to specify the project owner's anticipated take of golden eagles or other large special-status raptors (if any) and would require retrofitting of existing off-site electrical distribution lines to reduce electrocution risk to remediate any take of eagles or other large special-status raptors that may exceed the estimated take (even if estimated take is zero). Staff cannot quantify the expected mortality for bald or golden eagles at this time, but believes that the Rio Mesa SEGF has the potential to take one or more bald or golden eagles over the life of the project, due either to collision with project facilities or to injury or mortality caused by flying through concentrated solar energy over the heliostat field. Staff is coordinating with the US Fish and Wildlife Service to quantify expected take of eagles (if any) and hopes to include that estimate in its FSA. Staff concludes that the take of a bald or golden eagle, should it occur, would be significant according to CEQA. Staff's recommended Condition of Certification **BIO-12** would mitigate this impact to a level less than significant according to CEQA. However, take of bald or golden eagles could violate the California Fish and Game Code, due to the status of both species as migratory birds and fully protected species, and unauthorized take of either species could violate the federal MBTA and BGEPA. Staff's conclusion regarding CEQA significance of this impact does not imply conformance with these other LORS.

<u>Swainson's Hawk</u>: Swainson's hawk is listed as threatened under CESA and protected under the federal MBTA and California Fish and Game Code. Swainson's hawks do not nest or over-winter in the project region, but migrate through the region en route to breeding and wintering ranges. There is a low potential for take of Swainson's hawk due to collision with heliostats or other project facilities, or injury by concentrated solar energy surrounding the central towers. Mortality or other take would be significant under CEQA and may violate CESA. Staff's recommended Condition of Certification **BIO-12** would mitigate this impact to a level less than significant according to CEQA and fully mitigate the impact according to CESA. However, take of Swainson's hawks also could violate the California Fish and Game Code, due to its status as a migratory bird and unauthorized take could violate the federal MBTA. Staff's conclusion regarding CEQA significance of this impact does not imply conformance with these other LORS.

<u>Elf Owl and Gila Woodpecker</u>: The elf owl and Gila woodpecker are listed as endangered under CESA. The project site is near the western margin of both species' geographic ranges, and desert woodland habitat on the site is marginally suitable nesting habitat for them both. Both species have been observed at the proposed solar generator site, but neither has been documented nesting on the site. Staff concludes that 708.9 acres of desert microphyll woodlands on the site would be lost by construction of the project. This habitat is suitable as migratory stopover habitat, foraging habitat, and perhaps occasionally as breeding habitat for both species. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to this habitat (above), including compensation and management of offsite lands at a 3:1 ratio. In addition, staff's recommended Condition of Certification **BIO-11** (above) would require surveys and avoidance measures to prevent destruction of bird nests during construction and operations. Staff concludes that these conditions of certification would avoid any potential construction phase take of elf owl and Gila woodpecker according to CESA and would reduce or avoid construction phase impacts to both species to a level less than significant according to CEQA. However, staff is uncertain whether offset of impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible (see "Habitat Compensation," above). If 3:1 compensation for this habitat is found infeasible then the project's impacts to elf owl and Gila woodpecker habitat may be significant and unavoidable. In addition, project operation may cause take Gila woodpecker or elf owl by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers (see "Common Wildlife and Nesting Birds" above). If so, staff concludes that this impact would be significant and unavoidable.

<u>Burrowing Owl</u>: Construction and operation of the Rio Mesa SEGF would cause long-term degradation, and in many areas permanent elimination of 3,834 acres of seasonally occupied burrowing owl habitat, and adverse indirect impacts such as weed

introductions to surrounding vegetation and habitat. The project also could cause mortality to any burrowing owls that may be found on the site during construction, should they retreat into burrows to avoid construction equipment, where they may be crushed or entombed. The burrowing owl is a BLM sensitive species and a California Species of Special Concern. Based on the applicant's field survey data, staff estimates that three burrowing owl territories are found on the proposed solar generator site. These territories may be active during either winter or breeding season. Staff recommends Conditions of Certification **BIO-1** through **BIO-8** (above), which would serve to mitigate many of the project's impacts to native vegetation and wildlife habitat, including burrowing owl habitat. In addition, staff's proposed Condition of Certification **BIO-19** (Burrowing Owl Impact Avoidance and Compensation Measures) provides measures to avoid take or direct impacts to burrowing owls, and to compensate for habitat loss based on the estimated number of territories on the site. Habitat compensation may be "nested" within compensation lands required for other biological resources (**BIO-3**, above). With incorporation of these recommended conditions of certification, staff concludes that the project's potential construction phase impacts to burrowing owl would be less than significant. Project operation may cause take of burrowing owl by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers (see "Common Wildlife and Nesting Birds" above). If so, staff concludes that this impact would be significant and unavoidable.

<u>Other Special-Status Raptors</u>: Several other special-status birds of prey are found in the region seasonally, especially during winter, or as year-around residents. These include osprey, ferruginous hawk, Cooper's hawk, sharp-shinned hawk, northern harrier, prairie falcon, peregrine falcon, merlin, Harris hawk, short-eared owl, and long-eared owl. Staff concludes that the project would not affect nest sites for these species, and that the project's adverse impacts to foraging habitat for wintering and migratory species would be less than significant. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize or compensate for project impacts to prairie falcon foraging habitat. All of these species may be vulnerable to operations impacts including collision with heliostats or other project facilities and injury or mortality from exposure to concentrated solar energy (see "Common Wildlife and Nesting Birds" above). Take, if any, of large special-status raptor species can be offset through retrofitting of distribution lines that present electrocution hazards to large birds. Staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring Operational Impacts to Birds and Bats) would require the project owner to retrofit existing off-site electrical distribution lines to reduce electrocution risk to large raptors. Staff concludes that **BIO-12** would offset any potential take of large special-status raptors to below a level of significance according to CEQA. Smaller special-status raptors are less vulnerable to power line electrocution and staff concludes that distribution line retrofitting would not mitigate take, if any, of those birds. For these species, staff concludes that this impact would be significant and unavoidable.

<u>Special-Status Desert Shrubland Passerine Birds</u>: Several special-status upland perching bird species are present or have the potential to occur at the project site. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to nesting bird habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and

compensate for habitat loss through the acquisition and management of offsite lands. In addition, staff's recommended Condition of Certification **BIO-11** would require surveys and avoidance measures to prevent destruction of active bird nests during construction and operations. Taken together, staff concludes that these conditions of certification would avoid any potential take of these species during project construction and would reduce impacts to their habitat to a level less than significant according to CEQA. Project operation may cause take of these species by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers (see "Common Wildlife and Nesting Birds" above). If so, staff concludes that this impact would be significant and unavoidable.

Special-Status Migratory and Wintering Birds: Several special-status species have been observed on and around the project site during winter or migration, including greater sandhill crane, bank swallow, willow flycatcher, American white pelican, Vaux's swift, and yellow-headed blackbird. These species would not use the site regularly, but they are likely to fly over the site either during migration through the area or during shorter flights among regional wetland habitats. Project operation may cause take of these species by collision with heliostats or other project facilities, or burning in concentrated solar energy surrounding the central towers (see "Common Wildlife and Nesting Birds" above). If so, staff concludes that this impact would be significant and unavoidable. However, staff will continue coordinating with the applicant and resource agencies to review any potential for off-site habitat protection and enhancement, particularly in wetland areas and wildlife refuges, where habitat expansion or improvement may offset anticipated loss of migrating or overwintering birds. The greater sandhill crane, bank swallow, and willow flycatcher are listed under CESA, and the greater sandhill crane is fully protected under the state Fish and Game Code; therefore mortality or other take (as defined in the Code) may violate CESA and the regulations for fully protected species.

Large Mammals: The proposed solar generator site provides suitable cover and foraging habitat for Nelson's bighorn sheep, burro deer, and Yuma mountain lion. All three species would be expected occasionally on the site. All three species require regular access to drinking water, especially during summer, and may cross the site to reach irrigation water to the east. Loss of habitat is likely to significantly affect Nelson's bighorn sheep, burro deer, or Yuma mountain lion in the area. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** (above) would minimize and compensate for habitat loss. Staff concludes that the project's impacts to habitat for these three species would be reduced below a level of significance by implementing these measures. Potential impacts to regional wildlife movement for these and other species are addressed under Wildlife Movement, below.

Burrowing Mammals: American badgers and desert kit foxes occur throughout the project area. The entire project area is suitable breeding and foraging habitat for both species. Loss of habitat would significantly affect both animals, but staff's recommended Conditions of Certification **BIO-1** through **BIO-5** (above) would minimize and compensate for habitat loss. The project also could crush or entomb these species. Desert kit fox is protected from any take according to the California Fish and Game Code. Staff's proposed Condition of Certification **BIO-18** would require the project owner to prepare and implement a management plan to avoid take by excluding these animals from the project area prior to construction. Staff concludes that implementation of these recommended conditions of certification would reduce project impacts to desert kit fox and American badger below a level of significance.

Colorado Valley Woodrat: The Colorado Valley woodrat is generally found in dense patches of beavertail cactus or mesquite. It is not listed or proposed for listing as threatened or endangered and is not ranked as a species of special concern by CDFG. However, the CDFG status S1S2 indicates that Colorado Valley woodrat distribution is very restricted in California, possibly to the point of endangerment. Suitable habitat is found off-site in mesquite bosque habitat. Groundwater pumping for the project has the potential to adversely affect this habitat (see "Hydrology and Groundwater Dependent Vegetation," above). Staff's recommended Condition of Certification **BIO-8** (above) would require the project owner to monitor groundwater levels and plant health and vigor in adjacent desert dry wash woodland and mesquite bosque areas, and avoid or mitigate adverse impacts, should they occur, to this habitat. Staff concludes that this condition would identify and mitigate any adverse project impacts to Colorado Valley woodrat habitat to a level that is less than significant according to CEQA.

Special-Status Bats: Documented roosting areas for several special-status bats are found in caves and mines in the Mule Mountains, east of the proposed project site. Important foraging habitat is found over agricultural lands and desert woodland on-site and to the east. No special-status bats are expected to roost on-site, but several species could forage over the site or fly across the site en route between roosting areas in the Mule Mountains to agricultural lands to the east. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** (above) would minimize or compensate for habitat loss, including offset for blue palo verde – ironwood woodland at a 3:1 ratio. Staff concludes that these measures would effectively mitigate habitat impacts for special-status bats. Staff is uncertain whether offset of impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible (see "Habitat Compensation," above). If 3:1 compensation for this habitat is found infeasible then the project's impacts to special-status bat habitat may be significant and unavoidable.

Wildlife Movement: Construction of the proposed Rio Mesa SEGF could interrupt wildlife movement through the area. The project would impede movement for desert tortoises and other relatively less-mobile animals north to south across the Palo Verde Mesa. But movement habitat would remain in place east and west of the project site. Due to its location east of the Mule Mountains, the project would not interfere with important movement corridors for desert tortoise genetic exchange or demography. The proposed project site is not located between designated critical habitat units or Desert Wildlife Management Areas. Larger and more mobile animals such as Nelson's bighorn sheep, burro deer, and Yuma mountain lion may travel east and west across the valley regularly, as a part of daily or seasonal movement patterns. The proposed project would adversely affect east-west movement habitat for these species, and would likely cause animals to change their movement routes between the mountains and irrigated lands. These large mammals are wide-ranging by their nature, and staff believes that local populations would adapt to the changed land use. Staff concludes that impacts to wildlife movement would be less than significant according to CEQA.

Cumulative Impacts: Staff concludes that without mitigation, the Rio Mesa SEGF would contribute to the cumulatively significant loss of regional resources, including the state and federally threatened desert tortoise and other special-status species discussed above. Impact avoidance and minimization measures described in staff's analysis and included in the conditions of certification would help reduce impacts to these resources. These and additional compensatory measures are necessary to offset project-related losses, and to assure compliance with state and federal laws such as CESA and the federal ESA. With the implementation of Conditions of Certification **BIO-1** through **BIO-20**, staff concludes that the Rio Mesa SEGF's contributions to cumulative significant impacts to biological resources would not be considerable, with three possible exceptions:

1. Desert microphyll woodlands (also called dry desert wash woodlands, or blue palo verde – ironwood woodlands; these woodlands also meet jurisdictional criteria as waters of the state, and the cumulative impacts conclusion for waters of the state is the same); if the prescribed 3:1 compensation for impacts to jurisdictional waters and habitats is found infeasible, then the project's incremental contribution to cumulative impacts to blue palo verde – ironwood woodland and the wildlife species which depend on them may remain cumulatively considerable.

2. Operational impacts to native birds including special-status birds and raptors; and

3. Foraging habitat for golden eagles.

Additional Information Staff Requires from the Applicant in Order to Complete the FSA: Staff is awaiting additional information from the applicant for inclusion in the FSA, including the results of the full year of bird and bat surveys conducted during 2012, the results of late-season botany surveys conducted in 2012, clarification of acreages of permanent and temporary disturbance by vegetation type, the Lake and Streambed Alteration Agreement (LSAA) Notification and Incidental Take Permit application to be submitted to CDFG, and the draft Facility Closure, Revegetation, and Reclamation Plan and Financial Security.

## LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

The applicant would be required to abide by LORS during project construction and operation, as listed in **Biological Resources Table 1**.

**Biological Resources Table 1**
**Laws, Ordinances, Regulations, and Standards (LORS)**

| Applicable LORS | Description |
|---|---|
| **FEDERAL** | |
| Federal Endangered Species Act (Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq.) | Designates and provides for protection of threatened and endangered plant and animal species and their critical habitat. Take of a federally-listed species, as defined in the Act, is prohibited without incidental take authorization, which may be obtained through Section 7 consultation (between federal agencies) or a Section 10 Habitat Conservation Plan. |

| Applicable LORS | Description |
|---|---|
| Migratory Bird Treaty Act (Title 16, United States Code, sections 703 through 711) | Makes it unlawful to take or possess any migratory bird (or any part of such migratory bird, including active nests) as designated in the Migratory Bird Treaty Act unless permitted by regulation (e.g., duck hunting). |
| Clean Water Act (Title 33, United States Code, sections 1251 through 1376, and Code of Federal Regulations, part 30, section 330.5(a)(26)) | Requires the permitting and monitoring of discharges to surface water bodies. Section 404 requires a permit from the U.S. Army Corps of Engineers (USACE) for a discharge from dredged or fill materials into waters of the U.S., including wetlands. Section 401 requires a permit from a regional water quality control board (RWQCB) for the discharge of pollutants. By federal law, every applicant for a federal permit or license for an activity that may result in a discharge into a California water body, including wetlands, must request state certification that the proposed activity will not violate state and federal water quality standards. |
| Bald and Golden Eagle Protection Act (Title 16, United States Code section 668) | Provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the act. |
| Eagle Permits (Title 50, Code of Federal Regulations, Part 22) | Authorizes take of bald eagles and golden eagles where the take is compatible with the preservation of the bald eagle and the golden eagle; necessary to protect an interest in a particular locality; associated with but not the purpose of the activity; and (1) For individual instances of take: the take cannot practicably be avoided; or (2) For programmatic take: the take is unavoidable even though advanced conservation practices are being implemented. Also provides for the take of eagle nests under certain circumstances, such as where they pose a human health and safety risk or pose a functional hazard that renders a human-engineered structure unusable for its intended function. Take authorization for eagles and nests must be obtained through consultation with the USFWS. |
| Federal Land Policy and Management Act of 1976 (FLPMA) 43 U.S.C. 1701 section 102 | Governs the way in which the public lands administered by the BLM are managed. |
| California Desert Conservation Area Plan 1980, as amended (reprinted in 1999) | Administered by the BLM, the California Desert Conservation Area (CDCA) Plan requires that proposed development projects are compatible with policies that provide for the protection, enhancement, and sustainability of fish and wildlife species, wildlife corridors, riparian and wetland habitats, and native vegetation resources. |
| Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) | The BLM produced the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) as an amendment to the 1980 CDCA Plan. The NECO is a federal land use plan amendment that resolves issues of resource demands, use conflicts, and environmental quality in the 5.5-million acre planning area located primarily within the Sonoran Desert in the southeastern corner of California. NECO provides reserve management for the desert tortoise, integrated ecosystem management for special status species and natural communities for all federal lands, and regional standards and guidelines for public land health for BLM lands (BLM and CDFG 2002). |
| Executive Order 11312 | Prevent and control invasive species. |

| Applicable LORS | Description |
|---|---|
| Desert Tortoise (Mojave Population) Recovery Plan (USFWS 1994) and Revised Recovery Plan (USFWS 2011a) | Describes a strategy for recovery and delisting of the desert tortoise. |
| **STATE** | |
| California Endangered Species Act of 1984 (Fish and Game Code, sections 2050 through 2098) | Protects California's rare, threatened, and endangered species. Take of a state-listed species, as defined in the act, is prohibited except as authorized by California Department of Fish and Game under an Incidental Take Permit or Consistency Determination (for take authorized by US Fish and Wildlife Service under the federal Endangered Species Act). |
| Protected furbearing mammals (California Code of Regulations, Title 14, section 460) | Fisher, marten, river otter, desert kit fox, and red fox may not be taken at any time. |
| California Code of Regulations (Title 14, sections 670.2 and 670.5) | Lists the plants and animals of California that are declared rare, threatened, or endangered. |
| Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515) | Designates certain species as fully protected and prohibits the take of such species or their habitat unless for scientific purposes (see also California Code of Regulations, Title 14, section 670.7). |
| Nest or Eggs (Fish and Game Code section 3503) | Protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. |
| Birds of Prey (Fish and Game Code section 3503.5) | Birds of prey are protected in California making it "unlawful to take, possess, or destroy any birds of prey (in the order Falconiformes or Strigiformes)." |
| Migratory Birds (Fish and Game Code section 3513) | Protects California's migratory birds by making it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame birds. |
| Nongame mammals (Fish and Game Code section 4150) | Makes it unlawful to take or possess any non-game mammal or parts thereof except as provided in the Fish and Game Code or in accordance with regulations adopted by the commission. |
| California Environmental Quality Act (CEQA), CEQA Guidelines section 15380 | CEQA defines rare species more broadly than the definitions for species listed under the state and federal Endangered Species Acts. Under section 15830, species not protected through state or federal listing but nonetheless demonstrable as "endangered" or "rare" under CEQA should also receive consideration in environmental analyses. Included in this category are many plants considered rare by the California Native Plant Society (CNPS) and some animals on the CDFG's Special Animals List. |
| Streambed Alteration (Fish and Game Code sections 1600-1616) | Regulates activities that may divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake in California designated by CDFG in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit. Impacts to vegetation and wildlife resulting from disturbances to waterways are also reviewed and regulated during the permitting process. |
| Porter-Cologne Water Quality Control Act | Regulates discharges of waste and fill material to waters of the State, including "isolated" waters and wetlands. |
| **LOCAL** | |
| Riverside County General Plan: Land Use and | Contains specific policies to preserve the character and function of open space that benefits biological resources. It also contains specific policies |

| Applicable LORS | Description |
| --- | --- |
| Multipurpose Open Space Elements of the County General Plan | and goals for protecting areas of sensitive plant, soils and wildlife habitat and for assuring compatibility between natural areas and development. The project area is designated as Open Space Conservation in the General Plan and included in the Palo Verde Valley Area Plan. |
| Lower Colorado River Multi-Species Conservation Program (LCRMSCP) | Intended to balance the use of the Colorado River water resources with the conservation of native species and their habitats. Includes general and species-specific conservation measures for twenty-six covered species and five evaluation species. The project site is within one mile of the LCRMSCP planning area, and proposed access road improvements and drainage crossing upgrades are within LCRMSCP Reach #4. |

## DESERT RENEWABLE ENERGY CONSERVATION PLAN – INTERIM PLANNING

In addition to the federal, state, and local LORS summarized above, federal and state agencies are collaborating to establish joint policies and plans to expedite development of California's utility-scale renewable energy projects. On October 12, 2009, the State of California and the U.S. Department of Interior (USDI) entered into a Memorandum of Understanding (MOU) on renewable energy, building on existing efforts by California and its federal partners to facilitate renewable energy development in the state. The MOU stems from California and USDI energy policy directives, and California's legislative mandate to reduce greenhouse gases to 1990 levels by 2020, and meet the goal of 33 percent of California's electricity production from renewable energy sources by 2020.

The MOU expands on several MOUs issued in 2008 to establish the activities of the California Renewable Energy Action Team (REAT). The REAT was established with California Executive Order S-14-08 (issued November 18, 2008), to "*establish a more cohesive and integrated statewide strategy, including greater coordination and streamlining of the siting, permitting, and procurement processes for renewable generation* …."

The Energy Commission and CDFG are the primary state collaborators in the REAT, operating under a November 18, 2008 MOU between the two agencies to create a "one-stop process" for permitting renewable energy projects under their joint permitting authority. The BLM and the USFWS also participate in the REAT under a separate MOU signed in November 2008, which outlines the state and federal cooperation of the group. The October 12, 2009 MOU between California and the USDI reiterates several tasks of the REAT provided for in S-14-08 and the Energy Commission-Fish and Game MOU.

The REAT's primary mission is to streamline and expedite the permitting processes for renewable energy projects in the Mojave and Colorado Desert ecoregions within the State of California, while conserving endangered species and natural communities at the ecosystem scale. To accomplish this goal the REAT agencies are developing a Desert Renewable Energy Conservation Plan (DRECP), a science-based process for reviewing, approving, and permitting renewable energy applications in California. Once the DRECP is complete it will provide tools to expedite coordination of federal Endangered Species Act (ESA) and California Endangered Species Act (CESA) permitting. The DRECP will also offer a unified framework for state and federal agencies to oversee mitigation actions, including land acquisitions, for listed species.

The REAT agencies recognize that some renewable energy projects are scheduled to be approved prior to completion of the DRECP. Section 8.9 of the May 2010 Planning Agreement for the DRECP (CDFG et al. 2010) directs the REAT agencies to ensure that permitting for these projects is consistent with the preliminary conservation objectives for the DRECP; would not compromise successful completion and implementation of the DRECP; would facilitate Federal ESA, CESA, National Environmental Policy Act (NEPA) and CEQA compliance; and would not unduly delay permitting during preparation of the DRECP.

### REAT Account and Advance Mitigation

In May 2010 the REAT agencies signed a Memorandum of Agreement (MOA) to establish a REAT Account that may be used by project developers to deposit funding for specified mitigation for approved renewable energy projects in the Mojave and Colorado Desert region of southern California (the MOA is available at <www.energy.ca.gov/33by2020>). For each project using the REAT Account an individual subaccount would be established for project specific tracking, compliance and accounting purposes. The subaccount would include a list of the specific mitigation actions, the cost, a timeframe for carrying out the actions, and identify which of the REAT agencies would be responsible for requiring and coordinating the mitigation actions. The National Fish and Wildlife Foundation (NFWF) would manage each subaccount and would disburse mitigation funding at the direction of the REAT agencies. NFWF is a charitable non-profit corporation established in 1984 by the federal government to accept and administer funds to further the conservation and management of fish, wildlife, plants and other natural resources <www.nfwf.org>. Use of the REAT Account would not change conditions of certification or other project requirements as applicable under state and federal permitting and approvals.

California legislation SB 34 and ABx1 13 (2010 and 2011 legislature sessions, respectively) created an advanced mitigation program to purchase and protect habitat. This advanced mitigation can be used by qualifying renewable energy projects by paying into the Renewable Energy Development Fee Trust Fund. The MOA REAT Account and the Trust Fund are similar in that both accounts manage project-specific mitigation funds, and a third party implements the mitigation actions. Staff's proposed Condition of Certification **BIO-19** provides an opportunity for the applicant to fulfill their mitigation obligations by participating in the advance mitigation program.

## SETTING AND EXISTING CONDITIONS

## REGIONAL SETTING

The proposed Rio Mesa SEGF site is located on the Palo Verde Mesa in Riverside County, California, approximately 13 miles southwest of the City of Blythe and two miles west of the community of Palo Verde. The Rio Mesa SEGF would be located in the Colorado Desert region of the larger Sonoran Desert. Within California, the 7-million-acre Colorado Desert region extends from the border of the higher-elevation Mojave

Desert in the north to the Mexican border in the south, and from the Laguna Mountains of the Peninsular Ranges in the west to the Colorado River in the east. This desert experiences more summer precipitation than the northern deserts, and although annual precipitation is low overall, a substantial portion of it falls during August and September, usually as brief and intense thunderstorms. The mean annual precipitation (1948 to 2010) recorded at the Blythe Airport weather station is 3.54 inches per year. The minimum and maximum annual precipitation for the period of record is 0.59 inches and 9.16 inches, respectively.

Common landforms and habitats of the Colorado Desert include coarse sandy bajadas and alluvial fans supporting shrublands dominated by creosote bush, saltbush, and other shrubs; valley floors with finer soils, generally supporting saltbush scrub; and rocky mountain slopes supporting a mix of shrubs, cacti, and small trees (such as Joshua trees, junipers, and ocotillos). Less common and often specialized habitats of the Colorado Desert include palm oases, windblown sand dunes, and desert washes dominated by "microphyll" (small-leaved) shrubs and trees, such as desert ironwood and smoke trees.

There are no designated critical habitat, special management areas, wilderness study areas, or Areas of Critical Environmental Concern (ACEC) located within the proposed solar generator site or on the generator tie-line (gen-tie) corridor. Conservation land designations in the surrounding area are listed below and shown on **Biological Resources Figure 1**.

- Mule Mountains ACEC, 0.8 mile to northwest and west;
- Palo Verde Mountains Wilderness three miles south;
- Chuckwalla Valley Dune Thicket ACEC, four miles northwest;
- Chuckwalla Desert Wildlife Management Area (DWMA), four miles west;
- Palen/McCoy Wilderness, seven miles northwest;
- Little Chuckwalla Mountains Wilderness, nine miles west;
- Big Maria Mountains Wilderness, 16 miles northeast;
- Palen Dry Lake ACEC, 18 miles northwest; and
- Chuckwalla desert tortoise critical habitat unit, approximately five miles west of the project site.

## PROJECT AREA

Throughout this PSA section, the term "project site" refers to the proposed locations of all project components including the two solar generators, common area and shared facilities, and the gen-tie alignment. The two solar fields (RMS I and II), two solar receiver towers, each supporting a solar receiver steam generator (SRSG), power generation equipment, and associated facilities, are collectively termed the "solar generator site" throughout this section. The proposed solar generator site is undeveloped open space, surrounded by undeveloped land to the north, south, east, and west. Agricultural lands are located about one mile to the east. The site is comprised primarily of creosote bush scrub on upland areas and desert dry wash scrub in broad washes and along ephemeral channels. The proposed gen-tie alignment passes through BLM lands and lands leased from the MWD, and is mainly comprised of desert shrubland habitat, but the northern portion traverses windblown sand habitat near the Colorado River Substation (CRS). Several utility lines and maintenance roads cross the project site. Additionally, there is some evidence of off-road vehicle use, trash dumping, and historic use for military training during World War II, including training involving tanks. The extent of this disturbance is minor, and is comparable to the level of disturbance seen at other large, remote expanses of desert landscape in southeastern California (URS 2011).

The proposed solar generator site is on the eastern bajada of the Mule Mountains, and west of the Colorado River (about 4 miles northwest of the nearest point on the river and generally slopes to the east. The average slope is approximately 1 percent with the exception of rocky, somewhat steep slopes located along the northwestern boundary of the project site. Several large washes and their tributaries cross the site, and carry storm water runoff from the Mule Mountains to the west, eastward across the site, and discharge to Hodges Drain and ultimately the Colorado River, which is located about five to ten miles to the east. Active agricultural lands cover the Palo Verde Valley along the banks of the Colorado River, and extend westward to within a mile of the eastern boundary of the proposed solar generator site. The nearby agricultural lands effectively mark the boundary of habitat for many wildlife species such as desert tortoise and Nelson's bighorn sheep, but also increase the diversity of birds that use the area. Burrowing owl, a California Species of Special Concern, is abundant in these agricultural areas.

The Biological Resources Technical Report (URS 2011) provided by the applicant covers an area described as the biological study area (BSA), consisting of the main project site where the two solar plants (RMS I and II) and common area are proposed, the gen-tie alignment parallel to existing transmission lines that extend to the CRS (now under construction), and access routes from State Route 78 via Bradshaw Trail and a new secondary access road directly north and parallel to 34th Avenue. The BSA also includes buffer areas surrounding each project component: 500 feet surrounding the proposed solar generator site, 650 feet on each side of the proposed gen-tie line alignment, and 100 feet on each side of proposed access routes. The BSA also includes additional MWD lands east of the project area's eastern boundary and BLM lands north of the proposed solar generator site, based on an earlier proposed configuration that would have included a third solar plant (RMS 3). The analysis in this PSA section makes use of these data from the entire BSA to describe direct and indirect project impacts on the proposed project site (as described by the applicant's Environmental Enhancement Proposal, BS 2012v) and surrounding area.

## Proposed Project Components

A detailed description of the proposed project is included in the **Project Description** section of PSA – Part A and summarized here. The proposed project consists of the construction and operation of two 250-MW solar concentrating thermal power plants and a shared common area, an access road, gen-tie line, and emergency electrical backup line primarily on BLM-managed lands within the Northern and Eastern Colorado Desert (NECO) planning area. The fenceline boundary of the proposed solar generator site, including both power plants and the shared common area, encompasses approximately 3,805 acres. Major components of the proposed project include the following:

- Two 750-foot-high cylindrical concrete solar receiver towers (power towers), each with an solar receiver steam generator (SRSG) and 10-foot-tall lightening rod (for a total height of 760 feet);
- Approximately 85,500 solar-tracking heliostats arranged concentrically around each of the two power towers; each heliostat would comprise two mirrors, each mirror 8.5 x 12 ft (102.4 square ft), with a total reflecting surface of 205 square ft per heliostat;
- A common area on 19.5 acres within the project perimeter fence line;
- Two evaporation ponds within the shared common area (2 acres each; 4 acres total);
- Stormwater management system, primarily around facilities such as the power blocks, substation, heliostat assembly buildings and administrative areas, which would include berms, ditches, bypass channels, or swales to direct run-on flow from upslope areas and run-off flow through and around each facility;
- Perimeter and internal access roads;
- Perimeter fencing;
- Temporary construction logistics area (103 acres, outside of but adjacent to project fenceline);
- Improvements to approximately 4 miles of off-site access roads;
- A 33-kV service line (5.1 miles within existing right-of-way (ROW) and 3.1 miles within new ROW); and
- A 220-kV gen-tie line (9.9 miles primarily within existing transmission ROW);

Construction of the Rio Mesa SEGF from site preparation and grading to commercial operation is expected to require approximately 35 months[1], and is expected to take place from the fourth quarter of 2013 to the first quarter of 2016 (BS 2012v).

Construction access to the plant entrance road will generally be from 30th Avenue/Bradshaw Trail (primary access) and a new secondary access road directly north and parallel to 34th Avenue. Materials and equipment will be delivered by truck (BS 2012v).

The Rio Mesa SEGF is designed for an operating life of 25 years. The applicant expects that the project would be operated with a staff of up to 100 full-time employees. The solar generator would operate 7 days per week, typically up to 16 hours per day. The heliostats would be regularly washed to keep mirror surfaces free of dust buildup to

[1] The entire construction schedule is 35 months from start of construction to substantial completion. This includes desert tortoise translocation and completion of construction and demobilization of craft resources prior to the completion date.

optimize solar energy potential. The entire solar field would be washed over a period of three weeks, with washing occurring 12 hours per night (BS 2012v).

Rio Mesa SEGF's maximum total projected water consumption would be approximately 173.3 acre-feet per year, and would mainly be used to provide water for washing heliostats, to replace boiler blowdown, and to provide supplemental cooling for critical plant auxiliary systems (BS 2012v).

## Vegetation and Wildlife

### Plant Communities

The Biological Resources Technical Report (BRTR; URS 2011) maps and describes vegetation and habitat throughout the Biological Study Area (BSA), which is larger than the proposed project site. Most of the proposed solar generator site is covered by creosote bush scrub and creosote bush - white burr sage scrub (**Biological Resources Table 2** and **Figure 2**). Several large drainages and associated smaller tributaries support blue palo verde – ironwood woodland, which is a sensitive desert dry wash community. Desert dunes are found at the northern portion of the gen-tie line alignment, but are not present on the proposed solar generator site. The BRTR also describes disturbed areas such as dirt roads and trails, maintenance areas for transmission line poles, and ROWs along underground pipeline routes.

Staff's observations of the project site are generally consistent with mapping and descriptions provided by the applicant. The predominant vegetation and habitat types of the project site are described below based on staff's field visits and the applicant's vegetation maps and descriptions. Several vegetation types on the site are ranked by CDFG (2010) as special-status resources, due to relative rarity or biological resource value.

**Biological Resources Table 2.**
**Summary of Vegetation and Habitat in Biological Study Area and Project Area**

| Vegetation Type | Acreages | |
|---|---|---|
| | **BSA** | **Project Area[3]** |
| Creosote – White Burr Sage Scrub | 3,905.1 | 1,677.0 |
| Creosote Bush Scrub | 2,814.3 | 1,356.9 |
| Blue Palo Verde – Ironwood Woodland[1] | 2,237.8 | 708.9 |
| Creosote Bush – White Burr Sage Scrub with Big Galleta Grass Association[1] | 923.1 | 53.3 |
| Desert Dunes[1] | 789.2 | 0 |
| Brittle Bush – Ferocactus Scrub[1] | 220.4 | 43.3 |
| Bush Seepweed Scrub – Mesquite Bosque[1] | 110.3 | 1.2 |
| Agriculture | 85.7 | 4.2 |
| Creosote Bush – White Burr Sage Scrub with Ocotillo Association[1] | 68.6 | 7.9 |
| Ruderal | 44.2 | 0.5 |
| Bush Seepweed Scrub[1] | 7.5 | 0 |
| Unvegetated (incl. irrigation channels, developed lands) | 0.8 | 0.02 |
| **Total** | **11,277.0[2]** | **3,840.0** |

1 – Vegetation type is considered rare and worthy of consideration by CDFG (CDFG 2010)
2 – Total includes 70 acres of the BSE for which vegetation was not mapped in the gen-tie line because there was no right of entry granted to the applicant.
3 – Includes solar generator site and footprint of gen-tie and access roads.

**Creosote Bush Scrub.** Creosote bush scrub is the most characteristic vegetation of the California deserts. The shrub canopy is dominated by creosote bush (*Larrea tridentate*) and white burr sage (*Ambrosia dumosa*) is often co-dominant. Shrubs are typically widely spaced with bare ground between them. Other common shrubs can include Nevada ephedra (*Ephedra nevadensis*), burrobush (*Hymenoclea salsola*), brittlebush (*Encelia* spp.), and various cactus species (e.g., *Cylindropuntia* spp.). Other common plant species can include Shockley's goldenhead (*Acamptopappus shockleyi*), desert senna (*Senna armata*), ratany (*Krameria* spp.), rayless goldenhead (*Acamptopappus sphaerocephalus*), and water jacket (*Lycium andersonii*). A diverse annual herb layer may flower in late March and April with sufficient winter rains. The BRTR describes several subtypes or associations of creosote bush scrub, shown on **Biological Resources Figure 2** and listed below:

- Creosote bush scrub (with creosote bush the only dominant shrub species).
- Creosote bush – white burr sage scrub (with the two species co-dominant).
- Creosote bush – white burr sage scrub with big galleta grass association, which is similar to above, with big galleta grass (*Pleuraphis rigida*) comprising at least one percent cover; typically found on sandy fans or lower bajadas and occasionally at the edges of sand sheets and dunes. Cryptogrammic crust is often found in this association, implying no recent disturbance; State Ranked S3 (CDFG 2010).
- Creosote bush – white burr sage scrub with ocotillo association, which is similar to above but with ocotillo (*Fouquieria splendens*) as a codominant or conspicuous shrub.
- Brittle bush – ferocactus scrub, which is similar to creosote bush scrub but co-dominated by brittle bush (*Encelia farinose*), and with conspicuous California barrel cactus (*Ferocactus cylindraceus*) (CDFG 2010).

**Blue Palo Verde-Ironwood Woodland.** Blue palo verde – ironwood woodland is often the predominant vegetation of broad desert washes in the Colorado Desert region. The dominant plants are blue palo verde (*Parkinsonia floridum*) and desert ironwood (*Olneya tesota*). Both species are large shrubs or small trees, and are the tallest species in this vegetation. Blue palo verde – ironwood woodland is a State Rank S3 community, which is a high priority for inventory (CDFG 2010). The BLM categorizes blue palo verde – ironwood woodland as "desert dry wash woodland" and manages it as a sensitive habitat type. It is one of several communities included within broader vegetation types called desert wash woodland or microphyll woodland (Holland 1986; Schoenherr and Burk 2007). Vegetation in desert washes is generally taller, up to about 9 meters (30 feet) in height, and denser than the surrounding desert habitats, with the height of the wash vegetation proportional to the size of the arroyo (Laudenslayer 1988). Understory vegetation within these woodlands includes big galleta grass, cheesebush, desert lavender (*Hyptis emoryi*), catclaw acacia (*Acacia greggii*), white burr sage, burrobush, sweet bush (*Bebbia juncea*), and creosote bush. This plant community is generally found in desert arroyos, alluvial fans, and desert washes and is primarily found in larger desert washes throughout the project site.

**Desert Dunes.** Desert dunes are a unique habitat for plants and animals, though they are not a vegetation community and generally are not dominated by any plant species

(CDFG 2010). Dunes have a State Rank of S2 and are considered sensitive by BLM. Shrubs cover a small proportion of the dunes. Typical species include desert twinbugs (*Dicoria canescens*), desert sand verbena (*Abronia villosa*), speckled milk-vetch (*Astragalus lentiginosus* var. *variabilis*), browneyes (*Camissonia claviformis*), California croton (*Croton californicus*), buckwheat (*Eriogonum* spp.), hairy desert sunflower (*Geraea canescens*), broad leaf gilia (*Gilia latifolia*), dune primrose (*Oenothera deltoides*), desert palafox (*Palafoxia arida*), big galleta grass, and often invasive species such as Russian thistle (*Salsola tragus*) and Sahara mustard (*Brassica tournefortii*). Emergent shrubs including white burr sage and creosote bush may also be present.

**Bush Seepweed Scrub – Mesquite Bosque.** Mesquite bosque is a dense shrubland dominated by mesquite (*Prosopis glandulosa*) found on river terraces, dunes, playa margins, and other rarely inundated landforms throughout the California deserts (Sawyer et al. 2009). Bush seepweed scrub is generally classified as a different vegetation type, in which bush seepweed (*Suaeda moquinii*) is dominant or co-dominant with iodine bush (*Allenrolfea occidentalis*), found on gently sloping valley floors, playas, bajadas, and toe slopes adjacent to alluvial fans. The BRTR (URS 2011) maps areas east of the proposed solar generator site as a mix of these two types, with small patches of mesquite bosque within the bush seepweed vegetation. The canopy and herbaceous layers found onsite are continuous and sparse to absent, respectively. This vegetation is dependent on groundwater availability. Bush seepweed scrub and mesquite bosque both have a State Rank of S3 (CDFG 2010; see **Biological Resources Table 5**).

**Human-dominated land uses.** Portions of the BSA have been disturbed or developed for human uses, including agriculture, transportation, electrical transmission lines, underground gas lines, and irrigation channels. In some cases these lands are unvegetated or covered by crops; in other cases, such as compacted soils, graded areas, or parking areas, they support weedy species.

### Invasive Plants

Invasive plants are non-native species that, upon becoming established in a new area, propagate and, ultimately, displace native species, supplant food plants or other habitat elements (e.g., cover) that are important to native wildlife species, alter natural habitat structure and ecological function, alter natural wildfire patterns, or displace special-status plant occurrences and habitat (Zouhar et al. 2008; Lovich and Bainbridge 1999). These plants are considered “weeds” or “pest plants” when they invade natural land-scapes (Bossard et al. 2000). Weeds and pest plants are defined here to include any species of non-native plants identified on the weed lists of the California Department of Food and Agriculture, the California Invasive Plant Council, or of special concern identified by BLM.

Numerous invasive weeds have already become widespread throughout the Colorado Desert and prevention of further spread is impracticable for some of them. Examples of these established weeds include Mediterranean grasses (*Schismus arabicus* and *S. barbatus*), Russian thistle, and Sahara mustard. Others (e.g., saltcedar: *Tamarix ramosissima*) are damaging to mesic habitat types but pose little or no threat to widespread upland desert habitat.

Within the project area and surrounding BSA, the overall prevalence of invasive species is low, generally consistent with undisturbed desert bajadas and uplands throughout the region. Sahara mustard and Mediterranean grasses are scattered throughout the project area. Sahara mustard is particularly widespread in the northern section of the proposed gen-tie alignment. Additional invasive weeds also occur in the BSA, but are not widespread and typically included one to 10 plants per location found. Invasive plants detected within the BSA are listed in **Biological Resources Table 3.**

**Biological Resources Table 3.**
**Invasive Plant Species found within the BSA**

| Invasive Plant Species | Rankings[1] | Habitats, Range, and Control Notes |
|---|---|---|
| *Brassica tournefortii*<br>Sahara mustard | CDFA: n/a<br>Cal IPC: High<br>Impacts/ Invasiveness/ Distribution: A/A/B | Widespread and abundant in Calif. deserts; common in interior valleys; especially invasive in open sands and in disturbed soils (including natural disturbance) |
| *Chenopodium murale*<br>Nettleleaf goosefoot | CDFA: n/a<br>Cal IPC: n/a | Common among crops, and also found along roadsides, city streets, and waste places. Can be seasonally common along washes, in wet soils, and disturbed areas. |
| *Cynodon dactylon*<br>Bermuda grass | CDFA: C<br>Cal IPC: Moderate<br>Impacts/ Invasiveness/ Distribution: B/B/B | Widespread and abundant in much of Calif.; new introductions are probably chronic in region; in deserts, requires mesic soil conditions |
| *Dactylis glomerata*<br>Orchardgrass | CDFA: n/a<br>Cal IPC: Limited<br>Impacts/ Invasiveness/ Distribution: C/B/B | Grasslands, broadleaved forest, woodlands. Common forage species. Impacts appear to be minor. |
| *Erodium cicutarium*<br>Redstem filaree; crane's bill | CDFA: n/a<br>Cal IPC: Limited<br>Impacts/ Invasiveness/ Distribution: C/C/A | Ubiquitous and often abundant or dominant throughout region and throughout most of S Calif. |
| *Kallstroemia grandiflora*<br>Arizona poppy | CDFA: n/a<br>Cal IPC: n/a | Broadly distributed from the Sonoran desert to the semiarid west coast of Mexico. Overall uncommon in California. Often found on sandy roadsides. |
| *Lactuca serriola*<br>Prickly lettuce | CDFA: n/a<br>Cal IPC: Evaluated but not listed<br>Impacts/ Invasiveness/ Distribution: D/C/B | Primarily an agricultural and roadside weed. |
| *Phalaris minor*<br>Littleseed canarygrass | CDFA: n/a<br>Cal IPC: n/a | Both dry and moist sites of disturbed sites, roadsides, irrigation canals, and fallow fields |

| | | |
|---|---|---|
| *Polygonum arenastrum*<br>Oval-leaf knotweed | CDFA: n/a<br>Cal IPC: n/a | Field crops, row crops, orchards, yards, gardens and turf. Tolerant of compacted soils and is frequently found along paths, walkways, driveways, dirt roads, and other disturbed areas. |
| *Salsola paulsenii*<br>Barbwire Russian thistle | CDFA: C<br>Cal IPC: Limited<br>Impacts/ Invasiveness/ Distribution: C/C/C | Widespread and often abundant throughout much of Calif.; including deserts |
| *Salsola tragus*<br>Russian thistle | CDFA: C<br>Cal IPC: Limited<br>Impacts/ Invasiveness/ Distribution: C/B/B | Widespread and often abundant throughout much of Calif.; including deserts |
| *Schismus arabicus*<br>Mediterranean grass | CDFA: n/a<br>Cal IPC: Limited<br>Impacts/ Invasiveness/ Distribution: B/C/A | Widespread and often abundant throughout much of Calif.; including deserts |
| *Schismus barbatus*<br>Mediterranean grass | CDFA: n/a<br>Cal IPC: Limited<br>Impacts/ Invasiveness/ Distribution: B/C/A | Widespread and often abundant throughout much of Calif.; including deserts |
| *Setaria pumila*<br>Yellow foxtail | CDFA: n/a<br>Cal IPC: n/a | Roadsides, ditch banks, fields, pastures, cropland, orchards, vineyards, gardens, turf, and other disturbed sites. |
| *Sisymbrium altissimum*<br>Tumble mustard | CDFA: n/a<br>Cal IPC: n/a | Common weed of old fields, roadsides, and other disturbed places such as alluvial fans and disturbed rangelands |
| *Sisymbrium irio*<br>London rocket | CDFA: n/a<br>Cal IPC: Moderate<br>Impacts/ Invasiveness/ Distribution: B/B/A | Widespread and often common throughout much of Calif.; less common in deserts, mainly in seasonally slightly mesic or shaded sites |
| *Sonchus oleraceus* | CDFA: n/a<br>Cal IPC: n/a | Primarily an agricultural and roadside weed. |
| *Tamarix ramosissima*<br>Saltcedar, tamarisk | CDFA: B<br>Cal IPC: High<br>Impacts/ Invasiveness/ Distribution: A/A/A | Widespread and strongly invasive in riparian habitats throughout California and southwestern desert regions |
| *Tribulus terrestris*<br>Puncture vine | CDFA: C<br>Cal IPC: n/a | Widespread, especially roadsides, disturbed sites, and agricultural lands |
| *Vulpia bromoides*<br>Squirreltail fescue | CDFA: n/a<br>Cal IPC: Evaluated but not listed<br>Impacts/ Invasiveness/ Distribution: D/C/B | Roadsides, fields, and dry or seasonally wet sites in grassland, chaparral, coastal sage scrub, and open woodland throughout California. |

1 – Explanation of Rankings:
_California Department of Food and Agriculture Ratings (CDFA 2010):_
**A**: Eradication, containment, rejection, or other holding action at the state-county level. Quarantine interceptions to be rejected or treated at any point in the state;
**B**: Eradication, containment, control or other holding action at the discretion of the commissioner;
**C**: State endorsed holding action and eradication only when found in nursery; action to retard spread outside of nurseries at the discretion of the commissioner—reject only when found in a crop seed for planting or at the discretion of the commissioner
_Cal-IPC Ratings (Cal-IPC 2006):_

**High**: These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed.
**Moderate**: These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, although establishment is generally dependent on ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
**Limited**: These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.
*Impacts/Invasiveness/Distribution*
**A**: Severe **D**: None
**B**: Moderate **U**: Unknown
**C**: Limited

## General Wildlife

Desert shrublands and microphyll woodlands on the project site and surrounding BSA support an assortment of wildlife species representative of the Colorado Desert region. These include common species as well as special-status species. This subsection of the PSA provides an overview of wildlife species documented on the project site, or likely to occur on the site or in the surrounding area. Several special-status species are mentioned here; these and all special-status wildlife are included in **Biological Resources Table 5** and discussed further in the "Assessment of Impacts and Discussion of Mitigation" subsection of this PSA section.

Some of the reptile species reported in the BRTR (URS 2011) include desert tortoise (*Gopherus agassizii*), Mojave fringe-toed lizard (in the northern part of the gen-tie alignment only), common side-blotched lizard (*Uta stansburiana*), long-tailed brush lizard (*Urosaurus graciosus*), ornate tree lizard (*Urosaurus ornatus*), western whiptail lizard (*Aspidoscelis tigris*), zebra-tailed lizard (*Callisaurus draconoides*), desert iguana (*Dipsosaurus dorsalis*), chuckwalla (*Sauromalus obesus*), coachwhip (*Masticophis flagellum*), desert glossy snake (*Arizona elegans eburnata*), sidewinder (*Crotalus cerastes*) and western diamondback (*Crotalus atrox*).

Common resident and migratory birds observed in the BSA include horned lark (*Eremophila alpestris*), western kingbird (*Tyrannus erticalis*), tree swallow (*Tachycineta bicolor*), barn swallow (*Hirundo rustica*), mourning dove (*Zenaida macroura*), ash-throated flycatcher (*Myiarchus cinerascens*), and red-tailed hawk (*Buteo jamaicenis*). There are no large trees on the solar generator site suitable for large raptor nesting or roosting, but wide-ranging raptors such as golden eagle (*Aquila chrysaetos*) and prairie falcon (*Falco mexicanus*), nest in the adjacent mountains and are likely to forage over the project area. Both of these are special-status species, addressed in further detail below. These and other raptors are expected to forage over the site year-around. Many raptors from more northern latitudes migrate through or overwinter in the regional deserts where they forage over very wide areas. A flock of sandhill cranes was reported flying a few miles east of the BSA (URS 2012a).

Mammals observed or indirectly detected from sign include black-tailed jackrabbit (*Lepus californicus*), kit fox (*Vulpes macrotis;* numerous burrow complexes representing occupied and refuge shelters), coyote (*Canis latrans*), American badger (*Taxidea taxus*), Nelson's bighorn sheep (*Ovis canadensis nelson*; detected by hoof and horn remains), and woodrat (*Neotoma* sp.). Unidentified rodent tracks and burrows were observed throughout the BSA.

The southern portion of the proposed gen-tie line would be on open, relatively undisturbed desert scrub habitat, while the northern portion of the alignment traverses wind-blown sand dune habitat. The presence of sand dunes and desert washes increase the biodiversity of the BSA, as some habitat specialist species use these areas exclusively (whereas generalist species occur in more common habitats ranging throughout the region). For example, the Mojave fringe-toed lizard is closely associated with sand dunes, sand sheets, and fine sandy soils, but generally not on nearby alluvial fans and bajadas. Mojave fringe-toed lizards were recorded 115 times in the sand dunes along the gen-tie line during project surveys (URS 2011).

The entire project area comprises an extensive, contiguous, and intact region of typical native desert habitat. In addition to these general habitat values, two habitat types in the project area are particularly important as wildlife habitat. Blue palo verde – ironwood woodland, which covers more than 700 acres of the proposed solar generator site, provides greater food, nesting, and cover resources, and wildlife diversity is generally greater than in the surrounding desert (McKernan et al. 1996). These woodlands are particularly important as stopover feeding habitat for migratory bird species, and feeding areas for native bat species, due to high insect productivity. Desert dunes are a specialized habitat type for sensitive species, and dune systems are dependent on sand influx from upwind sources. A BLM sensitive species, Mojave fringe-toed lizard, was documented in the northern portion of the proposed gen-tie alignment.

Accessibility among habitat areas (i.e., “connectivity”) is important to long-term genetic diversity and demography of wildlife populations. In the short term, it may also be important to individual animals’ ability to occupy their home ranges, if their ranges extend across a potential movement barrier. These considerations are especially important for rare, threatened, or endangered species such as the desert tortoise, and wide-ranging species which exist in low population densities such as large mammals. However, these conditions are also relevant for other species, including corridor “passage” and corridor “dweller” species (Beier and Loe 1992). Corridor passage species would traverse connectivity areas during ordinary diurnal or seasonal movement patterns, whereas corridor dweller species must persist as viable populations over multiple generations within a connectivity area in order to eventually migrate from one habitat block to another. There are no anthropogenic barriers to wildlife movement or usage at the project site, and no substantial areas of disturbance.

## Special-Status Species

The applicant conducted several focused and protocol surveys of the project site in 2011 and 2012. These included surveys for special-status plants, desert tortoise, Mojave fringe-toed lizard, Couch’s spadefoot, burrowing owl, golden eagle, Gila woodpecker, and elf owl; point counts for migratory birds; and acoustic surveys for bats. In addition, all potential American badger and desert kit fox burrows were recorded during the desert tortoise and burrowing owl surveys. **Biological Resources Figures 3a** and **3b** identify the locations where special-status plants and wildlife were observed or detected during project surveys. In this PSA, plant or wildlife species are analyzed as special-status species if they are classified as one or more of the designations listed in **Biological Resources Table 4**:

**Biological Resources Table 4.**
**Definitions of Special-Status Species Considered in the PSA**

| Species Designation | Agency | Definition |
|---|---|---|
| Endangered | USFWS | A species that is in danger of extinction throughout all or a significant portion of its range. |
| Threatened | USFWS | Any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. |
| Candidate | USFWS | A species the USFWS has designated as a candidate for listing under Section 4 of the ESA, published in its annual candidate review; defined as a species for which the USFWS has sufficient information on its biological status and threats to propose it as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. |
| Proposed | USFWS | A species that the USFWS has proposed for listing under Section 4 of the ESA, by publishing a Proposed Rule in the Federal Register. |
| Protected under the federal Migratory Bird Treaty Act | USFWS | All native bird species in the U.S. |
| Protected under the federal Bald and Golden Eagle Protection Act | USFWS | Bald and golden eagles. |
| Endangered | CDFG | A native species or subspecies that is in serious danger of becoming extinct throughout all or a significant portion of its range due to one or more causes, including loss or change in habitat, overexploitation, predation, competition, or disease. |
| Threatened | CDFG | A native species or subspecies that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts. |
| Candidate | CDFG | A native species that has been officially noticed by the California Fish and Game Commission as being under review by the CDFG for addition to the threatened or endangered species lists. CDFG candidate species are given no extra legal protection under state laws. |
| Rare | CDFG | A plant species that, although not presently threatened with extinction, is in such small numbers throughout its range that it may become endangered if its present environment worsens. |

| Species Designation | Agency | Definition |
|---|---|---|
| Fully Protected (FP) | CDFG | Fully protected under the California Fish and Game Code. The CDFG may not issue take authorization except for scientific purposes or as provided under SB 618 (2011). |
| Species of Special Concern (SSC) | CDFG | A species, subspecies, or distinct population of an animal native to California that currently satisfies one or more of the following (not necessarily mutually exclusive) criteria:<br>• Is extirpated from the state or, in the case of birds, in its primary seasonal or breeding role;<br>• Is listed as federally but not state threatened or endangered;<br>• Meets the state definition of threatened or endangered but has not formally been listed;<br>• Is experiencing or formerly experienced serious (noncyclical) population declines or range retractions (not reversed) that, if continued or resumed, could qualify it for state threatened or endangered status; or<br>• Has naturally small populations exhibiting high susceptibility to risk from any factor(s) that if realized, could lead to declines that would qualify it for state threatened or endangered status.<br>SSC is an administrative designation and carries no formal legal status. This designation is intended to focus attention on animals at conservation risk, to stimulate research on poorly known species, and to achieve conservation and recovery before these species meet the CESA criteria for listing. California SSC are considered under CEQA and require a discussion of impacts and appropriate mitigation to reduce impacts. |
| California Fish and Game Code 3503 and 3513 | CDFG | All U.S. native bird species that occur in California. |
| Protected | CDFG | A species that is not federally or state listed, FP, or SSC, but is protected under the California Fish and Game Code. An example is the desert kit fox, which is afforded protection by the Fish and Game Code as a furbearing mammal. |
| NECO Plan/EIS | BLM | Special-status species that were addressed in the NECO Plan/EIS due to management concerns within the NECO Planning Area. |

| Species Designation | Agency | Definition |
|---|---|---|
| Sensitive | BLM | Plant and wildlife species designated by the BLM State Office (2010). Sensitive species are those species (1) that are under status review by the U.S. Fish and Wildlife Service or National Marine Fisheries Service or federally delisted species which were so designated within the last 5 years, (2) whose numbers are declining so rapidly that federal listing may become necessary, (3) those with typically small and widely dispersed populations, or (4) those inhabiting ecological refugia or other specialized or unique habitats. All CRPR 1B plants that occur on BLM lands are also designated sensitive by the BLM. |
| California Rare Plant Rank (CRPR) 1A | CDFG/CNPS | Plants presumed to be extinct in California. |
| CRPR 1B | CDFG/CNPS | Plants rare or endangered in California and elsewhere. |
| CRPR 2 | CDFG/CNPS | Plants rare or endangered in California but more common elsewhere. |
| CRPR 3 | CDFG/CNPS | Plants about which more information is needed – a review list. |
| CRPR 4 | CDFG/CNPS | Plants of limited distribution – a watch list. |

**Biological Resources Table 5** lists all special-status species evaluated during the analysis that occur or could occur in the project area and vicinity. Special-status plant and wildlife species detected or considered possible or likely to occur based on geographic distribution and habitat suitability are discussed in more detail below. Special-status species observed on the project site are indicated by bold-face type. Potential for occurrence is defined as follows:

**Present:** Species or sign of their presence observed on the site during surveys conducted for the proposed project (species that are present are noted in **bold text** in **Biological Resources Table 5**).

**High:** Species or sign not observed on the site, but reasonably certain to occur on the site based on conditions, species ranges, and recent records (generally within approximately 20 years and 10 miles of project site, depending on the species' life history).

**Moderate:** Species or sign not observed on the site, but conditions suitable for occurrence, site is within or near known distribution, and/or an historical record (generally greater than 20 years old) exists in the vicinity (generally within approximately 10 miles of project site, depending on the species' life history).

**Low:** Species or sign not observed on the site, and conditions marginal for occurrence.

**Not Likely to Occur:** Species or sign not observed on the site, outside of the known geographic and/or elevational range, and conditions unsuitable for occurrence.

## Biological Resources Table 5
## Special-Status Species, Their Status, and Potential Occurrence in the Rio Mesa Solar Electric Generating System Power Project Area

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| PLANTS | | | |
| *Abronia villosa var. aurita* | Chaparral sand verbena | CRPR 1B.1<br>BLM S<br>S 2 | **Moderate**. Suitable habitat is present on site. |
| *Acleisanthes longiflora* | Angel trumpets | CRPR 2.3<br>S 1 | **Moderate.** Suitable habitat is present on site. One known occurrence in Maria Mountains. |
| *Androstephium breviflorum* | Pink funnel-lily, Small-flowered androstephium | CRPR 2.2<br>S2S3 | **Low**. Suitable habitat is present but site probably outside geographic range. |
| ***Astragalus insularis var. harwoodii*** | **Harwood's milk-vetch** | CRPR 2.2<br>S 2.2? | **Present.** 119 plants reported in 2011, primarily in northwestern portion of the existing transmission alignment and sandy washes in the eastern portion of the BSA. |
| *Astragalus lentiginosus* var. *borreganus* | Borrego milk-vetch | CRPR: 4.3<br>S 3.3 | **Moderate**. Suitable habitat is present on site. |
| *Astragalus lentiginosus var. coachellae* | Coachella Valley milk-vetch | **FE**<br>CRPR 1B.2<br>BLM S<br>S 2.1 | **Not Likely to Occur.** No suitable aeolian soils on plant site; marginally suitable soils on transmission line; all known occurrences well to west. |
| *Astragalus sabulonum* | Gravel milk-vetch | CRPR 2.2<br>S2 | **Moderate.** Suitable habitat is present on site; two historic occurrences in vicinity of gen-tie line. |
| *Astragalus tricarinatus* | Triple-ribbed milk-vetch | **FE**<br>CRPR 1B.2<br>BLM S<br>S 2.1 | **Not Likely to Occur.** All known occurrences well to west in canyons and washes of Little San Bernardino, San Jacinto, and eastern San Bernardino mtns. |
| *Ayenia compacta* | California ayenia | CRPR 2.3<br>S 3.3 | **Not Likely to Occur.** All known occurrences well to west; generally occurs in rocky canyons; no such habitat on project site. |
| *Bouteloua trifida* | Three-awned grass | CRPR 2.3<br>S 2? | **Low.** Spring-blooming annual, generally found in rocky foothills; habitat on-site is marginally suitable; not seen during field surveys. |
| *Calliandra eriophylla* | Pink fairy duster | CRPR 2.3<br>S2S3 | **High.** Suitable habitat on the site; records adjacent to the site. |
| *Camissonia – see Chylismia* | | | |
| *Carnegiea gigantea* | Saguaro | CRPR 2.2<br>S 1.2 | **Low.** Suitable habitat on site, and records in adjacent areas; however, this is a conspicuous cactus that was not recorded during botanical surveys in the BSA. |
| *Cassia* – see *Senna* | | | |
| *Castela emoryi* | Emory's crucifixion thorn | CRPR: 2.3<br>S2S3 | **Low.** Reported in the region; but it is a conspicuous shrub and was not located during field surveys. |

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| *Chamaesyce abramsiana (Euphorbia abramsiana)* | Abram's spurge | CRPR 2.2<br>S 1.2 | **High.** Suitable habitat on the site; records adjacent to the site. |
| *Chamaesyce arizonica (Euphorbia arizonica)* | Arizona spurge | CRPR 2.3<br>S 1.3 | **Low.** Limited potential in washes or sandy sites of transmission line corridor. |
| *Chamaesyce platysperma (Euphorbia platysperma)* | Flat-seeded spurge | CRPR 1B.2<br>BLM S<br>S 1.2? | **High.** Limited to washes or sandy sites of transmission line corridor; |
| *Chylismia arenaria* | Sand evening-primrose | CRPR 2.2<br>S 2 | **Moderate.** Suitable habitat is present and historic records exist in the region. |
| *Colubrina californica* | Las Animas colubrina | CRPR 2.3<br>S2S3.3 | **Low.** Conspicuous shrub, not located during field surveys. |
| *Condalia globosa* var. *pubescens* | Spiny abrojo | CRPR 4.2<br>S 3.2 | **Low.** Conspicuous shrub, not located during field surveys. |
| *Coryphantha alversonii* (*Escobaria vivipara* var. *alversonii*) | Foxtail cactus | CRPR: 4.3<br>S 3.2 | **High.** Suitable habitat on site, recorded in adjacent areas. |
| ***Cryptantha costata*** | **Ribbed cryptantha** | CRPR: 4.3<br>S 3.3 | **Present.** About 13,000 plants reported in 2011 in dunes in the northwestern portion of the existing transmission line ROW |
| *Cryptantha holoptera* | Winged cryptantha | CRPR: 4.3<br>S 3? | **Moderate**. Suitable habitat is present. |
| *Cylindropuntia munzii* | Munz's cholla | CRPR 1B.3<br>BLM S<br>S 1.2 | **Moderate**. Suitable habitat is present. |
| *Cylindropuntia wigginsii (Opuntia wigginsii)* | Wiggins' cholla | CRPR 3.3<br>S 1? | **High**. Suitable habitat on site; recorded in areas adjacent to the project site. |
| ***Cynanchum utahense* (*Funastrum utahense*)** | **Utah vine milkweed, Utah cynanchum** | CRPR: 4.2<br>S 3.2 | **Present.** 98 plants in the BSA in 2011. |
| *Ditaxis claryana* | Glandular ditaxis | CRPR: 2.2<br>S1S2 | **Moderate.** Limited to gen-tie alignment. |
| *Ditaxis serrata var. californica* | California ditaxis | CRPR: 3.2<br>S 2 | **Moderate.** Suitable habitat on site. |
| ***Eriastrum harwoodii*** | **Harwood's eriastrum** | CRPR: 1B.2<br>BLM S<br>S 2 | **Present.** 160 plants at two locations in dunes in the northwestern portion gen-tie alignment. |
| *Escobaria* – see *Coryphantha* | | | |
| *Euphorbia – see Chamaesyce* | | | |
| *Horsfordia alata* | Pink velvet mallow | CRPR: 4.3<br>S 3.3 | **Moderate.** Occurs in canyons and washes; suitable habitat present. |
| *Hymenoxys odorata* | Bitter hymenoxys | CRPR 2<br>S 2 | **High.** Suitable habitat on site; recorded in areas adjacent to the project site. |

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| *Imperata brevifolia* | California satintail | CRPR 2.1<br>S 2.1 | **Low.** Marginal habitat occurs on site. |
| *Matelea parvifolia* | Spearleaf | CRPR: 2.3<br>S 2.2 | **Low.** Marginal habitat is present; no local occurrences. |
| *Mentzelia puberula* | Argus blazing star | CRPR 2.2<br>S 2 | **High.** Suitable habitat present; records in surrounding areas. |
| *Mentzelia tricuspis* | Spinyhair blazing star | CRPR 2.1<br>S 1? | **Low.** Marginal habitat is present; no local occurrences. |
| *Nemacaulis denudata* var. *gracilis* | Slender woolly-heads | CRPR: 2.2<br>S2S3 | **Moderate.** Limited to gen-tie alignment. |
| *Opuntia – see Cylinderopuntia* | | | |
| *Physalis lobata* | Lobed ground-cherry | CRPR: 2.3<br>S 1.3? | **Not Likely to Occur.** Occurs on dry lake margins and playas; no suitable habitat on the project site. |
| ***Proboscidea althaeifolia*** | **Desert unicorn plant** | CRPR 4.3<br>S 3.3 | **Present.** 132 plants reported in 2011. |
| *Psorothamnus fremontii* var. *attenuatus* | Narrow-leaved psorothamnus | CRPR: 2.3<br>S 2.3 | **Not likely to occur.** Probably outside geographic range; conspicuous shrub not located during early-season field surveys. |
| *Salvia greatae* | Orocopia sage | CRPR 1B.3<br>BLM S<br>S 2.2 | **Low.** Desert shrublands on alluvial slopes; known occurrences well to west. |
| *Senna covesii* (*Cassia covesii*) | Coves' cassia | CRPR: 2.2<br>S 2.2 | **Low.** Suitable habitat is present; no local occurrences. |
| *Teucrium cubense* ssp. *depressum* | Dwarf germander | CRPR: 2.2<br>S 2 | **High.** Suitable habitat on site; recorded in areas adjacent to the project site. |
| *Teucrium glandulosum* | Desert germander | CRPR: 2.3<br>S 1.3 | **Low.** Marginal habitat, probably outside geographic range. |
| *Wislizenia refracta* ssp. *refracta* | Jackass-clover | CRPR: 2.2<br>S 1.2? | **Moderate.** Limited to gen-tie alignment. |
| *Wislizenia refracta ssp. palmeri* | Palmer's jackass clover | CRPR: 2.2<br>S 1? | **Moderate.** Limited to gen-tie alignment. |
| **INVERTEBRATES** | | | |
| *Hedychridium argenteum* | Riverside cuckoo wasp | S 1? | **Low.** Reported by CNDDB about 6 miles northwest of the northern terminus of the gen-tie line based on a 1971 record. |
| *Melitta californica* | California mellitid bee | S 2? | **Low.** Reported by CNDDB about 6 miles northwest of the northern terminus of the gen-tie line based on a 1974 record. |
| **AMPHIBIANS** | | | |
| *Scaphiopus couchi* | Couch's spadefoot | BLM S<br>CSSC | **Low.** Drainage, sandy soils, and topography are unlikely to provide sufficiently inundated pools or ditches to support breeding, growth, and metamorphosis. |
| *Incilius alvarius (Bufo alvarius)* | Sonoran desert toad | CSSC | **Not Likely to Occur.** Formerly present in region, now possibly extirpated from California; no suitable breeding habitat on site. |

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| | | **REPTILES** | |
| ***Gopherus agassizii*** | **Desert tortoise** | **FT**<br>**ST** | **Present.** 6 live tortoises and multiple sign (carcasses, active burrows, pallets, etc.) observed in BSA; 8 additional live tortoises and additional sign observed incidentally during other surveys. |
| *Heloderma suspectum cinctum* | Banded Gila monster | BLM S<br>CSSC | **Low.** Site is at margin of geographic range and habitat generally only marginally suitable; more likely in rocky areas in the surrounding mountains. |
| *Lichanura trivirgata* | Rosy boa | n/a (former BLM S) | **Moderate.** Marginal habitat on site, more likely in rocky areas in the surrounding mountains. |
| *Phrynosoma mcallii* | Flat-tailed horned lizard | BLM S<br>CSSC | **Not Likely to Occur.** Suitable habitat at northern end of gen-tie; marginal habitat on SEGF sit. Outside geographic range (BLM and CDFG 2002). |
| *Uma notata* | Colorado Desert fringe-toed lizard | BLM S<br>CSSC | **Not Likely to Occur.** Project area at margin of geographic range. Fringe-toed lizards in area are the similar Mojave fringe-toed lizard (below). |
| ***Uma scoparia*** | **Mojave fringe-toed lizard** | BLM S<br>CSSC | **Present.** 115 observations in dune habitat at the northern end of the gen-tie alignment; not expected on the solar field site. |
| | | **BIRDS** | |
| ***Accipiter cooperii*** | **Cooper's hawk** | CDFG WL (nesting) | **Present.** Detected in the BSA. No breeding habitat and well outside breeding range; wide-ranging during winter and migratory seasons and likely to forage on site. |
| ***Accipiter striatus*** | **Sharp-shinned hawk** | CDFG WL (nesting) | **Present.** Observed during fall 2011; no breeding habitat and well outside breeding range; wide-ranging during winter and migratory seasons and likely to forage on site. |
| ***Aimophyla ruficeps*** | **Rufous-crowned sparrow** | CDFG WL | **Present.** Detected in BSA (apparently subspecies *scottii*, more common in Arizona and eastward). |
| ***Aquila chrysaetos*** | **Golden eagle** | Bald and Golden Eagle Protection Act<br>FBCC<br>CDFG FP<br>CDFG WL | **Present.** Two individuals observed in BSA in early March; nesting territories present in surrounding mountains but no nesting activity observed in 2011 or 2012. |
| *Asio otus* | Long-eared owl | CSSC (nesting) | **High.** Suitable foraging habitat throughout project site, nearby agricultural fields and river floodplain. |
| ***Athene cunicularia*** | **Western burrowing owl** | BLM S<br>FBCC<br>CSSC | **Present.** Observed on site. Also occurs in adjacent agricultural lands. |

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| ***Buteo regalis*** | **Ferruginous hawk** | FBCC<br>CDFG WL | **Present.** Suitable winter foraging habitat throughout site. Expected during migratory and winter seasons; not expected to breed onsite (well outside breeding range). |
| ***Buteo swainsoni*** | **Swainson's hawk** | FBCC<br>**ST** | **Present.** Migrant observed in BSA. Occasionally flies over during migration, not expected to breed onsite (well outside breeding range). |
| ***Chaetura vauxi*** | **Vaux's swift** | CSSC | **Present.** Observed in BSA during migration; well outside breeding range; no breeding habitat. |
| *Charadrius montanus* | Mountain plover | FPT<br>FBCC<br>BLM S<br>CSSC | **High (winter only).** May winter in fallow agricultural lands east of the project site; potential overflight during winter and migratory seasons. |
| ***Chlidonias niger*** | **Black tern** | CSSC (nesting colony) | **Present.** Detected in BSA in spring 2012. |
| ***Circus cyaneus*** | **Northern harrier** | CSSC (nesting) | **Present.** Detected in BSA; margin of breeding range but suitable habitat present along Colorado River; expected mainly in winter. |
| *Coccyzus americanus* | Western yellow-billed cuckoo | FC<br>FBCC<br>**SE** | **Low.** No habitat on or adjacent to the site; historic records along the Colorado River to the east. |
| *Colaptes chrysoides* | Gilded flicker | FBCC<br>**SE** | **Low.** Margin of geographic range and marginally suitable nesting habitat (large microphyll trees may cavity nests); recorded along the Colorado River 15 miles southeast. |
| ***Dendroica petechia*** | **Yellow warbler** | FBCC<br>CSSC (nesting) | **Present.** Detected in BSA in spring 2012. |
| ***Empidonax traillii*** | **Willow flycatcher** | FBCC<br>**SE** | **Present.** Four individuals observed in 2012. No breeding activity was observed. |
| ***Eremophila alpestris*** | **Horned lark** | CDFG WL | **Present.** Detected in BSA; potential overflight year around. |
| ***Falco columbarius*** | **Merlin** | CDFG WL | **Present.** Observed in BSA during 2011; no breeding habitat and outside breeding range; potential foraging throughout site during winter or migratory seasons. |
| ***Falco mexicanus*** | **Prairie falcon** | FBCC<br>CDFG WL (nesting) | **Present.** Detected in BSA and off site in the McCoy, Hodges, and Mule Mountains during golden eagle surveys; no breeding habitat on site; potential foraging year-around. |
| ***Falco peregrinus*** | **Peregrine falcon** | FBCC<br>CDFG FP | **Present.** Detected in BSA, and off site in the McCoy Mountains during golden eagle surveys; no breeding habitat and well outside breeding range; wide-ranging during winter and migratory seasons and potential to forage on site. |

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| ***Grus canadensis tabida*** | **Greater sandhill crane** | **ST**<br>CDFG FP | **Present.** Observed flying over agricultural lands east of the project site; no suitable breeding or wintering habitat present on the site, but expected as fly-over during winter and migratory seasons. |
| *Haliaeetus leucocephalus* | Bald eagle | FBCC<br>**SE**<br>CDFG FP | **High.** No breeding habitat and outside breeding range; expected as fly-over or foraging during winter and migratory seasons. |
| *Icteria virens* | Yellow-breasted chat | CSSC (nesting) | **Moderate.** No suitable breeding habitat; reported from riparian habitat at the Colorado River about 8 miles southeast; potential overflight during migration. |
| ***Lanius ludovicianus*** | **Loggerhead shrike** | FBCC<br>CSSC (nesting) | **Present.** Detected in BSA during multiple surveys. |
| ***Melanerpes uropygialis*** | **Gila woodpecker** | FBCC<br>**SE** | **Present.** Observed during fall and spring point count surveys. Expected to nest on site in palo verde – ironwood woodland. |
| ***Micrathene whitneyi*** | **Elf owl** | FBCC<br>**SE** | **Present.** Detected in BSA (two heard calling in May 2012); not relocated during follow-up focused surveys and apparently not nesting on site in 2012; marginal nesting habitat, these birds apparently migrating. |
| ***Myiarchus tyrannulus*** | **Brown-crested flycatcher** | CDFG WL (nesting) | **Present.** Detected during elf owl surveys in spring 2012. |
| ***Oreothlypis luciae*** | **Lucy's warbler** | FBCC<br>CSSC (nesting) | **Present.** Detected in BSA; secondary cavity-nester, expected during breeding season. |
| ***Pandion haliaetus*** | **Osprey** | CDFG WL (nesting) | **Present.** Observed during 2012 golden eagle surveys; no breeding habitat and outside breeding range; expected as fly-over during winter and migratory seasons. |
| ***Parabuteo unicinctus*** | **Harris hawk** | CDFG WL (nesting) | **Present.** Detected off site; northern margin of geographic range; expected uncommonly as flyover. |
| ***Pelecanus erythrorhynchos*** | **American white pelican** | CSSC (nesting colony) | **Present.** Observed over project site; no breeding habitat and outside breeding range; expected as fly-over during winter and migratory seasons. |
| *Polioptila melanura* | Black-tailed gnatcatcher | n/a (former species of concern) | **High.** Suitable habitat in shrublands, especially around washes; populations apparently stable. |
| *Pyrocephalus rubinus* | Vermillion flycatcher | CSSC (nesting) | **Moderate.** No suitable breeding habitat; expected in riparian habitat at the Colorado River; potential overflight during migration. |
| *Rallus longirostris yumanensis* | Yuma clapper rail | **FE**<br>**ST**<br>CDFG FP | **Low.** No suitable breeding or foraging habitat; occurs along Colorado River, low potential for overflight during migration or dispersal. |

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| ***Riparia riparia*** | **Bank swallow** | **ST** | **Present.** Observed migrating through the BSA in spring 2012. Not expected to nest (out of breeding range, no nesting habitat on site). |
| ***Spizella breweri*** | **Brewer's sparrow** | FBCC | **Present.** Detected in BSA. |
| ***Toxostoma crissale*** | **Crissal thrasher** | CSSC | **Present.** Detected in BSA. |
| ***Toxostoma lecontei*** | **LeConte's thrasher** | FBCC<br>CSSC | **Present.** Detected in BSA. |
| *Vireo bellii arizonae* | Arizona Bell's vireo | FBCC<br>**SE** | **Moderate.** No suitable breeding habitat; expected in riparian habitat at the Colorado River; potential overflight during migration. |
| ***Xanthocephalus xanthocephalus*** | **Yellow-headed blackbird** | CSSC | **Present.** Detected off site; no suitable breeding habitat; expected in riparian habitat at the Colorado River; potential overflight during winter or migration. |
| **MAMMALS** | | | |
| ***Antrozous pallidus*** | **Pallid bat** | BLM S<br>CSSC | **Present.** Detected during acoustic monitoring of the project site**;** roosts in rock outcrops of shrublands; potential roosting in nearby mountains (offsite) and foraging through the Palo Verde Mesa. |
| *Corynorhinus townsendii* | Townsend's big-eared bat | BLM S<br>CSSC | **Moderate (foraging).** Roosts primarily in caves, tunnels, mines; feeds mainly on moths; may roost in nearby mountains and forage through Palo Verde Mesa; recorded from agricultural lands just east of site. |
| *Euderma maculatum* | Spotted bat | BLM S<br>CSSC | **Low.** The site is southeast of range. |
| ***Eumops perotis californicus*** | **Western mastiff bat** | BLM S<br>CSSC | **Present.** Detected during acoustic monitoring; roosts in deep rock crevices and forages over wide area; may roost in nearby mountains and forage throughout the Palo Verde Mesa. |
| ***Lasiurus blossevillii*** | **Western red bat** | CSSC | **Present.** Detected during acoustic monitoring. |
| *Lasiurus xanthinaus (Nycteris ega xanthina)* | Western (southern) yellow bat | CSSC | **Moderate.** Within geographic range and habitat but no local reports. |
| *Macrotus californicus* | California leaf-nosed bat | BLM S<br>CSSC | **High**. Roosts at Roosevelt and Hodge Mines less than 3 miles from project site; expected to forage over site. |
| *Myotis occultus* | Occult little brown bat, Arizona myotis | CSSC | **Moderate.** Potential roosting in caves and mines to west; potential flyover en route to feeding areas over open water. |
| *Myotis thysanodes* | Fringed myotis | BLM S | **Moderate.** Potential roosting in caves and mines to west; potential foraging on site or flyover en route to feeding areas. |
| *Myotis velifer* | Cave myotis | BLM S<br>CSSC | **High**. Roosts at Roosevelt and Hodge Mines less than 3 miles from project site; expected to forage over site. |

| Scientific Name | Common Name | Status | Potential For Occurrence |
|---|---|---|---|
| *Myotis yumanensis* | Yuma myotis | BLM S | **Moderate.** Potential roosting in caves and mines to west; potential flyover en route to feeding areas over open water. |
| ***Nyctinomops femorosaccus (Tadarida femorosaccus)*** | **Pocketed free-tailed bat** | CSSC | **Present.** Detected during acoustic monitoring; roosts mainly in crevices of high cliffs; may roost in nearby mountains and forage throughout the Palo Verde Mesa. |
| *Nyctinomops macrotis (Tadarida macrotis)* | Big free-tailed bat | CSSC | **Moderate.** Potential roosting in caves and mines to west; potential flyover en route to feeding areas over open water. |
| *Chaetodipus fallax pallidus* | Pallid San Diego pocket mouse | CSSC | **High.** Reported from Mule Mountains west of the site. |
| *Sigmodon arizonae plenus* | Colorado River cotton rat | CSSC | **High.** Suitable habitat probably limited to mesquite bosque. |
| *Puma concolor browni* | Yuma mountain lion | CSSC | **High**. Uncommon; expected to forage on site and cross site en route between local mountains and riparian habitats. |
| *Odocoileus hemionus eremicus (= O. h. crooki)* | Burro deer, desert mule deer | n/a | **High**. Uncommon; expected in microphyll woodland. |
| ***Ovis canadensis nelsoni*** | **Nelson's bighorn sheep** | BLM S | **Present.** Sign (hoof, horns, and skull) found on the project site. |
| ***Taxidea taxus*** | **American badger** | CSSC | **Present.** Detected in BSA; wide-ranging and expected throughout area. |
| ***Vulpes macrotis arsipus*** | **Desert kit fox** | n/a | **Present.** Burrow complexes throughout site. |

***Federal Designations:***
FT = Federally listed Threatened
FD = Federally Delisted
FC = Federal Candidate
FBCC = Federal Bird of Conservation Concern
BLM S = BLM Sensitive
***State Designations:***
SE = State listed Endangered
ST = State listed Threatened (wildlife)
SR = State listed Rare (plants)
CSSC = California Species of Special Concern (wildlife)
SP = State Fully Protected Species
CDFG WL = California Department of Fish and Game Watch List
***CRPR (California Native Plant Society) Designations:***
List 1A = Plants presumed extinct in California
List 1B = Plants considered by CRPR to be rare, threatened, or endangered in California, and throughout their range
List 2 = Plants rare, threatened, or endangered in California, but more common elsewhere in their range
List 3 = Plants about which we need more information – a review list.
List 4 = Plants of limited distribution – a watch list
***CRPR Threat Rank:***
.1 = Seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat)
.2 = Fairly endangered in California (20-80% occurrences threatened)
.3 = Not very endangered in California (<20% of occurrences threatened or no current threats known)
***CDFG Natural Diversity Database Designations*** *(Applied to special-status plants and sensitive plant communities; where correct category is uncertain, CDFG uses two categories or question marks):*
S1 = Fewer than 6 occurrences or fewer than 1000 individuals or less than 2000 acres
S1.1 = Very threatened
S1.2 = Threatened
S1.3 = No current threats known
S2 = 6-20 occurrences or 1000-3000 individuals or 2000-10,000 acres (decimal suffixes same as above)
S3 = 21-100 occurrences or 3000-10,000 individuals or 10,000-50,000 acres (decimal suffixes same as above)
S4 = Apparently secure in California; this rank is clearly lower than S3 but factors exist to cause some concern, i.e., there is some threat or somewhat narrow habitat. No threat rank.
S5 = Demonstrably secure or ineradicable in California. No threat rank.
SH = All California occurrences historical (i.e., no records in > 20 years).

## Colorado River Migratory Flyway and Cibola National Wildlife Refuge

The proposed project site is located on open lands in the Lower Colorado River Valley within approximately 5 miles of the Colorado River, on the uplands overlooking the floodplain, wetland, and agricultural habitats. This area is an important migratory route for numerous birds, as well as a breeding and wintering stopover destination. Every spring and fall, millions of birds migrate through the region, a branch of the Pacific Flyway that stretches from the western Arctic to Central and South America.

Many listed species winter, breed, or migrate through the region. The greater sandhill crane, listed as threatened under the CESA and fully protected in California, winters in the lower Colorado River Valley. This population is numerically the least abundant of the six migratory sandhill crane populations recognized in the US. Greater sandhill cranes that winter in the project region breed primarily in northwestern Nevada (Kruse et al. 2012). A flock of migrating or wintering greater sandhill cranes was observed about three miles east of the project site (URS 2011).

The Cibola National Wildlife Refuge (NWR) is located along the Colorado River about six miles southeast of the project site. It encompasses 16,627 acres and is 12 miles long, joining the Imperial NWR on the south. The refuge was established in 1964 to mitigate the loss of fish and wildlife habitat involved in the U.S. Bureau of Reclamation's water salvage and channelization projects along the Colorado River. The refuge provides important wintering, breeding, or migratory stopover habitat for many species, including listed species such as Yuma clapper rail and greater sandhill crane. At least 244 bird species have been recorded at the refuge (USFWS 1995).

## Chocolate-Mule Mountains Burro Herd Area

The proposed project site is located within the boundaries of the Chocolate-Mule Mountains Herd Area. Herd Areas are those geographic areas that supported wild horses and/or burros at the passage of the Wild Horses and Burros Act of 1971. Herd Management Areas are subsets of Herd Areas, which have been designated through land use plans for management of populations of wild horses and/or burros. Herd Areas and Herd Management Areas are designations that apply to federal lands managed by the BLM. The Rio Mesa SEGF site is not on federal lands (the site would be leased from MWD), and is therefore not subject to the Wild Horses and Burros Act. Portions of the gen-tie line are on public lands managed by the BLM that are within the Chocolate-Mule Mountains Herd Area, but are not within the Chocolate-Mule Mountains Herd Management Area located to the south of the project site. The Chocolate-Mule Mountains Herd Management Area consists of approximately 159,000 acres managed for wild burros (SOWH 2012). Wild burros are not native species and are not considered further in this section of the PSA.

## ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

### METHODOLOGY AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

The threshold for determining significance is based on the biological resources present or potentially present within the proposed project area in consideration of the proposed project description.

CEQA requires a list of criteria that are used to determine the significance of identified impacts. A significant impact is defined by CEQA as “a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project” (CEQA Guidelines §15382).

Thresholds for determining CEQA significance in this PSA section are based on Appendix G of the CEQA Guidelines and standards or thresholds identified by the Energy Commission staff. The determination whether the project would significantly affect biological resources is based on the best scientific and factual data that could be reviewed for the project. In this analysis, impacts to biological resources are considered significant if the project would result in:

- A substantial adverse effect to plant species considered by the California Native Plant Society (CNPS), CDFG, or USFWS to be rare, threatened, or endangered in California or with strict habitat requirements and narrow distributions;
- A substantial impact to a sensitive natural community (i.e., a community that is especially diverse; regionally uncommon; or of special concern to local, state, and federal agencies);
- A substantial adverse effect, either directly or through habitat modifications, to wildlife species that are listed, proposed for listing, or candidates for listing under state or federal Endangered Species Acts; a substantial adverse effect to wildlife species of special concern to CDFG, fully protected in California, or identified as a sensitive or special-status species in local or regional plans or in policies, or regulations by the CDFG or USFWS;
- Substantial adverse effects to habitats that serve as breeding, foraging, nesting, or migrating grounds and are limited in availability or that serve as core habitats for regional plant and wildlife populations;
- Substantial interference with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impediment to the use of native wildlife nursery sites;
- Substantial adverse effect to important riparian habitats, wetlands, any other Waters of the U.S., or state jurisdictional waters; or
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

## ASSESSING DIRECT AND INDIRECT IMPACTS AND DISCUSSION OF MITIGATION

The California Environmental Quality Act (CEQA) Guidelines define "direct" impacts as those impacts that result from the project and occur at the same time and place. Indirect impacts are those effects caused by the project and occurring later in time or farther removed in distance, but still reasonably foreseeable. This section of the PSA presents analysis of the potential for direct and indirect impacts of construction and operation of the proposed project to biological resources and recommends mitigation, as necessary and feasible, to reduce the severity of potentially adverse impacts.

If a significant impact is identified, then staff recommends appropriate and feasible mitigation to reduce the impact. Staff then evaluates the mitigated impact to determine whether it would be reduced below the level of significance. Where an adverse significant impact is identified, staff reviews mitigation strategies as proposed by the applicant and, if considered appropriate, recommends them as conditions of certification. Where necessary and feasible, staff introduces and recommends supplementary mitigation and provides supporting rationale for effectiveness of the mitigation. The complete mitigation recommendations are found in the subsection entitled "Proposed Conditions of Certification."

## SUMMARY OF IMPACTS

**Biological Resources Table 6** summarizes the direct, indirect, and cumulative impacts to biological resources resulting from the proposed project, and includes suggested conditions of certification (COCs) to mitigate these impacts.

### BIOLOGICAL RESOURCES TABLE 6
### Summary of Impacts and Conditions of Certification (COCs)

| Impact | Conditions of Certification | Determination |
|---|---|---|
| **Native Vegetation And Wildlife Habitat.**<br>**Direct Impacts:** Permanent and long-term loss of 3,834 acres desert shrubland, including 708.9 acres of microphyll woodland habitat (also called desert dry wash woodland or blue palo verde – ironwood woodland)<br>**Indirect Impacts:** Spread of non-native invasive plants; changes in drainage patterns downslope; increased risk of fire; disturbance (noise, lights) to adjacent wildlife habitat; fugitive dust; groundwater pumping may affect off-site groundwater dependent vegetation.<br>**Cumulative Impacts:** Contributes to cumulatively significant loss of habitat, fragmentation, and indirect effects from past, present, and foreseeable future projects throughout the region. | **BIO-1** would require monitoring and reporting of project activities by qualified project Biology Staff.<br>**BIO-2** would require a Biological Resources Mitigation Implementation and Monitoring Plan to specify all requirements, verification, and reporting dates.<br>**BIO-3** would require compensation of vegetation and habitat at a ratio of 1:1 for creosote bush scrub and 3:1 for microphyll woodland.<br>**BIO-4** would require worker training regarding sensitive biological resources and worker responsibilities for avoidance and reporting.<br>**BIO-5** would require a series of impact avoidance and minimization measures to avoid or minimize impacts to biological resources.<br>**BIO-6** would require revegetation of temporary project disturbances to soils and vegetation to minimize vulnerability to further erosion, weed infestation, or as sources of dust. | **Less than significant** with staff's recommended conditions of certification; however, staff is uncertain whether recommended microphyll woodland compensation at the 3:1 ratio is feasible.<br><br>**Contribution to cumulative impacts would not be considerable** with implementation of conditions of certification; however, if 3:1 compensation is not feasible, contribution to cumulatively |

| Impact | Conditions of Certification | Determination |
|---|---|---|
| | **BIO-7** would require a weed management plan to minimize the introduction and spread of weeds, including prevention, detection, and control, and management of any herbicide use to avoid further impacts.<br>**BIO-8** would require on-site and off-site groundwater dependent vegetation monitoring and follow-up mitigation or compensation of adverse impacts to off-site habitat. | significant impacts may remain **cumulatively considerable**. |
| <u>**Waters of the State.**</u><br>**Direct Impacts:** Permanent and long-term impacts to 817.37 acres of state-jurisdictional desert washes, ephemeral channels, and adjacent riparian habitat (i.e., microphyll woodland, which is the regional riparian vegetation).<br>**Indirect Impacts:** Altered surface drainage and groundwater recharge downslope; spread of invasive plants in off-site streambeds; altered groundwater level due to groundwater pumping; potential erosion from head-cutting upstream; potential erosion or sedimentation downstream; loss or decreased habitat function and value for woodland wildlife off-site.<br>**Cumulative Impacts:** Contributes to cumulatively significant loss of desert wash habitat function and values, fragmentation, erosion, sedimentation, altered surface drainage patterns, and the spread of invasive weeds into desert washes from past, present, and foreseeable future projects in region. | **BIO-1** through **BIO-8** (above).<br>**BIO-9** would require minimization measures and Best Management Practices (BMPs) to minimize impacts to state waters both on the site and adjacent and downstream waters off the site; it also would require compensation and protection of off-site state waters at a 3:1 ratio to offset the on-site impacts. | **Less than significant** with staff's recommended conditions of certification; however, staff is uncertain whether recommended compensation at the 3:1 ratio is feasible.<br><br>**Contribution to cumulative impacts would not be considerable** with implementation of conditions of certification; however, if compensation at the 3:1 ratio is not feasible, contribution to cumulatively significant impacts may remain **cumulatively considerable** |
| <u>**Special-Status Plants.**</u><br>**Direct Impacts:** Loss of Harwood's milk-vetch occurrences on-site; potential direct impacts to Harwood's eriastrum occurrences near the northern segment of the generator tie-line alignment. Field surveys are in progress to identify any additional late-season special status species that may also occur on the site.<br>**Indirect Impacts:** Introduction and spread of non-native invasive plants; increased risk of fire; altered drainage patterns downstream of site; erosion and sedimentation of disturbed soils; accidental chemical and herbicide drift; dust.<br>**Cumulative Impacts:** Contributes to cumulatively significant direct and indirect effects from past, present, and foreseeable future projects in Colorado Desert region. | **BIO-1** through **BIO-9** (above).<br>**BIO-10** would require avoidance of impacts to special-status plants to the extent feasible, and would require mitigation of any unavoidable impacts through one or a combination of additional measures, such as off-site compensation, plant salvage, horticultural propagation, or enhancement of off-site occurrences. | **Less than significant** with staff's recommended conditions of certification.<br><br>**Contribution to cumulative impacts would not be considerable** with implementation of conditions of certification. |
| <u>**Common Wildlife and Nesting Birds.**</u> | **BIO-1** through **BIO-5** (above); **BIO-5** includes | Most impacts would |

| Impact | Conditions of Certification | Determination |
|---|---|---|
| **Direct Impacts**: Mortality, displacement and disturbance to wildlife throughout project area; habitat degradation and disturbance to wildlife near the site; collision hazards with project facilities (especially heliostat mirrors), electrocution hazard on gen-tie line; drowning or toxicity at evaporation ponds; and concentrated solar energy hazard in elevated energy flux area surrounding SRSGs.<br>**Indirect Impacts:** Fragmentation of local populations; introduction and spread of non-native invasive plants; increased risk of fire; noise, and light. Disruption of nesting and foraging behaviors.<br>**Cumulative Impacts:** Contributes to cumulatively significant loss of habitat, fragmentation, and indirect effects from past, present, and foreseeable future projects in the Colorado Desert. | gen-tie line design and receiver tower lighting recommendations to minimize electrocution and collision hazards.<br>**BIO-11** would require nesting birds clearance survey prior to construction and a Nest Management Plan to ensure no take of native birds or their nests; the Plan would specify buffer areas for impact avoidance to nesting birds, dependent on the bird species or family, conservation status, and nature of disturbance, and would specify procedures for situations where it may be necessary to reduce buffer areas.<br>**BIO 12** would require a Bird Monitoring Study to monitor any death and/or injury of birds, and to develop and implement adaptive management measures if those impacts are substantial. It also would require a Bird and Bat Conservation Strategy, to be prepared and implemented according to USFWS guidelines. | be mitigated to **less than significant** with staff's recommended conditions of certification.<br><br>Collision and concentrated solar energy hazards would be **significant and unavoidable** for most bird species that may fly over or near the site, including special-status species (below). These hazards would be mitigated to **less than significant** with staff's recommended conditions of certification for large raptors (see below).<br><br>**Contribution to cumulative** bird mortality due to collision and solar energy flux hazards to most birds, with the exception of large raptors, would be **cumulatively considerable**. |
| **Desert Tortoise.**<br>**Direct Impacts:** Loss of 3,834 acres of occupied desert tortoise habitat; potential mortality or disturbance during construction and operation, additional disturbance and risk from translocation, including mortality and spread of disease.<br>**Indirect Impacts:** Habitat fragmentation; introduction and spread of non-native invasive plants; increased risk of fire; noise, and light. Mortality by raven predation, road kill, and fire.<br>**Cumulative Impacts:** Contributes to cumulatively significant loss and fragmentation of habitat, and indirect effects from past, present, and foreseeable future projects in the Colorado Desert Recovery Unit. | **BIO-1** through **BIO-8** (above).<br>**BIO-13** would require desert tortoise fencing, preconstruction clearance surveys, the capture and translocation of all desert tortoises from the site according to an approved translocation plan to be prepared by the applicant.<br>**BIO-14** would require acquisition, set-aside, and enhancement of compensatory habitat in perpetuity at the ratio of 1:1.<br>**BIO-15** would require preparation and implementation of a Raven Management Plan and the payment of a fee for region-wide raven management and control to prevent any increased predation by ravens. | **Less than significant** with staff's recommended conditions of certification.<br><br>**Contribution to cumulative impacts would not be considerable** with conditions of certification. |
| **Other Special-Status Amphibians and Reptiles.**<br>**Direct Impacts:** Gen-tie construction impacts to aeolian sand habitat or seasonal summer rain pools; also see "Common Wildlife and Nesting Birds" (above). | **BIO-1** through **BIO-5** (above). | **Less than significant** with staff's recommended conditions of certification. |

| Impact | Conditions of Certification | Determination |
|---|---|---|
| **Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | | **Contribution to cumulative impacts would not be considerable** with conditions of certification. |
| **<u>Bald and Golden Eagle.</u>**<br>**Direct Impacts:** Foraging habitat loss (year-around for golden eagle; winter and migration seasons for bald eagle); electrocution hazard on gen-tie line; collision and concentrated solar energy hazards at solar generator facility.<br>**Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** Contributes to cumulatively significant foraging habitat loss throughout the Colorado Desert region. | **BIO 1** through **BIO 5** (above).<br>**BIO-14** (above); staff believes that compensation land meeting selection criteria as desert tortoise habitat also would serve as suitable golden eagle foraging habitat.<br>**BIO 12** would require an Eagle Conservation Plan to evaluate risk to bald and golden eagles and require distribution line retrofitting if an eagle is taken; the Plan would be prepared and implemented according to USFWS guidelines. | Foraging habitat impacts would be mitigated to **less than significant** with staff's recommended conditions of certification.<br><br>Collision and concentrated solar energy hazards would be mitigated to **less than significant**.<br><br>**Contribution to cumulative impacts to foraging habitat would be considerable** even with conditions of certification. |
| **<u>Swainson's hawk.</u>**<br>**Direct Impacts:** Electrocution hazard on gen-tie line; collision and concentrated solar energy hazards at solar generator facility.<br>**Indirect Impacts:** None expected.<br>**Cumulative Impacts:** No significant cumulative impact. | **BIO 12** would require an Eagle Conservation Plan to evaluate risk to bald and golden eagles and require distribution line retrofitting if an eagle or other large special-status raptor including Swainson's hawk is taken; the Plan would be prepared and implemented according to USFWS guidelines. | Collision and concentrated solar energy hazards would be mitigated to **less than significant.** |
| **<u>Elf Owl and Gila Woodpecker.</u>**<br>**Direct Impacts:** Habitat loss (marginal breeding habitat occasionally occupied by both species, no breeding in 2012; suitable as foraging and migration stopover); risks of collision or concentrated solar energy.<br>**Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | **BIO-1** through **BIO-5** (above).<br>**BIO-11** (above).<br>**BIO-12** (above). | **Less than significant** with staff's recommended conditions of certification.<br><br>Staff concludes that collision and concentrated solar energy hazards would be **significant and unavoidable**.<br><br>**Contribution to most cumulative impacts (i.e., habitat) would not be considerable** |

| Impact | Conditions of Certification | Determination |
|---|---|---|
| | | with conditions of certification; however, contribution to mortality due to collision and solar energy flux hazards would remain **cumulatively considerable**. |
| **Burrowing Owl.**<br>**Direct Impacts:** Habitat loss (estimated as 3 breeding or wintering territories); potential for take of burrowing owls during construction or operation; risks of collision or concentrated solar energy.<br>**Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | **BIO-1** through **BIO-5** (above).<br>**BIO-11** (above).<br>**BIO-12** (above).<br>**BIO-19** would require measures to avoid take or direct impacts to burrowing owls, and to compensate for habitat loss based on the estimated number of territories on the site; compensation lands may be "nested" within lands required for other biological resources (BIO-3, above). | Habitat loss and potential take would be **less than significant** with recommended conditions of certification.<br><br>Staff concludes that collision and concentrated solar energy hazards would be **significant and unavoidable**.<br><br>**Contribution to cumulative impacts would not be considerable** with implementation of conditions of certification; however, contribution to collision and solar energy flux hazards would remain **cumulatively considerable**. |
| **Other Special-Status Raptors**<br>**Direct Impacts:** Habitat loss; risks of collision, electrocution, or concentrated solar energy.<br>**Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | **BIO-1** through **BIO-5** (above).<br>**BIO-14** (above); staff believes that compensation land meeting selection criteria for desert tortoise habitat also would serve as raptor foraging habitat.<br>**BIO-12** would require a Bird Monitoring Study to monitor the death and injury of birds, and to develop and implement adaptive management measures if those impacts are substantial. It also would require a Bird and Bat Conservation Strategy, to be prepared and implemented according to USFWS guidelines. **BIO-12** also would require an Eagle Conservation Plan to evaluate risk to bald and golden eagles and require distribution line retrofitting if an eagle or other large special-status is taken; the Plan would be prepared and implemented according to USFWS guidelines. | Foraging habitat impacts would be mitigated to **less than significant** with staff's recommended conditions of certification.<br><br>For large special-status raptors, collision and concentrated solar energy hazards would be mitigated to **less than significant,** and contribution to cumulative impacts **would not be** |

| Impact | Conditions of Certification | Determination |
|---|---|---|
| | | **considerable.**<br><br>For small special-status raptors, staff concludes that collision and concentrated solar energy hazards would be **significant and unavoidable** and contribution to cumulative impacts **would be considerable**. |
| <u>**Special-Status Desert Shrubland Passerine Birds.**</u><br>**Direct Impacts:** See “Common Wildlife and Nesting Birds” (above), including risks of collision or concentrated solar energy.<br>**Indirect Impacts:** See “Common Wildlife and Nesting Birds” (above).<br>**Cumulative Impacts:** See “Common Wildlife and Nesting Birds” (above). | **BIO-1** through **BIO-5** (above).<br>**BIO-11** (above).<br>**BIO 12** (above). | Habitat loss and construction phase impacts would be mitigated to **less than significant** with staff’s recommended conditions of certification, and contribution to cumulative impacts **would not be considerable**.<br><br>Staff concludes that collision and concentrated solar energy hazards would be **significant and unavoidable** and contribution to cumulative impacts **would be considerable**. |
| <u>**Special-Status Migratory and Wintering Birds.**</u><br>**Direct Impacts:** Risks of collision, electrocution, or concentrated solar energy.<br>**Indirect Impacts:** See “Common Wildlife and Nesting Birds” (above).<br>**Cumulative Impacts:** See “Common Wildlife and Nesting Birds” (above). | **BIO-12** (above). | Staff concludes that collision and concentrated solar energy hazards would be **significant and unavoidable** and contribution to cumulative impacts **would be considerable**. |
| <u>**Large Mammals**</u>**.**<br>**Direct Impacts:** See “Common Wildlife and Nesting Birds” (above).<br>**Indirect Impacts:** See “Common Wildlife and Nesting Birds” (above).<br>**Cumulative Impacts:** See “Common Wildlife and Nesting Birds” (above). | **BIO-1** through **BIO-5** (above). | **Less than significant** with staff’s recommended conditions of certification, and contribution to |

| Impact | Conditions of Certification | Determination |
|---|---|---|
| | | cumulative impacts **would not be considerable**. |
| **Burrowing Mammals (Desert Kit Fox And American Badger).**<br>**Direct Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | **BIO-1** through **BIO-5** (above).<br>**BIO-18** would require the project owner to prepare and implement a management plan to avoid take by excluding these animals from the project area prior to construction. | **Less than significant** with staff's recommended conditions of certification, and contribution to cumulative impacts **would not be considerable**. |
| **Colorado Valley Woodrat.**<br>**Direct Impacts:** Potential habitat loss in mesquite bosque habitat.<br>**Indirect Impacts:** Groundwater pumping may cause groundwater level drop and consequent impact to mesquite bosque habitat.<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | **BIO-1** through **BIO-7 (above).**<br>**BIO-8** (above) would require groundwater and off-site groundwater dependent vegetation monitoring and follow-up mitigation or compensation of adverse impacts to off-site habitat. | **Less than significant** with staff's recommended conditions of certification, and contribution to cumulative impacts **would not be considerable**. |
| **Special-Status Bats.**<br>**Direct Impacts:** Foraging habitat loss; risks of collision, electrocution, or concentrated solar energy.<br>**Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | **BIO-1** through **BIO-5** (above). | **Less than significant** with staff's recommended conditions of certification, and contribution to cumulative impacts **would not be considerable**. |
| **Wildlife Movement.**<br>**Direct Impacts:** Interruption of north-south movement (especially for relatively immobile species, including desert tortoise); interruption of east-west movement (especially for large mammals' access to water at irrigation lands).<br>**Indirect Impacts:** See "Common Wildlife and Nesting Birds" (above).<br>**Cumulative Impacts:** See "Common Wildlife and Nesting Birds" (above). | None recommended. | **Less than significant**, and contribution to cumulative impacts **would not be considerable.** |

## NATIVE VEGETATION AND WILDLIFE HABITAT

### Direct Impacts to Native Vegetation and Wildlife Habitat

Staff has considered impacts to vegetation and habitat based on information provided by the applicant in the Environmental Enhancement Proposal (BS 2012v); however, staff is coordinating with the applicant to provide greater clarity with regard to temporary and permanent impacts to vegetation and habitat. For the purposes of this PSA, the following acreages are considered in the analysis of impacts to biological resources:

- **Project solar generator site** (within the permanent fenceline) = 3,805 acres
- **Total permanent impacts on project site** (solar generator site, gen-tie line, and access roads) = 3,840 acres
- **Permanent impacts to native vegetation** (not including areas mapped as ruderal, agricultural, or developed/open channel) = 3,834 acres

### Temporary and Long-term Impacts

Construction of the Rio Mesa SEGF would result in permanent or long-term land use conversion of native vegetation and habitat and the loss of special-status plant and animal species. Impact analyses typically characterize effects to vegetation and habitat as either temporary or permanent. Permanent impacts are generally considered disturbances or land use conversion that would preclude most natural habitat function throughout the life of a project or longer. Temporary disturbance is generally understood as construction disturbance occurring on a site that later may return to a more natural condition or may be actively revegetated or enhanced, either immediately after construction or during the early phases of project operation, returning to natural conditions within about five years. In the desert ecosystem, the interpretation of permanent and temporary impacts needs to reflect the slow recovery rates of native plant communities. Natural recovery rates from disturbance in desert ecosystems depend on the nature and severity of the impact. Temporary habitat impacts such as vegetation removal and soil disturbance can take from 50 to 300 years for partial recovery and complete ecosystem recovery may require over 3,000 years (Lovich and Bainbridge, 1999). In this analysis, an impact that might be considered temporary in other parts of California will be considered long-term or permanent due to these very slow natural recovery rates.

Permanent and long-term habitat loss as defined by staff include any impacts that would not recover within five years. Staff considers that project impacts to habitat persisting throughout the life of the project and beyond are, for purposes of this analysis, permanent. In addition, staff considers that temporary project impacts to habitats that persist longer than five years are long-term. Vegetation within the proposed solar facility would be cut to approximately 18 inches to prevent interference with the heliostat system and minimize fire hazard. Staff believes that this proposed vegetation treatment would enhance soils and water resource conservation (as compared with complete removal of the vegetation). However, the proposed vegetation treatment would substantially degrade habitat value for most wildlife species throughout the facility and treats this impact as a permanent loss of habitat throughout this section of the PSA. Construction and operation of the Rio Mesa SEGF would have permanent impacts throughout the solar generator site and on any permanent new or widened access routes. In addition, the project would have long-term impacts where habitat is disturbed for temporary construction use, gen- tie line construction areas, or temporary access routes to construction sites.

### Overview of Vegetation Impacts

Native vegetation would be cleared and grubbed (i.e., shrubs and roots removed) for construction of permanent access roads, heliostat support installation, construction of solar towers, and other project facilities throughout much of the proposed solar generator site, and possibly at each tower or pull site along the proposed gen-tie alignment. Outside of access roads and maintenance tracks, vegetation may be cut to ground level as needed for construction but roots would be left intact, allowing for some regrowth. During project operations, vegetation would be cut or removed as needed to provide clearance for heliostat function and manage potential fire hazard. Native shrubs undergoing repeated mowing would be weakened and diminished in size, degrading or eliminating their value as wildlife habitat. Overall impacts of these construction, operations, and maintenance procedures would cause substantial degradation to native vegetation and wildlife habitat. However, to the extent that native shrubs persist on the site, they may have some benefit to soils and hydrology, by reducing likely soil erosion throughout the heliostat fields.

**Overview of Wildlife Habitat Impacts**

The term "habitat" refers to the environment and ecological conditions where a species is found. Wildlife habitat is generally described in terms of vegetation, though a complete explanation often must encompass further detail, such as availability or proximity to water; suitable nesting or denning sites; shade; foraging perches; cover sites to escape from predators; soils that are suitable for burrowing or hiding; limited noise and disturbance; and many other factors that are unique to each species. Vegetation itself provides many aspects of habitat, physical structure, and biological productivity and food resources for many wildlife species. Further, vegetation often reflects other habitat components such as regional climate, soil productivity and texture, elevation, and topography. Thus, vegetation is a useful overarching descriptor for habitat and it is the primary factor in this analysis of impacts to wildlife habitat. Additional species-specific habitat components are provided in the discussions of special-status wildlife species below. Examples include the aeolian sand requirements for Mojave fringe-toed lizard, and the availability of shade, cover, and water for burro deer.

Project construction and operation would cause permanent and long-term direct impacts to 3,834 acres of native vegetation and habitat (i.e., the entire solar generator site and impacts on the gen-tie line and access roads, excluding human-dominated land uses; see **Biological Resources Table 7**). This vegetation and habitat provides cover, denning or nesting sites, foraging areas, and other habitat functions for wildlife species, including special-status species, throughout the area. In some cases, habitat use is seasonal (e.g., for migratory birds) or is limited to foraging but not nesting (e.g., for golden eagles or other wide-ranging cliff-nesting raptors). Remnant vegetation and habitat after construction and throughout operations may be suitable for some common species, such as side-blotched lizard, house finch, northern mockingbird, and desert cottontail. However, during construction and operations, the remnant or recovering vegetation and habitat would be unsuitable for most species, particularly species with specific habitat requirements, including most special-status wildlife species. The project's direct adverse impacts to native vegetation and wildlife habitat would be substantial. Staff recommends measures below to reduce, minimize, or offset these impacts.

Based on distances of 500 feet surrounding the site boundaries and 10 feet adjacent to access roads, an additional 1,089 acres would be indirectly impacted by dust, noise, and other effects. Staff notes, however, that these buffer distances are only rough estimates and that off-site and indirect impacts may extend greater or lesser distances, depending on circumstances. Additionally, groundwater-dependent vegetation off-site may be affected by groundwater draw-down that may be caused by the well pumping for project's construction and operations phase water use.

**Biological Resources Table 7**
**Summary of Project Disturbance Acreage by Vegetation Type**

| Vegetation Type | Impacts (Acres) | | | | | |
|---|---|---|---|---|---|---|
| | Solar Generator Site | Gen-Tie Line | Access Roads | Total Direct Impacts | Indirect Impacts (buffer area)[2] | Total Project Impacts |
| Creosote – White Burr Sage Scrub | 1,671.0 | 4.3 | 1.7 | 1,677.0 | 272.7 | 1,949.7 |
| Creosote Bush Scrub | 1,345.4 | 3.5 | 8.0 | 1,356.9 | 440.9 | 1,797.8 |
| Blue Palo Verde – Ironwood Woodland[1] | 707.2 | 1.4 | 0.3 | 708.9 | 265.5 | 974.4 |
| Creosote Bush – White Burr Sage Scrub with Big Galleta Grass Association[1] | 18.3 | 1.5 | 3.0 | 22.8 | 53.3 | 76.1 |
| Creosote Bush – White Burr Sage Scrub with Ocotillo Association[1] | 60.7 | 0 | 0 | 60.7 | 7.9 | 68.6 |
| Brittle Bush – Ferocactus Scrub[1] | 2.4 | 0 | 0 | 2.4 | 43.3 | 45.7 |
| Agriculture | 0 | 0 | 5.9 | 5.9 | 4.2 | 10.1 |
| Desert Dunes[1] | 0 | 4.1 | 0 | 4.1 | 0 | 4.1 |
| Bush Seepweed Scrub – Mesquite Bosque[1] | 0 | 0 | 0.7 | 0.7 | 0.5 | 1.2 |
| Ruderal | 0 | 0 | 0.6 | 0.6 | 0.5 | 1.1 |
| Unvegetated Channel, Developed | 0 | 0 | 0.02 | 0.02 | 0.02 | 0.04 |
| Total | 3,805.0 | 14.8 | 20.2 | 3,840.0 | 1,088.8 | 4,928.8 |

Source: BS 2012v.
1 – Vegetation type is considered rare and worthy of consideration by CDFG (CDFG 2010)
2 – Includes 500-foot buffer around project site fence line and 10-foot buffer on gen-tie roads and access roads.

### Special-status Plant Communities

Five vegetation or habitat types mapped within the project area are ranked as special-status plant communities, based on CDFG Vegetation Program compilations (CDFG 2010). Direct project impacts to these five vegetation types would total 799.6 acres, including 713.7 acres of vegetation or habitat types for which BLM requires compensation at a ratio of 3:1 (BLM and CDFG 2002: blue palo verde – ironwood woodland, desert dunes, and bush seepweed scrub – mesquite bosque). Two of these (blue palo verde – ironwood woodland, and bush seepweed scrub – mesquite bosque) may be dependent on groundwater availability within the root zone and thus may be vulnerable to any project related depletion of the groundwater table.

Blue palo verde – ironwood woodland (also called desert dry wash woodland, or microphyll woodland) provides habitat resources such as taller perch and nest sites, shade and cover, substrate for woodpecker nest cavities and secondary cavity nesting species, and high biological productivity (including productivity of insect biomass as prey for birds and bats) that are not available to the same degree in the surrounding creosote bush scrub. Desert wash woodlands are the primary habitat of burro deer, a high priority management species for the CDFG. Desert microphyll woodland is a more productive habitat than surrounding uplands and supports breeding desert bird species in higher densities (Laudenslayer 1988). During migration seasons, it is important as stopover habitat for large numbers of migratory songbirds. The assemblage of birds using these woodlands is similar to those of honey mesquite habitats to the east, including riparian species and frugivores (which feed on mistletoe berries) (Rosenberg et al. 1991). Also, desert upland birds are more numerous in desert washes than in surrounding creosote bush scrub. Desert wash woodlands are relatively uncommon in terms of overall area they cover. They support 85 percent of all bird nests built in the Colorado Desert, despite accounting for only 0.5 percent of the desert land base (McCreedy 2011).

Similarly, mesquite bosque is relatively small in overall area but disproportionately important in terms of wildlife habitat and diversity (Rosenberg et al. 1991). The Colorado River cotton rat is a CDFG Species of Special Concern that is found in these habitats.

In addition to the direct impacts to vegetation, project construction and operation would have several indirect impacts to native vegetation, including introduction or spread of invasive weeds and increased dust. These are described further below.

## Indirect Effects to Native Vegetation and Wildlife Habitat

In addition to the direct impacts to vegetation, project construction and operation could cause indirect impacts to native vegetation, including introduction or spread of invasive weeds, increased dust, and perhaps reduced water availability due to groundwater drawdown. Other indirect effects to on-site plant communities include soil compaction, changes to the soil structure by use of dust suppressants, and localized concentration of precipitation and wash water on soil beneath the heliostats (runoff would concentrate along the driplines, affecting soil water). Altered drainage patterns, especially around power blocks and common areas, would affect surface hydrology and local erosion or sedimentation patterns; these in turn could affect, plants, their habitat, or their seed banks in downstream off-site washes (e.g., soils could be eroded away or plants could be covered in sediment). If herbicides are used to control weeds, they also could affect native vegetation on-site or off-site.

**Biological Resources Table 7** estimates indirect impacts quantitatively by considering the acreage of each vegetation type within a 500-foot buffer of the solar generator site and a 10-foot buffer of the gen-tie line and access roads, to identify areas most likely to experience the greatest indirect effects. However, these buffer distances are only coarse estimates of the likely extent of off-site indirect effects. Indirect effects, particularly spread of invasive weeds, could extend much farther from the project site and could be substantial on a regional scale if not effectively mitigated.

### Invasive, Non-Native, and Noxious Weeds

The spread of invasive plants is a major threat to biological resources in the California desert because non-native plants can displace native plants, increase the threat of wildfire, supplant wildlife food plants, alter the habitat structure and ecological function of wetland, riparian, and desert wash communities, and invade special-status plant habitat (Zouhar et al 2008; Lovich and Bainbridge 1999).

Human activities can introduce new weed species to an area, or can cause spread of weeds that are already present. Construction activities and soil disturbance tend to introduce non-native invasive plant species into new areas and to facilitate their proliferation and spread. New introductions occur when seeds are inadvertently introduced, most often with mulch, hay bales, or wattles used for erosion control, or when they are carried on equipment tires from off-site. Construction and grading activities tend to promote or propagate invasive species, which are adapted to soil disturbance (Lathrop & Archibald 1980). Once introduced, weeds can out-compete native species because of minimal water requirements, high germination potential and high seed production (Beatley 1966) and can become locally dominant, representing a serious threat to native desert ecosystems (Abella et al. 2008). Invasive weeds generally spread most readily in disturbed, graded, or cultivated soils, including soils disturbed by construction equipment. Thus, the proposed Rio Mesa SEGF, including solar generator construction and associated gen-tie line and other facilities, would be expected to introduce or facilitate the spread of invasive non-native plants. Without weed control, staff anticipates that weeds already present in the area would increase their abundance in soils disturbed by project construction throughout the project site and along the linear facilities, and that construction equipment could import new invasive species from off-site.

Undisturbed desert habitat has been vulnerable to a limited suite of alien plant species capable of invading it. But the hot and arid environment; undependable timing and amount of annual precipitation; and often saline or alkaline soils limit the range of invasive species capable of naturalization there (Mack 2002). Certain aspects of the proposed project would change those conditions, probably creating habitat more suited to a wider variety of invasive plants and to greater abundance of the invasive species already present in the area. Shade beneath the heliostats would alter the micro-environment, favoring weedy annual species. Shading in desert habitat creates a cooler, moister microhabitat below and near structures (Smith 1984, Smith et al. 1987). Shading and wind deflection caused by the structures decrease soil temperature extremes and decrease evaporation from soil surfaces. Additionally, mirror washing would add water to the soil around the heliostats. This alteration to the arid environment would not favor the native arid-adapted species and, instead, would allow weedy ephemerals to colonize (Smith 1984).

Numerous invasive weeds have already become widespread throughout the Colorado Desert and prevention of further spread is impracticable. Examples of ubiquitous weeds include red brome, cheat grass, Mediterranean schismus, red-stemmed filaree, Sahara mustard, and Russian thistle. Other invasive species (e.g., saltcedar) are damaging to specific habitat types but pose little or no threat to widespread upland desert habitat. Weeds were relatively low in abundance throughout the Rio Mesa SEGF area. Weeds documented in the BSA are shown in **Biological Resources Table 3**. Once established in newly disturbed soils, these or other invasive weeds would likely spread beyond the project boundaries into surrounding undisturbed desert lands.

The proliferation of non-native annual weeds has dramatically increased the fuel load and frequency of fire in many desert ecosystems (Lovich and Bainbridge 1999). Unlike other ecosystems in California, fire was not historically an important natural disturbance in the deserts. Most native desert shrubs are poorly adapted to even low-intensity fires. The potential spread or proliferation of non-native annual grasses, combined with the proximity to ignition sources during construction and operations activities could increase the risk of fire, and the effects to these poorly-adapted desert communities would be harmful, particularly to cacti and most native shrub species. Weeds tend to spread into native vegetation and, once there, increase flammability and ignition frequency. Following fire, weeds tend to replace native vegetation so that fires become more frequent. The long-term effect is large-scale replacement of native desert shrublands by non-native annual weeds (Brown and Minnich 1986). In addition, the project is expected to increase vehicle traffic on access roads and on the gen-tie alignment. The increased traffic would correspondingly increase the risk of ignition, particularly at pullouts and on partially vegetated unpaved roads where the exhaust system may come into contact with dry grass or other vegetation. Mowing, welding, and grinding are also potential sources for ignition of accidental fires.

Staff's recommended Condition of Certification **BIO-7** would require the project owner to prepare and implement an Integrated Weed Management Plan. Staff concludes that this condition would reduce the impacts of invasive weeds to a level less than significant (see "Summary and Conclusion of Recommended Mitigation of Impacts to Native Vegetation and Wildlife Habitat"). Weed control would likely necessitate use of herbicides which may, in turn, pose risks to vegetation or wildlife. Most aquatic herbicides and several terrestrial herbicides are non-selective and could affect non-target vegetation. Accidental spills and herbicide drift from treatment areas could be particularly damaging to non-target vegetation on public land, and crop plants or other vegetation near treatment areas (e.g., access routes east of the proposed solar generator). Herbicides that persist on the vegetation or soil could adversely affect wildlife that feed on target plants or are exposed to the herbicides (e.g., by digging or rolling in treated areas).

### Dust

Disturbance of the soil's surface caused by construction traffic, operations traffic, and other activities such as mirror washing would result in increased aeolian (wind) erosion of the soil. Aeolian transport of dust and sand can result in the degradation of soil and vegetation over a widening area (Okin et al. 2001). Dust can have deleterious physiological effects on plants and may affect their productivity and nutritional qualities (Sharifi et al. 1997; 1999). Aeolian transport of dust and sand can kill plants by burial and abrasion, interrupt natural processes of nutrient accumulation, and allow the loss of soil resources. The destruction of plants and soil crusts by windblown sand and dust exacerbates the erodibility of the soil and accelerates the loss of nutrients (Okin et al. 2001). The impacts of increased dust can be minimized with implementation of staff's proposed Condition of Certification **BIO-5** (Impact Avoidance and Minimization Measures) to less than significant levels.

### Hydrology and Groundwater-Dependent Vegetation

Project construction could affect off-site vegetation, particularly the blue palo verde–desert ironwood woodland and bush seepweed – mesquite bosque west of the proposed solar generator site, by altering water quality, hydrology, and possibly by altering depth to groundwater. If pollutants, silt, or other materials are carried off-site by intermittent stream flows, they could be deposited in downstream washes or could enter the soil or groundwater, where they could adversely affect native woodland vegetation.

In addition, groundwater pumping during construction and operation of the project could lower local ground-water levels. Groundwater pumping for agriculture has caused loss of phreatophytic (groundwater-dependent) woodlands in Arizona (Jackson and Comus, 1999). Depending on the rate and extent of groundwater drawdown and on the ability for groundwater-dependent plants to adjust by extending their root systems, groundwater pumping could cause mortality of desert dry wash woodland trees (desert ironwood and blue palo verde). Staff recommends Condition of Certification **BIO-3** to prevent or offset any project impacts to groundwater-dependent vegetation thay may result from groundwater pumping. **BIO-3** would require the project owner to monitor groundwater levels and plant health and vigor in adjacent desert dry wash woodland areas; if plant stress or mortality occurs and is determined to be related to project activities, then the project owner shall either refrain from pumping, reduce pumping to allow for recovery of the groundwater table, or offset any additional habitat losses through off-site compensation. Staff concludes that **BIO-3** would mitigate any project imnpacts to off-site groundwater dependent vegetation to a less than significant level.

## Mitigation of Impacts to Native Vegetation and Wildlife Habitat

Staff concludes that the direct and indirect impacts to native vegetation and wildlife habitat from construction and operation of the proposed Rio Mesa SEGF would be significant. The applicant's proposed mitigation for impacts to vegetation are as follows (BS 2011):

- No mitigation is required to compensate for non-sensitive vegetation types that would be directly impacted by project activities.
- Impacts to sensitive vegetation communities will be satisfied though habitat conservation, habitat enhancement, in lieu fee payment, or other means agreed to by the CEC, BLM, USFWS and CDFG.

Staff recommends a more substantial strategy to mitigate these impacts, comprising several proposed conditions of certification which, together, would minimize or avoid impacts to the extent feasible and offset impacts through the acquisition and protection in perpetuity of off-site vegetation and habitat. Staff's recommended strategy is based in large part on offset of habitat impacts through acquisition and protection of offsite lands. This strategy is intended to mitigate the project's impacts to multiple biological resources described in the subsections that follow, and is compatible with the applicant's proposed mitigation for impacts to desert tortoise habitat, which reads "*an acreage-based mitigation formula as required by the BLM and USFW approved NECO Plan and in consultation with CEC and CDFG*" (BS 2011; BS 2012v).

### Habitat Compensation

The intent of off-site habitat compensation is to mitigate the unavoidable habitat loss and degradation resulting from land use change from natural open space to electricity production. Staff's approach to assigning compensation ratios, designating lands for compensation, and providing financial security to ensure completion of the mitigation is described here; this general approach is also applicable for mitigating impacts to several other related biological resources described in the subsections that follow, including waters of the state, desert tortoise habitat, golden eagle foraging habitat, and burrowing owl foraging habitat.

Staff reviewed available literature addressing selection of appropriate offset ratios for habitat loss. Quantitative guidelines for determining compensation ratios are generally lacking except where land management plans or other agency polices direct specific ratios. In a review of offset ratios in developed nations worldwide, McKenney and Kieseker (2010) found that all recommended ratios are 1:1 or greater, but that an improved "accounting framework" for assigning ratios is needed. There is a small body of literature addressing quantitative ratios to offset impacts to biological resources. Much of it addresses ratios for habitat restoration (rather than off-site protection), especially for wetlands and aquatic habitats. Moilanen et al. (2009) found that typical ratios may be far too low to account for uncertain success or restoration compensation, and McKenney and Kieseker (2010) noted that preservation ratios generally must be higher than restoration ratios, and also include habitat improvement ("additionality") to achieve no net loss of habitat value. Staff notes that "no net loss" is an applicable standard for desert tortoise compensation, to fulfill CESA requirement to fully mitigate impacts to state listed species (see "Desert Tortoise," below).

Based on the literature review, staff concludes that the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO Plan, BLM and CDFG 2002) is the only appropriate and applicable source of quantitative offset ratios for the Rio Mesa SEGF's impacts to vegetation and wildlife habitat. Staff recognizes that the gen-tie line is the only project component on BLM land. However, the rationale presented in the NECO Plan is based on resource values, not on agency jurisdiction, and is fully applicable to vegetation and habitat values on the project site. The USFWS Biological Opinion (2005) concurs with the Plan's overall conservation strategies. Moreover, CDFG is a signatory to the NECO Plan, and is the Energy Commission's partner agency in administration of CESA and the LSAA program. Therefore, staff's recommended Condition of Certification **BIO-3** would require compensation ratios for impacts to vegetation and habitat based on those presented in the NECO Plan. For the Rio Mesa SEGF, staff recommends compensation of habitat loss at 1:1 for creosote bush scrub and 3:1 (i.e., three acres of compensation land for each acre of impact) for state-jurisdiction streambeds, the adjacent blue palo verde – ironwood woodland and other special-status plant communities.

In the California desert, creosote bush scrub is the predominant habitat and, depending on other factors, may range widely in terms of its habitat value for desert tortoise or other special-status plants or animals. Recommended compensation ratios in the NECO Plan are generally 1:1, but range up to 5:1 based primarily on importance to desert tortoise. Compensation ratios for desert tortoise impacts are discussed further in the subsection entitled "Impacts to Special Status Wildlife."

The NECO Plan assigns a 3:1 compensation ratio for desert dry wash woodland based on (1) similar importance to desert tortoises; (2) disproportionately high importance to biodiversity and other special-status species due to high biological productivity and habitat heterogeneity (e.g., shade, cover, elevated perch sites, and substrates for nesting cavities); and (3) relative rarity, due to restriction to wash landforms with suitable surface or groundwater hydrology. Additionally, the increased ratio is intended to discourage development in desert dry wash woodland. The NECO Plan includes desert dry wash woodland among the habitats that are "present in small amounts but add greatly to overall plant diversity in the planning area" (p. 4-83) and states that the 3:1 ratio for desert dry wash woodland "would discourage development and aid in habitat acquisition, thereby aiding riparian-obligate special status species" (p. 4-78). The NECO Plan also notes that a lower replacement ratio for desert dry wash woodland would "reduce the incentive for proponents to place their projects outside of these communities."

### Calculation of Financial Security for Compensation Lands

Staff's recommended Condition of Certification **BIO-3** specifies the dollar amount and financial instruments of staff's recommended security deposit, and includes a provision for adjusting that financial security amount when parcel-specific information is available. The security amount is based on staff's estimated costs for land purchase, associated costs of purchase transactions, appraisals, escrow, title insurance (including mineral, oil, and gas rights). The estimate also addresses costs of initial enhancement or restoration (e.g., signs, fencing, and boundary surveys, weed control, decommissioning roads); management for ongoing activities (e.g., public access and law enforcement); and monitoring the implementation, effectiveness, and compliance with the conservation goals and objectives of the compensation. For those projects using the NFWF Mitigation Account for implementing mitigation actions, the budget includes costs of administration of contracts and reporting. For all conditions of certification requiring habitat compensation, staff recommends that the estimated land acquisition costs and amount of the financial security should be calculated based on the following estimated cost per acre as a best available proxy (see footnotes in **Biological Resources Table 8)**.

**Biological Resources Table 8** provides staff's estimated cost to implement habitat compensation measures described in Condition of Certification **BIO-3**. Staff recommends adopting this estimate as the security deposit amount to be required as a guarantee of completion of the habitat compensation measures. To some extent, the amount of the security may reflect anticipated "nesting" or "layering" of compensation lands. Therefore the total recommended security is less than the sum of the four columns (see '"Nesting or Layering Habitat Compensation Lands and Financial Security").

**Biological Resources Table 8**
**Compensation of Impacts to Biological Resources**
**Summary of Compensation Lands Costs[1]**

| | Native Vegetation and Wildlife Habitat (creosote bush scrub at 1:1; special-status vegetation at 3:1) | Desert Tortoise and Golden Eagle Habitat Compensation (total impact area at 1:1) | Burrowing Owl Habitat Compensation (3 territories at 300 acres each) | State Waters Compensation (817.37 acres at 3:1) |
|---|---|---|---|---|
| Number of acres | 5,175.5 | 3,834 | 900 | 2,452.1 |
| Estimated number of parcels to be acquired, at 160 acres per parcel[2] | 130 | 96 | 23 | 62 |
| Land cost at $1,500/acre[3] | $ 7,763,250 | $ 5,751,000 | $ 1,350,000 | $ 3,678,150 |
| Level 1 Environmental Site Assessment at $3000/parcel | $390,000 | $288,000 | $69,000 | $186,000 |
| Appraisal at no less than $5,000/parcel | $650,000 | $480,000 | $115,000 | $310,000 |
| Initial site clean-up, restoration or enhancement, at $250/acre[4] | $1,293,875 | $958,500 | $225,000 | $613,025 |
| Closing and Escrow Cost at $5000/parcel[5] | $650,000 | $480,000 | $115,000 | $310,000 |
| Biological survey for determining mitigation value of land (habitat based with species specific augmentation) at $5000/parcel | $ 650,000 | $ 480,000 | $115,000 | $ 310,000 |
| 3rd Party Administrative Costs (Land Cost x 10%)[6] | $ 776,325 | $ 575,100 | $ 135,000 | $ 367,815 |
| Agency cost to accept land[7] [(Land Cost x 15%) x 1.17] (17% of the 15% for overhead) | $ 1,362,450 | $ 1,009,300 | $ 236,925 | $ 645,515 |
| **Subtotal - Acquisition and Initial Site Work** | $ 13,535,900 | $ 10,021,900 | $ 2,360,925 | $ 6,420,505 |
| **Long-term Management and Maintenance Fund (LTMM)** fee at $1450/acre[8] | $ 6,986,925 | $ 5,175,900 | $ 1,215,000 | $ 3,310,335 |
| | | | | |
| **Financial Security Requirement Subtotal if the application-directed compensatory mitigation option** | $ 20,522,825 | $ 15,197,800 | $ 3,575,925 | $ 9,730,840 |
| | | | | |
| **NFWF Fees** | | | | |
| Establish Project Specific Account[9] | $12,000 | - | -- | -- |
| Call for and Process Pre-Proposal Modified RFP or | $30,000 | $30,000 | $30,000 | $30,000 |

| | Native Vegetation and Wildlife Habitat (creosote bush scrub at 1:1; special-status vegetation at 3:1) | Desert Tortoise and Golden Eagle Habitat Compensation (total impact area at 1:1) | Burrowing Owl Habitat Compensation (3 territories at 300 acres each) | State Waters Compensation (817.37 acres at 3:1) |
|---|---|---|---|---|
| RPF[10] | | | | |
| NFWF Management fee For Acquisition and Enhancement Actions (Subtotal x 3%) | $ 406,077 | $ 300,657 | $ 70,828 | $ 192,615 |
| NWFW Management Fee for LTMM account (LTMM x 1%) | $ 69,869 | $ 51,759 | $ 12,150 | $ 33,103 |
| **Subtotal of NFWF Fees if NFWF option selected** | $ 517,946 | $ 352,416 | $ 82,978 | $ 225,719 |
| **TOTAL Estimated cost for deposit in project specific REAT-NFWF Account[11]** | **$ 21,040,772** | **$ 15,550,217** | **$ 3,658,903** | **$ 9,956,559** |

1. All costs are best estimates as of summer 2012. Actual costs will be determined at the time of the transactions and may change the funding needed to implement the required mitigation obligation. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
2. For the purposes of determining costs, a parcel is defined at 160 acres, recognizing that some will be larger and some will be smaller, but that 160 acres provides a good estimate for the number of transactions anticipated (based on input from CDD).
3. Generalized estimate taking into consideration a likely jump in land costs due to demand, and an 18-24 month window to acquire the land after agency decisions are made. If the agencies, developer, or 3rd party has better information on land costs in the specific area where project-specific mitigation lands are likely to be purchased, that data overrides this general estimate. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
4. Based on information from CDFG.
5. Two transactions at $2500 each: landowner to 3rd party; 3rd party to agency. The transactions will likely be separated in time.
6. Includes staff time to work with agencies and landowners; develop management plan; oversee land transaction; organizational reporting and due diligence; review of acquisition documents; and assembling acres to acquire.
7. Includes agency costs to accept the land into the public management system and costs associated with tracking/managing the costs associated with the donation acceptance, including 2 physical inspections; review and approval of the Level 1 ESA assessment; review of all title documents; drafting deed and deed restrictions; issue escrow instructions; mapping the parcels; and any other transaction requirements.
8. Estimate for purposes of calculating general costs. The actual long term management costs will be determined using a Property Assessment Report (PAR) tailored to the specific acquisition. Includes land management; enforcement and defense of easement or title [short and long term]; monitoring…..
9. Each renewable energy project will be a separate sub-account within the REAT-NFWF account, regardless of the number of required mitigation actions per project.
10. If determined necessary by the REAT agencies if multiple 3rd parties have expressed interest; for transparency and objective selection of 3rd party to carryout acquisition.
11. Total recommended security amount reflects sum of columns 1 and 4; see “Nesting or Layering Habitat Compensation Lands and Financial Security.”

### Nesting or Layering Habitat Compensation Lands and Financial Security

Several of staff’s recommended conditions of certification would require the project owner to offset impacts to biological resources by acquiring comparable lands and protecting them in perpetuity under a conservation easement. The most significant of these are Conditions of Certification **BIO-9** (State Waters Impact Compensation, Avoidance and Minimization Measures), **BIO-14** (Desert Tortoise Habitat Compensation), and **BIO-17** (Burrowing Owl Impact Avoidance, Minimization, and Compensatory Measures). Two other recommended conditions of certification, **BIO-8** and **BIO-10**, also may necessitate offsite habitat compensation for either groundwater-dependent vegetation or rare plants. That determination would be made by the project owner and CPM during implementation of both measures.

Compensation lands designated for compliance with Condition of Certification **BIO-3** may also support other affected species or resources compatible with compensation as recommended in other conditions of certification. The project owner may offset project impacts to multiple species or resources on selected compensation lands, providing those lands meet the selection criteria described in each applicable condition of certification as adopted by the Energy Commission's Final Decision.

Acquisition lands designated as compensation for native vegetation and wildlife habitat impacts according to Condition of Certification **BIO-3** would generally also serve as suitable compensation for impacts to desert tortoise habitat, burrowing owl habitat, and golden eagle foraging habitat. Therefore staff believes that the applicant will likely be able to fully "nest" or "layer" compensation requirements for these impacts within compensation lands as recommended in **BIO-3**. Additionally, staff believes that lands designated as compensation for the project's impacts to desert dry wash woodland (blue palo verde – ironwood woodland) also would serve as compensation for impacts to waters of the state as recommended in **BIO-3**.

However, staff believes that acquisition of adequate compensation acreage of desert dry wash woodland and waters of the state will likely necessitate acquisition of more overall acreage than the minimum 5,175.5 acres (see **Biological Resources Table 8** and **Condition of Certification BIO-3**). Desert dry wash woodlands and jurisdictional waters of the state are found in linear patterns, along stream channels and broad floodplains and are disproportionately uncommon by comparison with upland creosote bush scrub vegetation. The actual acreage and proportion of desert dry wash woodland will vary among parcels but typically will be uncommon by comparison with upland vegetation. Therefore staff does not assume that the applicant will be able to fully nest all necessary compensation lands within the minimum 5,175.5 acres.

In addition, staff recommends that the project owner be required to deposit a financial security for each compensatory mitigation obligation, prior to the start of ground-disturbing activities. The financial security is intended to ensure that funds are available to acquire and preserve suitable compensation habitat as required by the Energy Commission's Final Decision. Staff recommends that the total amount of the financial security should reflect the likelihood that compensation acreage of desert dry wash woodland and waters of the state will not fully "nest" within other compensation habitat. Therefore staff recommends that the total financial security should be based on the sum of compensation acreage for (1) native vegetation and wildlife habitat and (2) state jurisdiction waters (i.e., the sum of columns 1 and 4 in **Biological Resources Table 8**).

Staff's recommended financial security amount is $30,253,666 (or $30,997,331 if the project owner uses a REAT NFWF account). This represents the sum of staff's recommended security for (1) Native Vegetation and Wildlife Habitat and (2) State Waters Compensation amounts (columns 1 and 4 of **Biological Resources Table 8**). Staff believes that the other components of the recommended compensation acreages (desert tortoise, golden eagle, and burrowing owl habitat) can be "nested" or "layered" within these two components, presuming judicious selection of compensation lands. However, suitable state jurisdictional waters, including adjacent riparian vegetation (i.e., blue palo verde – ironwood woodland) will only be available within parcels containing other habitats and lands uses. To obtain the staff's recommended compensation acreage of jurisdictional streambeds and dry wash woodland habitat, the applicant would need to acquire more acres than specified. Staff believes that a security in the recommended amounts (above) represents a reasonable estimate of the funding that would be needed to implement all recommended habitat compensation.

### Summary and Conclusion of Recommended Mitigation of Impacts to Native Vegetation and Wildlife Habitat

Staff recommends the following Conditions of Certification to reduce the project's impacts to native vegetation and wildlife habitat:

- **BIO-1** (Designated Biologist, Authorized Desert Tortoise Biologist, and Biological Monitors: Selection, Qualifications, Responsibilities, and Authority), which states the qualifications, duties and responsibilities during any site mobilization or ground disturbance, the reporting and agency contact responsibilities, and stop-work authority of the biologists and monitors to be appointed by the project owner;
- **BIO-2** (Biological Resources Mitigation Implementation and Monitoring Plan), which would require the project owner to prepare an implementation plan and schedule for compliance with all conditions of certification and other project requirements related to biological resources, including monitoring, compliance measures, and wildlife agency permits and agreements;
- **BIO-3** (Compensatory Mitigation: Offset For Loss and Degradation of Native Vegetation and Wildlife Habitat), which would require the project owner to offset vegetation and habitat at a ratio of 1:1 for creosote bush scrub and 3:1 (i.e., three acres of compensation land for each acre lost) for special-status plant communities to include blue palo verde – ironwood woodland. Compensation lands would be set aside through a conservation easement or similar requirement and managed in perpetuity to protect habitat values. The project owner would be required to post a financial security to ensure the compensation lands would be acquired and set aside within 18 months of the commencement of ground disturbing project activities. Staff's rationale for the recommended compensation ratios and calculation of the security are presented below, under Habitat Compensation;
- **BIO-4** (Worker Environmental Awareness Program), which would require the project owner to train workers on the project site or related facilities about sensitive biological resources and worker responsibilities for avoidance, reporting, and other requirements;
- **BIO-5** (Impact Avoidance and Minimization Measures), which would require the project owner to implement a series of measures to avoid or minimize adverse impacts to biological resources, such as minimizing disturbance area, monitoring soil disturbing project activities, controlling lighting and dust, preventing wildlife hazards such as open pits or pipes, and other feasible measures;
- **BIO-6** (Revegetation Plan), which would require the project owner to revegetate temporary project disturbances to soils and vegetation throughout the project area; impacts to habitat values in these areas would be mitigated in part through offset or compensation requirements (Condition of Certification **BIO-3**), but staff recommends revegetation to minimize vulnerability of these areas to further erosion, weed infestation, or as sources of dust;

- **BIO-7** (Integrated Weed Management Plan), which would require preparation and implementation of a weed management plan to minimize the introduction and spread of weeds, including prevention, detection, and control methods to be implemented; include specific measures to avoid or minimize herbicide application at project perimeters, in the vicinity of native vegetation, or near special-status plants, and to avoid overspray or spillage in any areas; and describe all proposed herbicide usage and formulations; the applicant has submitted a Draft Integrated Weed Management Plan in response to staff's Data Request 72; staff will review the draft plan for conformance with **BIO-7**; and
- **BIO-8** (Desert Dry Wash Woodland Monitoring Plan and Off-site Impact Compensation) would require the project owner to monitor groundwater levels and plant health and vigor in adjacent desert dry wash woodland areas; if plant stress or mortality occurs and is determined to be related to project activities, then the project owner shall either refrain from pumping, reduce pumping to allow for recovery of the groundwater table, or provide additional habitat compensation as described in staff's recommended Condition of Certification **BIO-3**.

The full text of the recommended conditions can be found in the subsection entitled "Proposed Conditions of Certification." Staff concludes that these measures would mitigate the project's impacts to native vegetation and wildlife, including special-status vegetation, to a level of less than significant according to CEQA. Implementation of these measures would reduce or minimize impacts to native plant communities to the extent practicable; minimize off-site and indirect impacts by controlling dust and invasive weeds and preventing infestations by newly introduced weeds; rectify impacts to temporarily disturbed areas by requiring revegetation; and offsetting lost vegetation and habitat by providing for long-term conservation and management of native vegetation on compensation lands. Staff also concludes that management of invasive weeds through the use of herbicides would not cause significant impacts to biological resources because herbicides may only be used according to specific requirements of the applicant's IWMP, as reviewed and approved by the Energy Commission compliance project manager (CPM) in coordination with resource agencies.

**Feasibility of the recommended compensation acreage for desert dry wash woodland habitat habitat.** Staff is uncertain whether compensation for impacts to desert dry wash woodland (blue palo verde – ironwood woodland) at the recommended 3:1 ratio will be feasible. Desert dry wash woodland is relatively rare, due to restriction to wash landforms with suitable surface or groundwater hydrology, and large parcels predominantly covered by this habitat may not be available. Staff overlayed land ownership and vegetation GIS shapefiles obtained from BLM to estimate total acreage of desert dry wash woodland in private ownership within the NECO Plan area. The total estimate was about 40,000 acres. Therefore, while staff believes that sufficient acreage is present in the region, feasibility of the recommended mitigation will depend upon availability from willing sellers of 2,126.7 acres of privately owned desert woodland habitat. If 3:1 compensation for these impacts is found infeasible then the project's impacts to special-status vegetation may be significant and unavoidable.  Staff will coordinate with the applicant and public or private entities specializing in compensation habitat acquisition and management to determine feasibility and, if necessary, identify alternate mitigation.

## WATERS OF THE STATE

### Existing Conditions

The project site is located in the Colorado River Hydrologic Region within the Palo Verde Hydrologic Area. Clear and sunny conditions typically prevail, and the region receives 85 to 90 percent of the maximum possible sunshine each year; the highest value in the U.S. (URS 2011).

Most of the state and federal jurisdictional waters throughout the Colorado Desert are ephemeral streams. All channels observed in the Rio Mesa SEGF site and crossed by the proposed transmission line are ephemeral (URS 2011; BS 2012v). These ephemeral streams are typically dry washes that only flow briefly, following heavy rains. Winter storms are typically of low intensity, but can create short-lived ephemeral stream flow and cause significant flooding on the Palo Verde Mesa and in the valley. Intense summer thunderstorms can also produce flooding in the low-lying areas of the mesa and valley. During most storms, ephemeral streams may only run surface water for a few hours, though some may run for several days during an uncommon series of heavy storms. The mean annual precipitation (1948 to 2010) recorded at the Blythe Airport weather station is 3.54 inches per year. The minimum and maximum annual precipitation for the period of record is 0.59 inches and 9.16 inches, respectively.

Numerous well-defined ephemeral washes originating in the mountains to the west drain eastward across the site. Drainages on the solar generator site include these large washes as well as many tributaries, ranging from 1 foot to over 100 feet in width. They convey runoff originating upstream and on-site to Hodges Drain, to the east. Hodges Drain is a manmade channel at the western edge of the agricultural lands, located about a mile east of the proposed solar generator site. It collects runoff from the Palo Verde Mesa and conveys runoff about two miles south to the Palo Verde Outfall Drain. Runoff continues south approximately 6.5 miles within the Palo Verde Outfall Drain where it discharges to the Colorado River south of the Cibola National Wildlife Refuge. No dams or levees are located upstream of the project site (URS 2011).

All ephemeral drainage channels crossing the project area or originating within the project area drain to the Colorado River, an interstate water, and thus are within the geographic jurisdiction of the Colorado River Basin Regional Water Quality Control Board (CRB RWQCB) and U.S. Army Corps of Engineers (USACE) under Sections 401 and 404 (respectively) of the federal Clean Water Act (CWA). Actual CWA jurisdictional area is based on presence of an "ordinary high water mark" (OHWM) as delineated in the field. All these ephemeral channels also may fall under jurisdiction of the state under Sections 1600-1616 of the California Fish and Game Code, based upon CDFG's jurisdictional criteria (i.e., presence of bed and banks). Additionally, the state holds jurisdiction of riparian vegetation adjacent to jurisdictional streambeds. In the Colorado Desert, the Blue Palo Verde - Ironwood Woodland (see "Plant Communities," above) is one of the regional riparian vegetation types. Due to the abundance and close spacing of braided channels throughout the area, all mapped Blue Palo Verde-Ironwood Woodland is adjacent to one or more channels and thus within state jurisdiction. For most projects, state regulation is exercised by CDFG through Lake and Streambed Alteration Agreements (LSAAs). Under the Warren-Alquist Act, the Energy Commission implements this regulatory program for thermal power plants 50 MWs and greater in capacity including the Rio Mesa SEGF. Energy Commission staff works with CDFG to ensure consistency in application of state regulatory policy.

The RWQCB and USACE regulate discharge of dredge or fill material within jurisdictional Waters of the U.S. Proposed project activities such as construction of roads or foundations, trenching, or other ground disturbance within jurisdictional waters would meet this definition. Other project activities that do not disturb soils within drainages, such as vegetation clearing, would not be regulated under the CWA. However, these activities are regulated by the state through the LSAA program.

Due to differences in definitions of state and federal jurisdiction (OHWM vs. bed and bank) and types of regulated activities (dredge and fill vs. habitat effects), the extent of regulated acreage and activities under federal jurisdiction is generally much smaller than under state jurisdiction.

The applicant has provided a preliminary delineation of state and federal jurisdictional waters (i.e., ephemeral streambeds) throughout the BSA and proposed project area (URS 2011; BS 2012v, see Table 5.2-14). **Biological Resources Figures 4a** and **4b** show the waters of the US identified by the applicant on the project site and gen-tie route, respectively. **Biological Resources Figures 5a** and **5b** show the applicant's delineation of potential waters of the state on the project site and gen-tie route, respectively. Staff is coordinating with CDFG to verify this delineation upon the applicant's submittal of an LSAA Application to the CDFG. The applicant's conclusions are summarized in **Biological Resources Table 9**. Project impacts to jurisdictional streambeds and adjacent riparian vegetation are described below in the subsection entitled "Impacts to Waters of the State." Staff's understanding is that the state jurisdictional acreages are inclusive of all federally jurisdictional waters and wetlands; thus, the total jurisdictional acreages in **Biological Resources Table 9** include all federally jurisdictional waters.

**Biological Resources Table 9**
**Summary of Applicant's Jurisdictional Waters Delineation**

| | **Acreages** | | | | |
|---|---|---|---|---|---|
| **Jurisdiction** | **BSA** | **Solar Generator Site** | **Linear Components** | **Temporary Constr. Area** | **Total Within Project Area** |
| Wetlands (state and federal) | 117.8 | 0 | 0.65 | 0 | 0.65 |
| Non-wetland Waters of U.S. | 1,205.5 | 392.13 | 1.89 | 1.53 | 395.55 |
| Total federally jurisdictional waters | 1,323,3 | 392.13 | 2.54 | 1.53 | 396.20 |
| Non-wetland Waters of the State (incl. adjacent riparian veg.) | 2,490.6 | 809.91 | 4.14 | 2.67 | 816.72 |
| Total state jurisdictional waters | 2,608.4 | 809.91 | 4.79 | 2.67 | 817.37 |

## Impacts to Waters of the State

The applicant reports a total of approximately 817.37 acres of state-jurisdictional waters, including ephemeral channels, adjacent riparian, and 0.65 acre of wetlands located within the project area (**Biological Resources Table 9, Biological Resources Figures 5a** and **5b**). Staff is coordinating with CDFG to verify this delineation upon the applicant's submittal of an LSAA Application to the CDFG. Staff concludes that all of these areas would be directly or indirectly impacted by construction and operation of the project (e.g., by ground disturbance, vegetation removal, vehicle access crossings, etc.). Staff concludes that all direct or indirect impacts to these channels are subject to state regulation.

If the proposed solar field is developed, sheet flow and existing natural contours will be maintained to the extent practicable to maintain existing flow rates. No additional storm drainage control is proposed (BS 2012v). In some areas including the power blocks, substation, heliostat assembly buildings and administrative areas, a stormwater management system is proposed, which would include berms, ditches, bypass channels, or swales to direct run-on flow from upslope and run-off flow through or around each facility. To minimize erosion, storm drainage channels may be lined with a non-erodible material, such as compacted rip-rap, rock gabions, or geo-synthetic matting. Additionally, storm drainage channels would include downstream flow dispersion features to reduce the depth and velocity of the flows (BS 2012v Section 5.15, Water Resources). Operational impacts to jurisdictional waters would include routine cutting or mowing of vegetation, vehicle access for heliostat washing and other activities, interruption of natural flows by diversion channels and other project features, and repair of damaged culverts and roads following large storms.

On the gen-tie line, some drainages may be avoided by site-specific tower placement and construction, but final engineering has not been completed, and there are numerous drainages along the alignment. Staff cannot evaluate precise acreages of state waters that may be affected by the gen-tie line, but these impacts would include construction disturbance for tower locations, pull sites, and equipment access. Staff includes streambed acreage on the gen-tie line alignment in the total streambed acreage, above, and notes that it is only about 0.5 percent of the total state jurisdictional acreage.

In addition to grading and vegetation removal in on-site ephemeral streambeds, direct impacts of project construction and operation to waters of the state would include alteration or attenuation of peak flood flows and consequent sediment transport effects to channels and adjacent riparian vegetation downstream. These impacts would originate during construction and would persist throughout the life of the project. Flooding, sediment transport, and channel scouring are natural processes in desert watersheds and may be necessary to soil and hydrology conditions for native vegetation and habitat (Busch and Smith 1995). Storm flow attenuation can adversely affect biological resources in or adjacent to downstream channels by affecting seed germination or exaggerating drought stress and reducing seedling survival (Mahoney and Rood 1998; Johnson et al. 1976). The applicant has estimated storm flows in the main channels that carry water and sediment off-site under existing conditions and post-construction scenario (BS 2012v Section 5.15 Water Resources, Table 5.15-8).

Expected alterations to storm flows would be relatively minor and staff concludes that altered storm flows caused by the project would not cause significant impacts to waters of the state or streambed vegetation and habitat downstream from the project area.

## Mitigation of Impacts to Waters of the State

Staff concludes that the project's permanent and long-term impacts to state jurisdictional waters would be significant. The applicant has proposed a series of mitigation measures to reduce impacts to waters of the state (BS 2011a). These are:

- Permanent impacts to jurisdictional wetlands and non-wetland waters will be mitigated either on or off site in the form of enhancement, restoration, or creation of wetland habitat or use of mitigation credits from an approved wetlands mitigation bank.
- Temporary impacts to jurisdictional wetland and non-wetland waters will be mitigated on site through the restoration of temporary impact areas to pre-construction conditions.
- A Wetland Restoration Plan shall be approved by the appropriate regulatory agencies.
- Appropriate BMPs shall be used at all times to maintain proper water quality and prevent excessive soil erosion and scour.
- A Storm Water Pollution Prevention Plan will be prepared in conformance with the SWRCB Order Number 99-08-DWQ, General Permit Number CAS000002.

Staff has incorporated the applicant's proposed measures, wherever appropriate, into the conditions of certification recommended below.

The applicant's first proposed measure would not mitigate the project's impacts to microphyll woodlands and ephemeral channels in a "like for like" manner. The applicant proposes wetland habitat mitigation for project impacts to non-wetland habitat. The resources impacted by the project (primarily blue palo verde – ironwood woodland which is an important regional habitat) would not be replaced or offset through wetland mitigation, and the applicant's proposed approach would result in a substantial and significant net loss of blue palo verde – ironwood woodland. Staff recommends, instead, mitigating this impact through habitat compensation described in recommended Conditions of Certification **BIO-3** and **BIO-9**. **BIO-3** (above) specifies the habitat ratios, management requirements, and funding requirements for compensation of project impacts to numerous biological resources. **BIO-9** (State Waters Impact Compensation, Avoidance, and Minimization Measures) would require compensation for streambed impacts through the acquisition, protection, and management of comparable streambeds offsite at a ratio of 3:1 (i.e., three acres of state waters compensation for each acre impacted by the project). Staff's rationale for the 3:1 ratio is presented in the subsection "Impacts to Native Vegetation and Wildlife Habitat," above. In addition, **BIO-9** would require implementation of Best Management Practices (BMPs) during project construction and operation, consistent with the applicant's fourth proposed measure. Staff does not recommend compensatory mitigation for impacts to downstream streambeds because the hydrology and sediment transport functions of the major channels would be only minimally affected by the project.

Staff concurs with the applicant's proposed measures to mitigate temporary impacts to jurisdictional wetland and non-wetland waters on-site through the restoration of long-term (albeit temporary) impact areas to pre-construction conditions (the applicant's second and third proposed measures, above). Staff recommends Condition of Certification **BIO-7** (Revegetation of Temporary Construction Areas), which would require the applicant to revegetate native vegetation in the temporary construction area, including jurisdictional wetlands and waters of the state, to minimize further degradation due to erosion and weed infestation.

In addition, staff's recommended Condition of Certification **BIO-19** (Facility Closure, Revegetation, and Reclamation Plan) would require the project owner to restore natural contours and flow patterns, and revegetate the solar generator site upon the project's retirement. The applicant's proposed measure, to prepare a Storm Water Pollution Prevention Plan (SWPPP), is incorporated into staff's recommended Conditions of Certification **SOIL & SURFACE WATER-1** (Drainage, erosion, and sediment control plan), **SOIL & SURFACE WATER -2** (construction SWPPP), and **SOIL & SURFACE WATER-3** (industrial SWPPP).

With implementation of staff's proposed conditions of certification, project impacts to state jurisdictional waters would be mitigated below a level of significance under CEQA by minimizing project impacts to streambeds; revegetating disturbed waters of the state in temporary construction areas to minimize further degradation; protecting off-site acreage to compensate for on-site impacts; and reclaiming on-site streambeds to minimize erosion and weed infestation upon eventual closure of the Rio Mesa SEGF. However, if 3:1 compensation for these impacts is found infeasible then the project's impacts to waters of the state may be significant and unavoidable (see "Feasibility of the recommended compensation acreage for desert dry wash woodland habitat" above). Staff will continue to coordinate with CDFG to determine whether these conditions may also fulfill requirements of the state LSAA program pursuant to Fish and Game Code Sections 1600-1616 upon the applicant's submittal of an LSAA Application to CDFG. Staff will coordinate with the applicant and public or private entities specializing in compensation habitat acquisition and management to determine feasibility and, if necessary, identify alternate mitigation.

## SPECIAL-STATUS PLANTS

### Existing Conditions

**Biological Resources Table 10** summarizes special-status plants of the region, including the species identified in the BSA and on the proposed project site. Five special-status plants are reported within the BSA, and three of them (Harwood's milk-vetch, Utah vine milkweed, and desert unicorn plant) were located on the proposed solar generator site (URS 2011, BS 2012v; **Biological Resources Figure 3a**). Construction of the project would directly impact these three species.

**Biological Resources Table10**
**Impacts to Special-Status Plants**

| Scientific Name | Common Name | Status[2] | Number of Plants Observed[1] | | | | |
|---|---|---|---|---|---|---|---|
| | | | BSA | Solar Generator Site | Gen-Tie Line | Total Direct Impacts | 500-foot Buffer from Fence |
| *Astragalus insularis* var. *harwoodii** | Harwood's milk-vetch | CRPR 2.2 | 119 | 2 | 0 | 2 | 0 |
| *Cryptantha costata** | Ribbed cryptantha | CRPR: 4.3 | Ca. 13,000 | 0 | 0 | 0 | 0 |
| *Cynanchum utahense (= Funastrum u.)* | Utah vine milkweed, Utah cynanchum | CRPR: 4.2 | 98 | 47 | 0 | 47 | 2 |
| *Eriastrum harwoodii** | Harwood's eriastrum | CRPR: 1B.2 BLM S | 160 | 0 | 0 | 0 | 0 |
| *Proboscidea althaeifolia* | Desert unicorn plant | CRPR 4.3 | 132 | 32 | 0 | 32 | 12 |

1 – Numbers of plants impacted are estimates based on the results of the applicant's botanical surveys. Actual number impacted may differ somewhat, especially for annuals that may experience large fluctuations in population densities from year to year (annual taxa are denoted with an asterisk [*])
2 – Definition of Status:
California Rare Plant Rank (CRPR):
1A.– Presumed extinct in California
1B.– Rare or endangered in California and elsewhere
2. – Rare or endangered in California, more common elsewhere
3. – Plants for which more information is needed (Review list)
4. – Plants of limited distribution (Watch List)
Threat Rank Extension:
0.1 = Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2 = Fairly endangered in California (20-80% occurrences threatened)
0.3 = Not very endangered in California (<20% of occurrences threatened or no current threats known)
BLM Sensitive = Species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. BLM Sensitive Species also include all federal candidate species and federal delisted species which were so designated within the last 5 years, and CRPR 1B plant species occurring on BLM lands.

None of the affected species are state or federally listed as threatened or endangered, or state-listed as rare, and none are candidates for state or federal listing. Harwood's milk-vetch is ranked by the CDFG and California Native Plant Society (CNPS) as CRPR 2.2, meaning it is considered "rare or endangered in California, more common elsewhere." Utah vine milkweed and desert unicorn plant are ranked as CRPR 4.2 and 4.3, respectively. CRPR 4 plants are those of limited distribution, and CRPR 4 is considered a watch list.

Staff notes that the seasonal and irregular nature of most plants' life histories and the scheduling of the field surveys provided in the AFC limit staff's ability to interpret the data as submitted for some later-flowering species. There is a low to moderate probability that additional special-status plants may be present within the project area. The applicant's report on late-season 2012 botanical surveys has not yet been submitted to CEC staff for review. The potential for impacts to such species is described below. If late-season botanical surveys identify additional special status plants not reported in the AFC, staff will revise its analysis and recommended mitigation for special status plants according to the approach below ("Impact Evaluation and Mitigation Strategy").

Staff has reviewed the AFC and its appendices; the applicant's responses to Data Requests; and botanical literature to evaluate potential project impacts to these species. Staff concludes that substantial adverse impacts to Harwood's milk-vetch or Harwood's eriastrum, should they occur, would be significant under CEQA and would warrant mitigation. Staff concludes that the proposed Rio Mesa SEGF either would not impact ribbed cryptantha, desert unicorn plant, or Utah vine milkweed or, if adverse impacts were to occur, they would be less than significant under CEQA and would not warrant mitigation. Staff's approach to impact evaluation and mitigation for impacts to special-status plants is detailed in the subsection "Impact Evaluation and Mitigation Strategy" below.

## Impact Evaluation and Mitigation Strategy

For impacts to special-status plants, staff applies the significance criteria (see "Methodology and Thresholds for Determining Significance"), based on factors described below. Staff's recommended Condition of Certification **BIO-10** would apply the same criteria to evaluate significance of impacts to any additional special-status plant occurrences discovered in ongoing late-season field surveys.

- Conservation status of each taxon, as reported by CNPS (2012a), CDFG (2012a), and botanical literature;
- Proportion of occurrences that may be lost or indirectly affected by the project relative to the documented occurrences and distribution of these species in California;
- Extent of occurrence on the site;
- Habitat quality;
- Threats to remaining occurrences; and
- Peripheral population status.

### CEQA Significance and California Rare Plant Rank (CRPR) Status

Plants ranked by CDFG and CNPS as CRPR 1A, 1B and 2 meet the significance criteria above, based on best available information on rarity, threats, and other factors. The Energy Commission and other state agencies such as CDFG, the California Department of Water Resources, and others have a history of requiring mitigation for impacts to CRPR 1B and 2 plants. Harwood's eriastrum and Harwood's milk-vetch are CRPR 1B and 2 species, respectively. The other three species observed in the BSA are CRPR 4 plants. CRPR 4 is a "watch list" of plants that are of limited distribution in California. CNPS and CDFG monitor their status but adverse impacts to plants on CRPR 4 generally would not meet CEQA significance criteria except under special circumstances. Staff considered the two CRPR 4 plants (Utah vine milkweed and desert unicorn-plant) in the following CEQA evaluations and concluded that project impacts to them would be less than significant.

**Proportion and Extent of Affected Occurrences.** Plants, like wildlife, are vulnerable to the effects of habitat fragmentation (see “Wildlife Movement,” below). Small habitat patches (“fragments”) can support only small populations, which are more vulnerable to extinction. Even minor habitat changes or other effects can cause extinction of a small, localized plant population. As a CRPR 2 plant, the Colorado Desert populations of Harwood’s milk-vetch represent a substantial portion of its known distribution within California. Loss of plants and occupied habitat in the project area would make it more vulnerable to extirpation within the state.

Harwood’s eriastrum is a California endemic with a relatively limited geographic range; is rare throughout its range; and its habitat, semi-stabilized dunes, is uncommon. It was not found within the project footprint, but it is present in the BSA and adverse offsite effects to the plants or occupied habitat, if any, could affect a substantial portion of its regional population and make it more vulnerable to extirpation.

**Habitat Quality.** Staff notes that habitat at the solar generator site and along the proposed gen-tie line alignment is generally undisturbed and supports a low proportion of weeds (see “Setting and Existing Conditions,” above). The site appears to be good-quality habitat for these special-status plants.

**Threats.** Threats to special-status plants in the region include land use changes, grazing, mining, off-road vehicle (ORV) use, and invasive non-native plants (CNPS 2012a). The project area is relatively remote and there has been only minimal habitat damage by these or other disturbances. Most disturbances would be localized on access routes and utility alignments.

**Status as Peripheral Populations**. California occupies an important biogeographic location and zone of ecological transition on the Pacific coast of North America, and its floristic diversity includes many widespread taxa at the edges of their geographic ranges. Peripheral populations can be completely isolated from their core populations, or they can occur in closer proximity to other marginal populations. Harwood’s milk-vetch within the project area is at the western limits of its geographic distribution centered farther east. Harwood’s eriastrum in the BSA is at the eastern limit of its range.

Peripheral plant populations are at greater risk of extirpation because they occur on the edge of a species’ range. Relative to core populations, peripheral populations tend to be smaller, more isolated, and more genetically and ecologically divergent than central populations, they have more variable densities, and are ecologically distinctive and/or occur in marginal habitats (Leppig & White 2006). The biological and intrinsic values of these peripheral populations are well documented; maintenance of genetic variation contributes to long-term species survival and preservation of local genetic diversity (Channel and Lomolino 2000).

## Direct and Indirect Impacts to Special-Status Plants

Potential direct or indirect project impacts to two special-status plants, Harwood’s milk-vetch and Harwood’s eriastrum, would meet the significance criteria described above. The following summaries of life histories, habitat, distribution, and conservation status of these two species are based on the California Native Plant Society *Online Inventory of Rare, Threatened, and Endangered Plants of California* (CNPS 2012), the CDFG

*Special Vascular Plants, Bryophytes, and Lichens List* (CDFG 2012a), California Natural Diversity Data Base (CDFG 2012b), and other sources cited below.

Harwood's milk-vetch is an annual herb found in desert dunes and sandy or gravelly desert scrub from about sea level to 2,300 feet elevation. It flowers between January and May. Like most desert species, its above-ground growth and flowering season vary from year to year, depending on the amount and timing of seasonal rainfall. In California, Harwood's milk-vetch is found in Imperial, Riverside, and San Diego counties. It also occurs in Arizona and Mexico.

Harwood's eriastrum is an annual species known only from partially stabilized aeolian sand habitats in the deserts of eastern Riverside and San Bernardino counties (Gowen 2008) and San Diego County (DeGroot 2008). It flowers in early April. The proposed gen-tie line would pass through suitable habitat, though all recorded locations are outside the proposed alignment.

Project construction and operations, including soil disturbance, ongoing vehicle and equipment traffic, vegetation mowing and management during operation, and weed control are expected to eliminate or significantly degrade special-status plant habitat and occurrences within the project footprint. Potential indirect impacts to special-status plants located near the project site are similar to those described above for plant communities in general, and include: introduction and spread of invasive plants; alteration of the surface hydrology or geomorphic processes that maintain habitat for rare plants; fragmentation of the local population; increased risk of fire; erosion and sedimentation of disturbed soils; disturbance of the structure and functioning of biological soil crusts; impacts of herbicide or other chemical drift on plants and their pollinators; shading; and fugitive dust.

Changes to drainage patterns downstream of the project area could indirectly affect special-status plants located downstream through sedimentation or introduction of invasive plants.

The Conservation Biology Institute (CBI 2000) reviewed a variety of edge effects known or likely to adversely affect a rare plant species in southern California, and evaluated buffer distances in terms of their potential to prevent those effects. The CBI review evaluated edge effects expected to result from suburban development in interior Ventura County. Staff is not aware of any available research that would be more applicable to the Rio Mesa SEGF. CBI reviewed potential effects of invasive plant and animal species; vegetation management (e.g., for fuels management); trampling; increased water supply (e.g., irrigation runoff); chemicals such as pesticides, herbicides, and fertilizers; and increased fire frequency. These edge effects are largely comparable to expected edge effects that would result from the Rio Mesa SEGF. For example, soil disturbance and altered shade and hydrology on the solar generator site will likely lead to weed invasions (above), which could spread from the site into surrounding desert. Construction-related soil disturbance along linear project facilities would have similar effects. Watering for dust control or other project-related hydrology changes could cause colonization by invasive ant species which, in turn, could affect specialized habitat conditions in surrounding soils. CBI concluded that buffer distances of 200-300 feet were "moderately" or "highly" likely to be effective in minimizing these adverse edge effects on rare plant habitat. Based on CBI's analysis, staff concludes that that the project would likely cause adverse indirect effects to any rare plant occurrences within a 250-foot radius of project activities.

## Conclusions and Discussion of Special-Status Plant Mitigation

The proposed project would directly affect Harwood's milk-vetch and may indirectly affect Harwood's eriastrum on sand dunes in the northwestern portion of the proposed gen-tie alignment. Staff concludes that the likely direct and indirect project impacts to Harwood's eriastrum and Harwood's milk-vetch would be significant.

To reduce project impacts to CRPR 1 and 2 plants below a level of significance, staff recommends a mitigation strategy to (1) minimize overall project disturbance to native vegetation and habitat, (2) avoid occupied Harwood's milk-vetch or Harwood's eriastrum habitat to the extent feasible (e.g., by selectively locating gen-tie line towers and work sites), (3) determine whether any additional late-season special-status plants would be affected by the project, and (4) identify and mitigate any additional significant adverse impacts to CRPR1B and 2 plants through avoidance measures, by protecting acquired lands off-site, or through other off-site measures such as habitat improvement or management. Staff recommends mitigation for any additional CRPR 1A, 1B, or 2 plants discovered within the project area or within 250 feet of any project activities during future pre-construction clearance surveys as recommended in staff's proposed Condition of Certification **BIO-10**. This mitigation strategy is described further in the paragraphs below. Full implementation of this mitigation strategy would reduce the project's direct, indirect, and cumulative impacts to special-status plants below a level of significance by identifying the occurrence and locations of CRPR 1A, 1B, or 2 plants that may be affected by the project, and mitigating any significant adverse impacts to them through avoidance and protection, or through acquiring and protecting lands off-site, or through other off-site measures such as habitat improvement or management. Staff concludes that this mitigation strategy is both feasible and effective.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-9** (above) would partially mitigate project impacts to special-status plants by minimizing project disturbance, requiring monitoring of project activities, setting aside off-site habitat that may (but may not) support these species, and other related requirements. In addition, staff recommends Condition of Certification **BIO-10** (Special-Status Plant Impact Avoidance and Minimization), which would require the applicant to minimize disturbance to the extent feasible as described above and mitigate any unavoidable disturbance through one or more of a series of recommended strategies.

Staff's recommended mitigation approach is to avoid or minimize construction impacts to CRPR 1 or 2 plant locations as feasible by avoiding direct and indirect impacts to the plants and a 250-foot buffer area surrounding each protected plant location (Condition of Certification **BIO-10, Part 1**). Where avoidance is not feasible, staff recommends salvaging seed from the affected special-status species (**BIO-10, Part 2**) and a series of alternate mitigation strategies, to be implemented according to specific conditions and the plant species that may be affected (**BIO-10, Part 3**). These strategies may include off-site compensation, plant salvage, horticultural propagation, or off-site enhancement. Staff concludes that this mitigation is feasible and would reduce impacts to Harwood's milk-vetch and other special-status plants that could be affected by the project below a level of significance.

Due to the potential for occurrence of special-status late-season plant taxa, staff has recommended that the applicant conduct late-season botanical field surveys in summer or fall 2012. Staff anticipates incorporating the results of those surveys into the FSA. Staff's proposed Condition of Certification **BIO-10** does not specify further botanical surveys; however, pending the results of the 2012 surveys, staff may recommend further field surveys in the FSA.

Staff concludes that implementation of proposed Conditions of Certification **BIO-1** through **BIO-10** would be effective and feasible in reducing the project's impacts to special-status plants to a level less than significant, by minimizing overall impacts to special-status plants to the extent feasible, and offsetting remaining impacts through implementation of one or more additional conservation measures, listed above and described in **BIO-10**.

## OVERVIEW OF IMPACTS TO WILDLIFE

### Common Wildlife

Construction-related effects to wildlife would include mortality from trampling or crushing; increased predation when wildlife is flushed from cover; increased noise levels due to heavy equipment; disturbance to nocturnal animals by project lighting; increased vehicle and human presence along access roads and desert washes; displacement due to habitat removal and altered soil conditions; fugitive dust; and modified runoff and sedimentation due to construction within washes and the storm water management system. Indirect impacts to wildlife may also result from the spread of invasive weeds and an increase in subsidized predators such as ravens and other predators attracted to the project area.

Direct mortality of small mammals; reptiles; eggs and nestlings of bird species with small, well-hidden nests; and other less mobile species could occur during site clearing or mowing, grading, and equipment movement. Wildlife could become entrapped in open trenches during construction, especially if trenches remain open during inactive construction periods. Mobile species will generally disperse into nearby habitat during construction. However, the off-site dispersal of many species (e.g., small mammals and reptiles) would be hindered by the project's perimeter fencing and tortoise exclusion fence.

The AFC does not describe vegetation management during construction and operations. Staff understands that the applicant's Hidden Hills project would remove vegetation for access routes, and would cut vegetation to 12-18 inches to provide clearance for heliostats, but leave the root structures intact. Staff assumes that the Rio Mesa SEGF would manage vegetation similarly. This approach would maintain some vegetation function for soils stability and erosion control, but functional habitat values for most species of wildlife would be lost.

By design, the project would include perimeter fencing to prevent desert tortoise and other species from entering the solar generator site. Prior to construction, tortoises inhabiting the project site would be translocated to suitable receptor sites (see "Desert

Tortoise” below). The fence would exclude most terrestrial wildlife from the site, but also would entrap terrestrial species already present within the fenced area. Therefore, terrestrial wildlife within the perimeter fence would be unable to disperse from the site during construction and would be subject to repeated disturbance by project activities. While many species of wildlife can tolerate human disturbance to some degree, project construction and operations would cause an ongoing loss of wildlife from mowing, vehicle traffic, nest failure, and alteration of foraging habitat. The most likely long-term effect of the project on most wildlife within the fenced solar generator site would be mortality from road traffic and the loss of habitat functions and value due to vegetation management.

Staff concludes that these impacts to common wildlife would be significant without mitigation, due primarily to the large extent of the project and the large number of animals that would be affected. The applicant has recommended general impact avoidance and minimization measures to reduce construction impacts to common wildlife. These recommendations have been incorporated into staff’s recommended conditions of certification, and enhanced where deemed necessary to reduce effects to common wildlife.

Staff recommends the following conditions of certification to avoid or minimize impacts to common wildlife to less-than-significant levels:

- **BIO-1** (Designated Biologist, Authorized Desert Tortoise Biologist, and Biological Monitors: Selection, Qualifications, Responsibilities, and Authority), which states the qualifications, duties and responsibilities during any site mobilization or ground disturbance, the reporting and agency contact responsibilities, and stop-work authority of the biologists and monitors to be appointed by the project owner;
- **BIO-2** (Biological Resources Mitigation Implementation and Monitoring Plan), which would require the project owner to prepare an implementation plan and schedule for compliance with all conditions of certification and other project requirements related to biological resources, including monitoring, compliance measures, and wildlife agency permits and agreements;
- **BIO-3** (Compensatory Mitigation: Offset For Loss and Degradation of Native Vegetation and Wildlife Habitat), which would require the project owner to offset vegetation and habitat at a ratio of 1:1 for creosote bush scrub and 3:1 (i.e., three acres of compensation land for each acre lost) for special-status plant communities including blue palo verde – ironwood woodland. Compensation lands would be set aside through a conservation easement or similar requirement and managed in perpetuity to protect habitat values. The project owner would be required to post a financial security to ensure that compensation lands would be acquired and set aside within 18 months of the commencement of ground disturbing project activities. Staff’s rationale for the recommended compensation ratios and calculation of the security are presented above, under Habitat Compensation;
- **BIO-4** (Worker Environmental Awareness Program), which would require the project owner to train workers on the project site or related facilities about sensitive biological resources and worker responsibilities for avoidance, reporting, and other requirements;

- **BIO-5** (Impact Avoidance and Minimization Measures), which would require the project owner to implement a series of measures to avoid or minimize adverse impacts to biological resources, such as minimizing disturbance area, monitoring soil disturbing project activities, controlling lighting and dust, preventing wildlife hazards such as open pits or pipes, and other feasible measures;

Potential impacts from the spread of invasive plant species and effects to locally important ground water dependent vegetation and seeps including the mesquite bosque habitat located east of the project site would be reduced to less than significant levels through the implementation of Conditions of Certification **BIO-7** (Integrated Weed Management Plan) and **BIO-8** (Desert Dry Wash Woodland Monitoring Plan and Off-site Impact Compensation). Implementation of these measures would reduce impacts of the proposed project to less-than-significant levels under CEQA.

## NESTING BIRDS

Native birds are protected under the California Fish and Game Code and federal Migratory Bird Treaty Act (MBTA), though most native birds have no other special conservation status. The entire project site and surrounding area provides suitable nesting habitat for numerous resident and migratory bird species. The applicant provided point count data on bird diversity within the BSE (URS 2011) and continues to collect additional data on bird diversity and abundance on the site in response to staff's data requests. These additional data will be submitted for staff review and incorporated into the FSA. The project's impacts to special-status birds are discussed under Special Status Wildlife, below.

Many adult birds would flee from equipment during initial vegetation clearance for project construction. However, nestlings and eggs would be vulnerable to impacts during project construction, and are also protected by the MBTA and Fish and Game Code Sections 3503 and 3513. If initial site grading or brush removal were to occur during nesting season, then it likely would destroy bird nests, including eggs or nestling birds. One special-status species, the burrowing owl, is unlikely to flee the site during construction, due to its characteristic behavior of taking cover in burrows. Potential project impacts and an avoidance and mitigation strategy for burrowing owl are presented separately under Special Status Wildlife, below.

Noise during construction may be loud enough to adversely affect bird nesting success. For most common species, staff concludes that this impact would be less than significant, but staff believes that it could significantly affect breeding habitat suitability for native birds, including special-status species.

Birds can become entrapped in vertical or horizontal open pipes with diameters from 1 to 10 inches. Cavity-nesting species are particularly vulnerable. Examples of cavity-nesting birds protected under the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code Sections 3503 and 3513 that have been found dead inside open pipes include Say's phoebes, owls, woodpeckers, kestrels, and ash-throated flycatchers (ABC 2011; Brean 2011). Birds may enter pipes to search for nest sites or food, and then become entrapped. Once inside the pipe, they cannot open their wings to fly, and cannot climb out on the smooth interior surface. Once entrapped, they die from starvation and dehydration.

These project impacts to native birds can be reduced or offset through implementation of staff's recommended Conditions of Certification **BIO-1** through **BIO-5** (see "Common Wildlife," above). These measures would require biological monitoring during construction activities, worker environmental awareness training, restoration of temporarily impacted areas, compensation habitat, minimization of impact areas, and protection measures to prevent wildlife entrapment in trenches, pipes, or other facilities or supplies.

In addition, staff recommends Condition of Certification **BIO-11** (Pre-Construction Nest Surveys and Impact Avoidance), which would require the applicant to survey the project area for nesting birds prior to construction, and to prepare and implement a Nest Management Plan to ensure no take of native birds or their nests. The Nest Management Plan would specify buffer areas for impact avoidance to nesting birds, dependent on the bird species or family, conservation status, and nature of disturbance. The Plan also would specify procedures for situations where it may be necessary to reduce buffer areas or to remove or relocate a bird nest to proceed safely with construction or operations.

Some birds will likely nest in the project area during construction and operations, even after initial grading and clearing. Depending on the species, birds may nest on the ground close to equipment; within the open metal heliostat supports; on buildings, foundations, structures, or construction trailers; or on idle vehicles or construction equipment. Common ravens, house finches, and mourning doves are the species most likely to nest at the facility during construction and operations. All of these birds are protected by the MBTA and Fish and Game Code. Condition of Certification **BIO-11** would require regular monitoring of the work area throughout the breeding season.

Staff concludes that Conditions of Certification **BIO-1** through **BIO-5 (**see "Common Wildlife," above), and **BIO-11** are feasible and would effectively minimize adverse impacts to nesting birds on the site throughout project construction and operations. **BIO-1** through **BIO-5** would minimize overall project impacts to habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. In addition, **BIO-11** would require surveys and avoidance measures to prevent nest destruction during construction and operations. Taken together, these conditions of certification would reduce impacts to nesting birds below a level of significance.

## OPERATIONAL IMPACTS TO WILDLIFE

This subsection presents staff's analysis of expected impacts to wildlife during the project's operation. Each of the impacts analyzed below would affect large groups of wildlife species, such as ground-dwelling vertebrates (roads and traffic impacts) or birds (collision and concentrated solar energy impacts). Most of the wildlife species likely to be affected by these factors are common species. However, in many cases, the impacts also would affect special-status wildlife species. Where appropriate, those potential impacts to special-status species are briefly mentioned in the subsection, "Impacts to Special-Status Wildlife."

### Roads and Traffic

Vehicle access by project personnel during construction and operations, and perhaps by the public on improved access along the gen-tie access road, would increase the risk of vehicle strikes to terrestrial wildlife. The potential for increased traffic-related wildlife mortality is greatest on paved roads where vehicle frequency and speed is greatest, though animals on dirt roads may also be affected depending on vehicle frequency and speed. Data indicate that desert tortoise numbers decline as vehicle use increases (Bury et al. 1977) and that tortoise sign increases with increased distance from roads (Nicholson 1978; Karl 1989; von Seckendorf and Marlow 1997, 2002). New or improved access roads also can lead to creation and propagation of new, unauthorized vehicle routes.

### Evaporation Ponds

The proposed Rio Mesa SEGF includes two 2-acre evaporation ponds (BS 2012v, Fig 2-8 (rev)). Staff presumes that one or both of these ponds would hold surface water year around. The ponds would be within the project's security fence and tortoise exclusion fence. However, absent further measures, they would be accessible to small mammals, reptiles, and other wildlife within the project boundaries and to birds or bats that may fly into the area. In addition, if dilute saline wastewater is present in the evaporation ponds, it could serve as a water subsidy for ravens (see the discussion of subsidized predators under "Desert Tortoise," below).

The primary evaporation pond risks to wildlife are drowning, salt toxicosis, and salt encrustation. Absent mitigation, these risks could constitute a significant impact to special status wildlife species and migratory birds. Terrestrial wildlife are at risk of drowning if they fall into the water and cannot climb back out. However, terrestrial wildlife exposure to the evaporation ponds would be limited by the security and exclusion fencing, and any animals that could encounter the ponds would likely be those that remain within the fenceline after the fence is erected at the start of construction activities (i.e., small mammals and reptiles, not including desert tortoise, desert kit fox, or other special-status species).

Small mammals (including bats), reptiles, waterfowl, shorebirds, and other resident or migratory birds that drink from the ponds could be exposed to toxic levels of hyper-saline water, depending on the salts and concentrations present. Numerous waterfowl died from salt toxicosis at the Harper Lake Solar Electric Generating System in the Mojave Desert evaporation ponds (Luz 2007). As water evaporates away, the dissolved salts would precipitate from solution, so that evaporation ponds may contain sludge beneath the water surface. If birds land on the pond surfaces or wade in the ponds, this material may accumulate on feathers and interfere with flight. Encrusted salts may also cause toxicosis if birds absorb them through the skin or ingest them during preening.

Additionally, the evaporation ponds are expected to attract birds, whether or not they land on the ponds, increasing potential risk of collision with heliostats or burning due to concentrated solar energy above the project area. These hazards are described in the subsection entitled “Operational Impacts to Birds and Bats.” Foraging bats also may be attracted to the evaporation ponds, but staff believes that potential adverse impacts to bats would be minimal because they would be able to detect collision hazards and would not be active during daylight hours (i.e., when concentrated solar energy is present).

### Lighting

Lighting may affect essential behavioral activities, physiology, population ecology, and ecosystems of diurnal, crepuscular, and nocturnal wildlife, and light pollution may affect competition and predation for some species (Longcore and Rich 2004). Lighting may also increase the risk of predation of wildlife because they may be more detectable to nocturnal predators (USACE and CDFG 2009). Many insects are drawn to lights, and bats or other insectivores may be attracted to lighted construction areas which would increase the potential for disturbance and mortality. However, many small species, such as rodents, rabbits, snakes, and bats, are less active in bright lighting (Longcore and Rich 2004), which may be a biological adaptation to avoid predation during bright moonlight. Overall, chronic ecological light pollution may favor light-tolerant species over those that are dark-adapted (Longcore and Rich 2004).

The heliostat fields may be sources of polarized light pollution (PLP) which results from light reflecting from anthropogenic structures. PLP can alter the ability of wildlife to seek out suitable habitat, elude or detect predators, and ability to detect natural polarized light patterns which can affect navigation and ultimately affect dispersal and reproduction (Horvath et al. 2009). The project also may have a “mirage” effect caused by appearance of the proposed heliostat field from a distance. Both of these potential effects could attract birds or bats to the facility, where they may be susceptible to mortality or injury by collision or burning (below).

### Bird and Bat Collisions with Project Facilities

Birds collide with many types of structures, including communications towers, transmission lines, and buildings. Numerous studies have documented extensive bird mortality from collisions with buildings and other structures such as smokestacks or monuments, and estimates of annual bird morality from collisions with transmission and distribution lines nationwide range from hundreds of thousands to as many as 175 million (Erickson et al., 2001).

Collisions typically result when the structures are not visible (e.g., power lines, guy wires, or unlighted towers at night), deceptive (e.g., glazing and reflective glare), or confusing (e.g., light refraction or reflection from mist) (Jaroslow 1979). Collision rates generally increase in low light conditions, during strong winds, and during panic flushes when birds are startled by a disturbance or are fleeing from danger. Most or all of the project components present collision risks for birds or bats. Nocturnal visibility of the gen-tie and internal distribution line conductors and towers would depend on moonlight. The receiver towers would be lighted to conform to Federal Aviation Administration (FAA) regulations but most of their surfaces would not be lighted and visibility at night would also depend on moonlight. Facilities lighting at night may attract insects and, consequently, feeding bats, which may then be at risk of colliding with heliostats or other structures. During daylight, the mirrored heliostats would reflect images of open sky or desert shrubland from most nearby viewpoints (similar to windows, which birds commonly strike). The evaporation ponds may attract birds or insects (and feeding bats). The magnitude of collision mortality to birds and bats will depend upon multiple factors, including the size and location of project features, numbers of birds and bats in the project vicinity, diurnal and seasonal timing of bird and bat flights across the site, and specific flight behavior of birds and bats.

SRSG technology necessitates an extensive heliostat field made up of many large mirrors, which presents a collision hazard for birds. Staff has reviewed research by McCrary et al. (1986) which quantified bird mortality, including collisions, at a 10 MW pilot SRSG pilot facility (Solar One) near Daggett, California. The Solar One facility consisted of a 32-hectare (79-acre) heliostat field and 86-meter (282-foot) solar receiver tower. The results of that study are summarized below. Staff is not aware of any other scientific study of bird mortality at any other comparable generator.

The potential for collision risk is summarized below for major project components.

- **Heliostats.** Bird mortality at the Solar One facility consisted predominantly of collisions with mirrors (McCrary et al. 1986). The heliostats would reflect images of sky or open areas, confusing birds in the same way that large glass or mirrored surfaces may be appear as open sky. The heliostat field also may reflect a deceptive mirage-like image to birds aloft, perhaps causing birds to mistake them as water and increase the collision risk. Staff expects an unknown numbers of birds will strike the mirrors and perish. Staff is coordinating with the applicant and USFWS to review the project’s risks to birds and hopes to evaluate this risk more completely in the FSA.
- **Receiver towers.** One bird mortality at the Solar One facility resulted from a collision with the 282 ft. receiver tower (McCrary et al. 1986). The Rio Mesa SEGF receiver towers would be 750 ft tall, and lighted to comply with aviation safety requirements but no other lighting on the tower is proposed (BS 2011). Most nocturnally migrating birds fly above about 300 m (984 ft) and only about 15 percent fly below that altitude (Felix et al. 2008). However, nocturnally migrating songbirds strike lighted communications towers, especially towers greater than 300 to 500 feet tall (Manville 2001; Kerlinger 2004). The type of aviation lighting appears to affect bird behavior and collision hazard. Many of the avian fatalities at communications towers and other tall structures have been associated with steady-burning, red incandescent L-810 lights, which seem to attract birds (Gehring et al. 2009). Longcore et al. (2008) concluded that strobe or flashing lights on towers resulted in less bird aggregation and, by extension, lower bird mortality than steady burning lights. Staff believes that the Rio Mesa SEGF towers would present a collision hazard, particularly for birds flying over the site at night. The applicant has identified measures to reduce this hazard (URS 2012a): FAA lighting should be only red lights

with the longest permissible interval between flashes and the shortest permissible flash duration, and with flashes synchronized to increase the flash effect.

- **Gen-tie line conductors and towers.** Bird collisions with power lines generally occur when: (1) a power line or other aerial structure transects a daily flight path used by a concentration of birds, or (2) migrant birds are traveling at reduced altitudes and encounter tall structures in their path. Collisions are more probable near wetlands (where bird numbers are high), within valleys that are bisected by power lines, and within narrow passes where power lines run perpendicular to flight paths (APLIC 1996). Songbirds (passerines) and waterfowl collide with wires, particularly during nocturnal migrations or poor weather (APLIC 2006; Avery et al. 1978). However, passerines and waterfowl tend to fly beneath power lines and thus have lower potential for collisions than larger birds, such as raptors, which generally fly over conductor lines and risk colliding with higher static lines. Also, many smaller birds tend to reduce their flight activity during poor weather (Avery et al. 1978). The proposed gen-tie line would be on single-pole towers, with final heights to be determined during final design. (BS 2012v, Fig. 3.3-2 (rev), depicting 110-foot-tall design). The towers would be well below the elevations of most nocturnal migrating birds, but would present a collision risk to birds flying at night in the area, or to birds flying during fog or rain in daylight hours. The gen-tie line is not expected to pose a significant collision risk to bats due to their echolocation ability, though information on bat collisions with transmission lines is minimal (Manville 2001). Staff believes that the gen-tie line would pose some risk of collision for birds and bats, however, that risk is expected to be no greater, and possibly less than that posed by similar structures elsewhere, due to infrequent rain and fog in the Sonoran desert.
- **Additional structures (above-ground infrastructure, generation facilities, electrical distribution lines, administration buildings, vehicles, etc.)**. All structures, facilities, and vehicles have some potential for bird or bat collisions. Among the project components described in the AFC, the collector and distribution lines and the windows or other reflective surfaces of any structures present the greatest hazards. The most likely collision risk for bats is likely to be from vehicles operating during bat foraging hours as bats forage near roads or work areas. Staff believes that these facilities pose some risk of collision for birds and bats, though that risk is expected to be no greater than similar structures elsewhere (e.g., similar to typical residential, commercial, or industrial land uses).

As discussed above, bird collisions with a 10 MW pilot SRSG pilot facility (Solar One) near Daggett, California were documented by McCrary et al (1986). The Solar One facility consisted of a 32-hectare (79-acre) heliostat field and 86-meter (282-foot) solar receiver tower. The researchers documented 70 bird fatalities during the course of a 40-week study, and estimated that about 10 to 30 percent of bird carcasses went undocumented because animal scavengers removed them before researchers detected them. Adjusting for the estimated number of undocumented birds, the total average mortality rate was 1.9 to 2.3 birds per week. The bulk of bird mortality (more than 80 percent) resulted from collisions. The average weekly mortality rate for collisions was 1.5 to 1.8 birds. Most of these mortalities were from collisions with the heliostat mirrors and one known mortality resulted from collision with the solar receiver tower. The authors partially attributed these collisions to high numbers of birds attracted to the adjacent evaporation ponds and agricultural fields. Staff is not aware of any other scientific study of bird mortality at any other comparable generator. The applicant has made no anecdotal observations of bird mortalities at its 6 MW SEDC project in Israel (URS 2012b). The proposed Rio Mesa SEGF would be substantially larger than the Solar One or the SEDC project (**Biological Resources Table 11**; see also CEC 2012y).

**Biological Resources Table 11**
**Avian Mortality Hazard: Comparison of SRSG Projects**

| Project Component | Solar One (San Bernardino Co., CA) | SEDC (Israel) | Rio Mesa (Riverside Co., CA) |
|---|---|---|---|
| Acreage / MW | 80 acres / 10 MW | Unknown acres / 6 MW | 3,805 acres / 500 MW |
| Mirrors | 1,818 heliostats, each one 22.6 x 22.6 ft (512 $ft^2$); Total = 931,000 $ft^2$ | 1,610 heliostats, 75-150 $ft^2$ each. Total = 120,000 – 240,000 $ft^2$ | 2 generators x 85,000 heliostats each (170,000 total); 2 mirrors per heliostat; each mirror 8.5 x 12 ft (102 $ft^2$ each, 205 $ft^2$ per heliostat); Total = 34.8 million $ft^2$ |
| Tower(s) | One; 282 ft. tall | One; 256 ft tall | Two; each one 760 ft tall |
| Adjacent land use/ habitat | Desert shrubland; adjacent agriculture & evaporation ponds | No agriculture or wetlands; adjacent evaporation ponds; within major migratory flyway | Major migratory flyway; evaporation ponds on site; adjacent to desert shrubland and microphyll woodland; irrigated agriculture within +/- 1 mile; Colorado River wetlands and wildlife refuges within +/- 5 miles |
| Bird Mortality | 70 mortalities documented during 40 weeks of surveys 19 were waterfowl & shorebirds; 51 (incl. all burns) were other species | No monitoring protocol or replicable study; no anecdotal mortality reports | unknown |

Source: URS 2012b.

McCrary et al. (1986) also inventoried bird carcasses on the Solar One project site and estimated the number of birds in the surrounding approximately 150 ha (370 ac), including the solar facility, evaporation ponds, and adjacent agricultural fields. They estimated total bird mortality as 1.9 to 2.2 birds per week (including collisions and burns; collisions alone account for 1.5 to 1.8 of the weekly mortalities). Based on the total number of birds observed in the area weekly, collisions and burns accounted for a 0.6 to 0.7 percent weekly mortality rate in the survey area. The authors characterized this mortality rate as “minimal.”

The applicant has indicated that heliostat mirrors at the Rio Mesa SEGF project would be shorter than those at the Solar One site, and that this design difference would reduce collision hazard for birds. However staff has been unable to find documentation of relative collision hazards of taller or shorter mirrors. Staff believes that collision hazard is more likely to be a function of the total area of mirror surface than the height of the individual mirrors.

The applicant extrapolated from the Solar One data to estimate "worst case" bird mortality rates from collision with the heliostats as 5.8 to 6.7 birds per week (URS 2012b). It is not clear how that estimate was derived. The Rio Mesa SEGF would cover 48 times more acreage than the Solar One project and would have 37 times more surface area of mirrors. Based on those factors, the Solar One collision mortality rates extrapolate linearly as 55 to 86 bird mortalities per week at the larger Rio Mesa SEGF project site. The low value (55 birds per week) is based on the low estimate for Solar One collision mortalities (1.5 birds per week) multiplied by 37 (the mirror surface ratio). The higher value (86 birds per week) is based on the higher estimate for Solar One collision mortalities (1.8 per week) multiplied by 48 (the acreage ratio). Similar calculations are provided for burn mortality under "Concentrated Solar Energy," below. These extrapolations are intended as rough projections of the anticipated scale of bird collision mortality. Staff cautions, however, that this is not an estimated or predicted mortality rate. McCrary et al. (1986) noted that "The greater magnitude of these [larger commercial-scale] facilities may produce non-linear increases in the rate of avian mortality when compared to Solar One and extrapolations from this study should be made with caution." Due to the many factors contributing to bird collision risk, staff cannot quantify expected bird mortalities from collision with project facilities. Nevertheless, staff believes that the risk is significant.

The actual mortality rate for bird collisions with heliostats will depend on a series of further considerations and variables. Some of these may imply that the extrapolated Solar One values would overestimate potential collision mortality at the Rio Mesa SEGF, whereas others may imply an underestimate. A partial list of these considerations includes:

Factors suggesting that linear extrapolation from Solar One data would overestimate Rio Mesa SEGF collision mortality:

- Immediate proximity of the Solar One project to irrigated agricultural fields and evaporation ponds;
- No observed collision mortality at BSE's SEDC project; and
- Larger heliostats at Solar One (URS 2012b; note however that staff does not concur and believes, instead, that collision hazard is more likely to vary according to total area of reflective surface than size of individual heliostats).

Factors suggesting that linear extrapolation from Solar One data would underestimate Rio Mesa SEGF collision mortality:

- Proposed on-site evaporation ponds;
- Location within significant migration corridor (Colorado River branch of the Pacific flyway);
- Proximity to local agricultural lands (approximately one mile); birds en route among agricultural lands and other habitat areas are likely to fly over the site;
- Proximity to significant regional wintering waterfowl habitat (several miles); birds en route among wetlands, refuges, and other habitat areas are likely to fly over the site;
- Proximity to large areas of desert microphyll woodland, which supports disproportionate numbers of nesting birds;
- McCrary et al. conclusion that large scale projects may produce non-linear increases in mortality rates;

- Observations at BSE's SEDC project were anecdotal and not based on rigorous methodologies;
- Solar One study did not account for injury, morbidity, or late mortality effects (e.g., birds injured by heliostat collisions, but still able to fly off-site, likely leading to delayed or off-site mortality; and
- Substantially taller solar receiver towers present increased collision hazard.

### Electrocution

Large birds such as egrets, herons, and raptors, including special-status species, are susceptible to transmission line electrocution if they simultaneously contact two energized phase conductors (i.e., wire or cable) or an energized conductor and grounded hardware. Transmission tower or pole design is a major factor in electrocution hazard. Electrocution happens most frequently when a bird attempts to perch on a transmission tower or pole with insufficient clearance between the energized or grounded elements. The majority of bird electrocutions are caused by distribution lines and relatively small transmission lines, energized at voltage levels between 1 kV and 60 kV. Higher voltage transmission lines have wider spacing between the conductors and grounds, reducing the threat of electrocution. Electrocution can occur when horizontal separation is less than the wrist-to-wrist (flesh-to-flesh) distance of a bird's wingspan or where vertical separation is less than a bird's length from head to foot. Electrocution can also occur when birds perched side-by-side span the distance between these elements (APLIC 2006).

The largest bird that is likely to come in contact with the gen-tie line is a golden eagle (average wingspan to 7.5 feet; wrist-to-wrist length of 3.5 feet; height to 2.2 feet). The red-tailed hawk is the most common large bird that could come in contact with the gen-tie lines (average wingspan to 4.7 feet; wrist-to-wrist length of 1.9 feet; height to 1.8 feet). Other large birds in the area are turkey vulture (average 5.8 foot wingspan, 2.0 foot wrist-to-wrist length, 1.8 feet tall) and great horned owl (average 4.3 foot wingspan, 2.1 foot wrist-to-wrist length, 1.3 feet tall). Swainson's hawk, which may migrate over the area, has a 4.5 foot wingspan, and can be 1.3 feet tall (bird sizes from APLIC, 2006).

The Avian Powerline Interaction Committee (APLIC, 2006) guidelines recommend 60 inch separations between components to protect eagles and most other birds from electrocution. The applicant does not specify gen-tie line or other electrical infrastructure clearance distances between electrical components and grounds, except to state that transmission system design will "meet all national, state, and local code requirements" (BS 2011: p 3-9). However, the applicant has identified measures to reduce this hazard (URS 2012b) by designing and constructing gen-tie poles according to guidelines in APLIC (2006) and Edison Electric institute (2004) to prevent avian electrocution and minimize electrocution hazard for raptors.

### Concentrated Solar Energy

The Rio Mesa SEGF would use concentrated solar energy to generate steam within the solar receiver steam generators (SRSGs) at the tops of the receiver towers. During operational hours the radiant solar energy including visible light, infrared (IR), and ultraviolet (UV; most UV light would not be reflected) reflected from as many as 85,000 heliostats (mirrors) would be focused on each SRSG. Boiler temperature would be controlled by increasing or decreasing the number of heliostats focused on the SRSGs. Heliostats that are defocused from the SRSGs would be redirected to standby positions. In sum, the standby positions would form a ring around each SRSG, about 40 m (130 ft) in radius and at the same height (230 m or about 750 ft). During normal operation as many as 15 percent of the heliostats may be focused on the standby ring (BS 2012w). Full standby condition (i.e., all heliostats focused on the standby ring) would only occur "for possibly a few minutes over an entire year during an unusual or emergency episode" (BS 2012w).

Energy flux, or radiant flux, is the rate of radiant energy flow onto or through a surface. At the surface of the earth, solar energy flux is about one kilowatt per square meter (1 kW/$m^2$). An object located in the path of reflected energy from one or more heliostats would be exposed to radiant flux higher than ambient conditions. The total radiant flux level would be roughly proportional to the number of heliostats reflecting solar energy onto the object. An object near the SRSG would be exposed to very high radiant flux.

Radiant energy is converted to heat as it is absorbed by an object. Increased exposure time causes increased energy absorption and increased heating. Elevated radiant flux causes skin injury or burning in humans and very high radiant flux levels cause spontaneous combustion of organic materials such as wood (**Biological Resources Table 12**). The extent of injury or damage is a function of (1) radiant flux level, and (2) time of exposure. Exposure to high radiant flux levels has the potential to harm birds by damaging their eyes, burning or singeing their feathers and skin, or by increasing their body temperatures (i.e., hyperthermia).

**Biological Resources Table 12**
**Energy Flux Effects to Organic Materials, Bird Carcasses, and Human Skin**

| Description of effect | Energy flux level | Time of exposure |
|---|---|---|
| Unpiloted combustion (redwood) | 50 kW/$m^2$ | 3 seconds |
| Unpiloted combustion (redwood) | 16 kW/$m^2$ | 12 minutes |
| Singed or burned feathers; tissue discoloration and drying (bird carcass) (BSE 28 Aug 2012) | 50 kW/m2 | 20-30 seconds |
| Pain (human skin) | 23.5 kW/$m^2$ | 1.6 seconds |
| Pain (human skin) | 10.5 kW/$m^2$ | 5 seconds |
| Pain (human skin) | 8.2 kW/$m^2$ | 5 seconds |
| Pain (human skin) | 4.8 kW/$m^2$ | 10 seconds |
| Blisters (human skin) | 4.2 kW/$m^2$ | 30 seconds |
| Limit for human circulatory system to dissipate heat | 3.4 kW/$m^2$ | n/a |
| Generally safe | 2.5 kW/$m^2$ | n/a ("lower limit for pain after a long period") |

Source: "Toxicity assessment of combustion products," accessed April 30, online: http://go.totalsafety.nl/uploads/heat/fire-dynamics-exposure-to-heat.pdf.

Feathers are "instrumental in flying [and] they play a critical role in temperature regulation" (Sibley 2002). They are composed of protein (keratin), similar to the material of human hair and nails. The long relatively rigid feathers of the wings and tail (flight feathers) are the bird's aerodynamic flight surfaces. Surface feathers, or contour feathers, cover and streamline the remainder of the body and also contribute to aerodynamics. Insulating feathers are found beneath the contour feathers. Seemingly minor damage to flight feathers may affect a bird's ability to maneuver or its flight speed; more significant damage to flight feathers would prevent flight altogether. Significant damage to contour feathers also may affect aerodynamics. And damage to insulating feathers may affect the bird's thermoregulation (body temperature control). Feathers normally become worn over time and birds periodically lose and replace them during molting. Molting generally occurs once yearly (twice yearly in some species; generally every second year in raptors). Birds have no physiological means to replace damaged feathers other than the normal molting cycle.

McCrary et al. (1986) found that 13 of the bird carcasses (19 percent) at the Solar One facility had been burned, reporting that the "heavily singed flight and contour feathers indicated that the birds burned to death." The authors interpreted these mortalities as the result of birds flying through that facility's standby points, though they did not observe the incidents, and the mortalities also may have been caused by flying within elevated flux levels surrounding the SRSG during normal operation. Risk of burning was evidently higher for aerial foragers (swifts and swallows) because of their feeding behavior. The McCrary study was based on systematic searches of the 32 hectare (79 acre) Solar One site but not beyond the site boundaries. Thus, if any birds were injured but were able to fly beyond the site's boundaries (about 1,200 ft from the receiver tower), they would not have been found by the field biologists. For this reason, staff believes that actual mortality from burning may have been higher than reported.

The applicant has investigated effects of concentrated solar energy on bird carcasses and presented its findings to staff during a workshop on August 28, 2012. Carcasses of three species (chickens, doves, and quail) were exposed to various energy flux levels for periods of 10 to 30 seconds. Burned or singed feathers and discolored or dried muscle tissue were observed in the carcasses exposed for 20 to 30 seconds to flux levels above 50 $kW/m^2$. These effects were not observed in carcasses exposed to lower flux levels for the same intervals. No data on longer exposures were available. The applicant notes that feather temperatures in living birds probably would not reach the same temperatures during the same exposure periods due to convective heat dissipation by air motion surrounding them and because the birds' movement would change the amount and locations on its body of impacts from the solar flux.

Staff believes that the levels of feather and tissue damage reported for these exposures at 50 $kW/m^2$ or above would be likely to kill living birds. In addition, staff believes that shorter exposures at these energy flux levels would be likely to cause other tissue or feather damage that could impair flight or vision or cause physiological effects and ultimately cause or contribute to mortality from other causes (e.g., reduce ability to forage, escape from predators, or thermoregulate). Staff also believes that longer exposures to lower energy flux levels are likely to cause feather damage or physiological effects.

Feathers are composed of protein (keratin) and contain some moisture, both on the surfaces and bound to the protein. Reflected solar energy is converted to heat as it is absorbed by an object (i.e., feather). Continued heating will drive off all moisture and the keratin structure will begin to deform. Once fully dry, the feathers will singe or burn after continued heating. Surface heating and feather damage is a function of energy flux level and exposure time. Staff's research of heating effects on keratin indicate that short exposures to radiant flux levels above 4 $kW/m^2$ may cause irreversible damage to feathers (see **Biological Resources Appendix: Risk Assessment Of Avian Exposure To Concentrated Radiant Solar Flux**). Staff estimates that a one-time exposure to radiant flux between 2.5 $kW/m^2$ and 4 $kW/m^2$ for duration not exceeding 1 minute would cause little if any damage to flight feathers and could be considered safe. Staff estimates that exposure to 5 $kW/m^2$ for a similar period may cause feather damage (depending on exposure angle and other factors), and that shorter exposures at higher flux levels could cause similar damage.

Birds have higher metabolic rates and higher body temperatures than mammals. Passerine birds (songbirds) have the highest basal metabolic rates among all vertebrates. In order to maintain constant body temperature, birds employ several physiological mechanisms to reduce excess metabolic heat (Sibley 2002). In humans, symptoms of hyperthermia include hyperventilation, respiratory problems, and muscle spasms. Similar symptoms, if they occur in birds, would likely cause decreased ability to forage or escape predators, and increased risk of mortality. Feathers may help to insulate the body from some level of increased heat. But small animals (including birds) have much higher ratios of body surface to body volume and, as a result, are more susceptible to internal temperature changes through surface heat absorption. Staff is unaware whether birds in the Colorado Desert are at or near their physiological ability to dissipate heat during ordinary summer flight activity. Thus staff cannot predict the level of increased heating from concentrated solar energy that may cause hyperthermia. Staff notes that hyperthermia or its effects to living birds cannot be evaluated through carcass experiments such as the applicant's work described above.

Concentrated radiant flux could also cause eye damage to birds. For humans the maximum permissible exposure (MPE) to radiant flux for momentary exposure (0.25 second or less) is 2 $kW/m^2$, and MPE for continuous exposure (for a period greater than 0.25 second) is 1 $kW/m^2$. The Rio Mesa SEGF would concentrate sunlight at much higher radiant flux values than these, and staff believes that birds flying over the heliostat fields, especially near the SRSGs may be at risk of eye damage or permanent blindness upon relatively brief exposures. Birds looking directly into concentrated light would likely suffer some damage to the central part of the retina, perhaps causing significant visual impairment, depending on radiant flux level and exposure time. Birds viewing the reflected light obliquely may experience some damage to peripheral vision.

Concentrated solar energy will create a volume of airspace surrounding each SRSG where radiant flux levels are elevated well above ambient levels. The shape of the volume is complex. During full load, a broad flattened cone-shaped volume of airspace surrounding each SRSG would contain energy flux levels above 5 $kW/m^2$ and smaller similarly shaped volumes would contain flux levels above 10 $kW/m^2$, 25 $kW/m^2$, 50 $kW/m^2$, and 150 $kW/m^2$ (BS 2012w). There also would be a smaller upward-facing cone-shaped volume above each SRSG due to reflected energy that "misses" the SRSG. During full standby conditions the volume of elevated energy flux would be much greater. The applicant notes that full standby condition would not occur during normal operation, and that this condition would occur for possibly a few minutes over an entire year during an unusual or emergency episode (BS 2012w).

During normal operation, the energy flux surrounding the receiver tower would exceed 25 $kW/m^2$ in a disk-shaped area about 20 m to 60 m (65 ft to 200 ft) thick and 150 m (490 ft) radius. The 5 $kW/m^2$ volume would be larger, with thickness about 20 m to 150 m (66 ft to 490 ft) and radius more than 400 m (1,300 ft). The applicant calculated the 5 $kW/m^2$ volume as 23 million cubic meters.

Based on staff's understanding of energy flux intensity and exposure times, staff believes that birds flying for short periods through energy flux exceeding about 25 $kW/m^2$ will likely suffer significant damage to flight feathers, eyes, or skin so that they would be unable to survive longer than a few days. In some cases, where they fly through higher flux levels, these birds would fall to the ground with evidence of severe burning as reported by McCrary et al. (1986). Staff believes that many such birds may continue flying for a few seconds or minutes, perhaps long enough to escape the hazard, but would be unable to fly effectively, find food, or escape predators and would die within a few days of the exposure.

Staff also believes that birds exposed for longer durations to energy flux exceeding about 5 $kW/m^2$ would be at risk of suffering (1) feather damage and consequent flight impediment, or (2) hyperthermia or other damaging physiological or anatomical effects. These energy flux levels cause pain or blistering on human skin within a few seconds (**Biological Resources Table 12**). The minimum exposure period and flux levels that would injure birds are unknown. To some extent, plumage may insulate birds from hyperthermia. Heat absorption rates will depend on plumage color, density, and structure; and any air cooling effect during flight. Further, it is unknown whether birds would attempt to escape from elevated energy flux, perhaps by flying upward or by turning around. Even presuming that most birds would attempt to move away from the energy flux, they would have no way of determining which direction to move.

Typical flight speeds are 20 to 50 miles per hour (mph) (USGS 1998), but can vary widely. Staff calculates a bird flying 20 mph (approximately 9 meters per second), would take approximately 90 seconds to fly across a disk-shaped volume of 400 m radius where energy flux would be above 5 $kW/m^2$. Based on the heating effects of concentrated solar energy, staff concludes that these exposure periods would be hazardous to birds, and that higher energy flux levels would be hazardous at considerably shorter exposure periods.

The USFWS (2011b) recommends that developers and operators evaluate potential risk of wind energy projects to bald and golden eagles to determine whether eagle mortality may be expected and, if so, whether it can be mitigated. The risk assessment is based on multiple factors including eagle occurrence and habitat use, habitat characteristics, and the level of hazard posed by wind turbine technology (i.e., number, size, and locations of turbines). Turbines would pose a particularly high risk if they are in areas where eagles tend to congregate for breeding, roosting, foraging, or migration. From these data, the USFWS and applicants can model a predicted number of eagle fatalities per year or over the life of the project. For the Rio Mesa SEGF project, USFWS biologists hope to revise the wind energy risk assessment model to account for the zone of concentrated solar energy surrounding the towers in general and SRSGs in particular, and to model risks to other bird species.

Staff notes that the assessment model was designed for wind energy projects and some modeled fatality predictions have not corresponded closely to actual fatalities (de Lucas et al 2008; Ferrer et al 2011), probably due to the difficulty of accounting for local topographic conditions or eagle flight behavior. The current USFWS model takes into account recommendations by de Lucas et al. (2008) but was published prior to the follow-up work of Ferrer et al. (2011). Nevertheless, the predictive risk assessment model is the only tool available to evaluate likely impacts of energy developments to bald or golden eagles. Staff hopes to incorporate the USFWS risk assessment for the project's potential impacts to eagles into the FSA. Staff is not aware of a comparable model to assess risk to other birds. However, staff will continue to work with the applicant and resource agencies to evaluate energy flux risks to all bird species as completely as possible.

Concentrated solar energy may also affect bats in the area, if they fly near the SRSGs near dusk. Remnant radiant heat from operation hours just before dusk could burn bats' wings or fur. Staff considers this potential effect unlikely and believes, instead, that bats would avoid the SRSGs and other project facilities.

The applicant concluded that "worst case" bird mortality rates caused by concentrated solar energy would be zero birds per week (URS 2012b). It is not clear how that estimate was derived. McCrary et al. estimated bird mortality from burns as approximately 0.4 birds per week. The volume of hazardous airspace surrounding the Solar One SRSG is unknown but, due to the relative scale of the project, could not have approached the volume of similar radiant energy flux hazard that would surround the Rio Mesa SRSGs. Staff believes that relative surface of heliostats is the best available proxy for volume of hazardous airspace at each project. The Rio Mesa SEGF's reflective surface area would be 37 times greater than Solar One's. Based on those factors, the Solar One radiant energy flux mortality rate extrapolates linearly as 15 bird mortalities per week at the larger Rio Mesa SEGF project site. This extrapolation is intended as a rough projection of the anticipated scale of radiant energy flux mortality. Staff cautions, however, that this is not an estimated or predicted mortality rate. McCrary et al. (1986) noted that "The greater magnitude of these [larger commercial-scale] facilities may produce non-linear increases in the rate of avian mortality when compared to Solar One and extrapolations from this study should be made with caution." Due to the many factors contributing to bird collision risk, staff cannot quantify expected bird mortalities from radiant energy flux. Nevertheless, staff believes that the risk is significant.

The actual radiant energy flux mortality rate will depend on a series of further considerations and variables. Some of these may imply that the extrapolated Solar One values would overestimate potential radiant energy flux mortality at the Rio Mesa SEGF, whereas others may imply an underestimate. A partial list of these considerations includes:

Factors suggesting that linear extrapolation from Solar One data would overestimate Rio Mesa SEGF radiant energy flux mortality:

- Immediate proximity of the Solar One project to irrigated agricultural fields and evaporation ponds;

- Estimated higher maximum radiant energy flux level at Solar One standby points, compared with lower levels at Rio Mesa SEGF standby ring;
- Probable extended periods in standby positions during Solar One testing, compared with minimal standby time at Rio Mesa SEGF; and
- No observed radiant energy flux mortality at BSE's SEDC project.

Factors suggesting that linear extrapolation from Solar One data would underestimate Rio Mesa SEGF radiant energy flux mortality:

- Proposed on-site evaporation ponds;
- Location within significant migration corridor (Colorado River branch of the Pacific flyway);
- Proximity to local agricultural lands (approximately one mile); birds en route among agricultural lands and other habitat areas are likely to fly over the site;
- Proximity to significant regional wintering waterfowl habitat (several miles); birds en route among wetlands, refuges, and other habitat areas are likely to fly over the site;
- Proximity to large areas of desert microphyll woodland, which supports disproportionate numbers of nesting birds;
- McCrary et al. conclusion that large scale projects may produce non-linear increases in mortality rates;
- Solar One study (McCrary et al.) did not account for injury, morbidity, or late mortality effects (e.g., birds injured by heliostat collisions, but still able to fly off-site, likely leading to delayed or off-site mortality;
- Much larger volume of Rio Mesa SEGF standby ring compared with Solar One standby points;
- Observations at BSE's SEDC project were anecdotal and not based on rigorous methodologies; and
- Substantially larger volume of concentrated solar energy.

## Mitigation of Operational Impacts to Wildlife

### Evaporation Ponds

The applicant proposes to protect birds from hazard or injury caused by evaporation ponds "based on local jurisdiction and agency requirements" (BS 2011) and will design a bird netting system to reduce water fowl access to the evaporation ponds (BS 2011c). Potential evaporation pond impacts to wildlife would be further reduced through staff's recommended Condition of Certification **BIO-5** (Impact Avoidance and Minimization Measures), which would require the project owner to exclude wildlife from the evaporation ponds and cover the ponds with netting. In addition staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring of Operational Impacts to Birds and Bats) would require monitoring of the evaporation ponds and preparation of a Bird and Bat Conservation Strategy to minimize all project impacts to birds and bats. With implementation of **BIO-5, BIO-12,** and other measures (above) to exclude wildlife from the project site, staff concludes that drowning, toxicosis, and encrustation hazards would be reduced below a level of significance. These measures also would minimize evaporation pond availability as a subsidy to common ravens.

### Noise, Disturbance, and Lighting

Staff proposes measures to reduce the effects of operational lighting on birds, including designing facility lighting to prevent side casting towards adjacent habitat and using only flashing or strobe lights on project features that require lights per FAA regulations (Condition of Certification **BIO-5**). Staff's proposed Condition of Certification **VIS-3** describes measures to minimize the off-site effects of facility lighting. With implementation of this measure, lighting impacts to wildlife in surrounding habitat would be reduced to less than significant levels under CEQA.

### Collision

Staff concludes that bird mortality caused by collisions with project facilities would be significant without mitigation. To minimize the risk of collision with the gen-tie line and towers, staff recommends Condition of Certification **BIO-5** (Impact Avoidance and Minimization Measures), which specifies that gen-tie design and construction shall conform to Avian Powerline Interaction Committee (APLIC, 2004) guidelines to minimize collisions and flashing red lights rather than steady burning lights atop the towers. Staff's recommended Condition of Certification **BIO-12 (**Mitigation and Monitoring of Operational Impacts to Birds and Bats) would require preparation and implementation of a Bird and Bat Conservation Strategy (BBCS) and a Golden Eagle Protection Plan according to USFWS guidelines. These plans would require the project owner to identify adaptive management measures to minimize collisions and incinerations. The BBCS would also require implementation of remedial actions such as screening to minimize access to the heliostat field and placement of aerial markers or other devices to reduce bird mortality on gen-tie lines.

Staff's recommended Condition of Certification **BIO-3** (Compensatory Mitigation: Offset for Loss and Degradation of Native Vegetation and Wildlife Habitat) would require the project owner to preserve wildlife habitat in perpetuity to compensate for habitat loss on the project site. Habitat compensation is intended primarily to offset project-related habitat loss, but also may compensate in part for project related bird mortality.

Condition of Certification **BIO-12** would require the project owner to monitor, record, and report bird and bat mortality within the project footprint, whether from collision or other causes. The monitoring plan would address seasonal factors, species or taxonomic groups of birds affected, and types of injuries. Monitoring of operational impacts to birds would not reduce these impacts or mitigate them according to CEQA. However, staff believes that a carefully designed and implemented scientific monitoring program would provide valuable data which would document the actual impacts to birds and would inform environmental analysis of future projects proposing similar technologies.

Staff is considering the possibility that installing bird flight diverters on project-related and existing power lines in the vicinity of the Colorado River would minimize and offset potential take of sandhill cranes associated with the Rio Mesa SEGF, as flight diverters have reduced power line collision mortality for this species in some studies (Murphy et al. 2009).

Staff believes that these conditions of certification are feasible and would partially mitigate the anticipated impacts to birds and bats caused by collisions with the Rio

Mesa SEGF components. However, staff concludes that significant residual impacts to birds and perhaps bats would remain. In particular, staff is not aware of any feasible means of minimizing or avoiding bird collisions with the heliostats. Staff will continue coordinating with the applicant and resource agencies to review any potential for off-site habitat protection and enhancement, particularly in wetland areas and wildlife refuges, where habitat expansion or improvement may offset anticipated loss of migrating or overwintering birds. At this time, staff cannot determine appropriate acreage or other criteria for such compensation habitat, but believes that further analysis may enable quantification of expected project-related bird mortality and productivity of bird populations in regional wetland areas. Acquisition or other compensation measures may serve to partially mitigate this impact. However, staff concludes that it is not feasible to mitigate this impact below a level of significance, and that collision with project facilities, particularly heliostats, is a significant and unavoidable adverse impact.

### Electrocution

Staff's recommended Condition of Certification **BIO-5** (Impact Avoidance and Minimization Measures) would require above-ground transmission lines and all electrical components on the site, gen-tie alignment, and intertie at the Colorado River Substation, to conform to guidelines recommended by APLIC (2006). Clearance distances recommended in these guidelines would minimize the likelihood of bird electrocutions. Staff concludes that recommended Condition of Certification **BIO-5** would reduce the electrocution hazard and project impacts below a level of significance.

### Concentrated Solar Energy

Staff concludes that the impacts from exposure to elevated energy flux to all bird species in the project vicinity, including golden eagle and migratory birds, would be significant. This impact would be mitigated in part by staff's recommended Conditions of Certification **BIO-12** (Mitigation and Monitoring of Operational Impacts to Birds and Bats) and **BIO-3** (Compensatory Mitigation: Offset for Loss and Degradation of Native Vegetation and Wildlife Habitat). Staff believes that these conditions of certification are feasible and would partially mitigate the anticipated impacts to birds caused by exposure to concentrated solar energy. However, staff concludes that significant residual impacts to birds would remain. No other feasible mitigation is known or has been identified. In particular, staff is not aware of any feasible means of minimizing or avoiding bird mortality due to energy flux. Therefore staff concludes that it is not feasible to mitigate this impact below a level of significance, and that bird mortality or injury from exposure to concentrated solar energy is a significant and unavoidable adverse impact. Staff will coordinate with the applicant and resource agencies to review any potential for off-site habitat protection and enhancement, particularly in wetland areas and wildlife refuges, where habitat expansion or improvement may offset anticipated loss of migrating or overwintering birds.

## IMPACTS TO SPECIAL-STATUS WILDLIFE

Numerous special-status wildlife species are found on the proposed project site and surrounding lands. **Biological Resource Table 5** lists these species and provides brief summaries of their conservation status and likelihood of occurring in the project area. Many of the project's expected impacts to special-status wildlife are those described above under the subsections "Native Vegetation and Wildlife Habitat;" "Overview of

Impacts to Wildlife;" "Nesting Birds;" and "Operational Impacts to Wildlife." This subsection addresses these and other impacts to special-status species and evaluates the significance of those impacts according to CEQA.

## Invertebrates

No special-status invertebrates are known from the project area, and focused surveys for special-status invertebrates were not conducted. The CNDDB reports historical records for two species, the Riverside cuckoo wasp (State Rank S1? [the question-mark is included in the state ranking, to indicate uncertainty]) and California mellitid bee (State Rank S2?), both approximately six miles northwest of the northern terminus of the gen-tie line and 11 miles northwest of the solar generator site. However, habitats present in the project area are widespread regionally, and there are no unique features on site that are expected to support localized populations of special-status invertebrates. Nonetheless, should they occur, impacts to special-status and rare invertebrates would be similar to those discussed above for common wildlife. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to invertebrates and their habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. Staff concludes that these measures are feasible and effective; that their implementation would minimize potential project impacts to special-status and rare invertebrates; and would reduce potential impacts to a less-than-significant level.

## Reptiles and Amphibians

### Couch's Spadefoot

Couch's spadefoot, like other spadefoot species, is an amphibian with appearance and life history characteristics similar to the true toads (*Anaxyrus* [*Bufo*] spp.) but distinguished from that genus by several characteristics, especially the thickened sharp-edged "spades" on the hind feet, used for burrowing (Stebbins 2003). Couch's spadefoot is almost entirely terrestrial. It is dormant in burrows 20 to 90 cm deep for 8 to 10 months of the year (Jennings and Hayes 1994). It is active on the surface only during periods following warm summer rains, when it emerges to feed on insects and to reproduce. Successful reproduction requires warm rain pools which must hold water while the adults breed, the eggs hatch, and the tadpoles develop and then metamorphose into juvenile spadefoots. The process may occur in as few as 7 to 10 days (Jennings and Hayes 1994; Grismer 2002).

In addition to summer rain pools, Couch's spadefoot requires soft, sandy soils for burrowing and generally is found at the edges of arroyos or in open soil around the bases of shrubs (Grismer 2002). Adult spadefoots make seasonal movements to and from breeding pools, but movement distances are unknown for this and other spadefoot species (Morey 2005). Some true toads may move as far as 1.2 km between breeding habitat and their upland burrows (Holland and Sisk 2000).

Couch's spadefoot is widespread in southwestern North America and Mexico. The project area is near the western margin of its geographic range. Stebbins (2003) indicates that it is restricted in California to a corridor immediately adjacent to the

Colorado River, though Morey (2005) indicates a much broader distribution in the California deserts. There are several known regional occurrences (Jennings and Hayes 1995; Morey 2005). In California, Couch's spadefoot is threatened by habitat conversion for other land uses. It is ranked as a Species of Special Concern by CDFG and as a Sensitive Species by BLM.

On August 1, 2012, after an intense summer thunderstorm, one Couch's spadefoot was observed at the Genesis Solar Energy Project, about 10 miles northwest of the northern terminus of the Rio Mesa SEGF gen-tie line and about 16 miles northwest of the proposed solar generator site. Potential pool habitat was reported along portions of the proposed gen-tie alignment, particularly in the northern portion (URS 2011). Areas where water pooled after summer rains in July 2012 were revisited approximately 8 days after the rains to determine whether they continued to hold water. None of the pools held water for more than a few days, apparently due to rapid percolation through the sandy soils. No Couch's spadefoot toad calls were heard at night while the pools were inundated, nor were spadefoots observed during the day and no evidence that they may have used the ponds (e.g., dried egg mass remains) was found during the follow-up visit.

Creosote bush shrubland throughout the Rio Mesa SEGF project site may be suitable as habitat for Couch's spadefoot winter dormancy within burrows. Based on anecdotal information on a number of species, Hammerson (2002) reported that spadefoots move several hundred meters or more from breeding sites and suggested that, without specific information, the minimum extent of terrestrial habitat around breeding sites can be set at 500 meters. A further evaluation of habitat suitability would require more detailed knowledge of Couch's spadefoot movement distances between breeding ponds and burrow sites. The project area does not appear to provide specialized habitat or other resources for Couch's spadefoot other than those resources widely available throughout the region; however, available information cannot rule out the potential that Couch's spadefoot could breed on the gen-tie alignment or overwinter anywhere on the project site.

The project would eliminate or degrade potentially suitable habitat throughout the proposed solar generator site and at work sites and access routes on the gen-tie line. In addition to habitat loss, project construction could destroy Couch's spadefoots if breeding ponds are disrupted while adults, eggs, tadpoles, or juvenile spadefoots are present, or if the animals are crushed in their burrows by vehicles.

Based on the project's proposed disturbance to a large area of potentially suitable winter dormancy habitat and to potential breeding habitat in the northern part of the gen-tie alignment, staff concludes that project impacts to Couch's spadefoot, if it occurs in the area, would be significant under CEQA. Staff notes, however, that long-term or permanent habitat loss along the project's transmission line components would be minimal, and that impacts of these project components would primarily be those resulting from short-term construction.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to Couch's spadefoot habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. Staff concludes that these measures are feasible and effective; that their implementation would minimize potential project impacts to Couch's spadefoot; and would reduce potential impacts to a less-than-significant level.

### Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is found almost exclusively in California, primarily in San Bernardino and eastern Riverside counties, but also in southeastern Inyo County and historically to the west in eastern Los Angeles County (Jennings and Hayes 1994). It is a California Species of Special Concern and BLM Sensitive Species. It is found in arid, sandy, sparsely vegetated habitats, generally within or near creosote bush scrub, throughout much of its range (Norris 1958; Jennings and Hayes 1994). It is generally restricted to fine, loose, aeolian (windblown) sand habitat, typically with sand grain size no coarser than 0.375 mm in diameter (Turner et al. 1984a; Jennings and Hayes 1994; Stebbins 1944). These sands are the most important element of its habitat. It burrows in the sand to avoid predators and to thermoregulate (Stebbins 1944), though it will also seek shelter in rodent burrows. Sand dunes provide its primary habitat, although it can also be found in the margins of dry lakebeds and washes and isolated sand pockets against hillsides (BLM and CDFG 2002).

In addition to the aeolian dunes and sandfields where Mojave fringe-toed lizard is best known, it is also found in mixed habitat such as hummocks or pockets of soft sand interspersed with hard-packed sand and less suitable densities and composition of vegetation (Cablk and Heaton 2002).

The Mojave fringe-toed lizard is primarily insectivorous, but also eats leaves, seeds, and buds (Stebbins 1944). It normally hibernates from November to February, and emerges from hibernacula in March or April. From April to May, while temperatures are relatively cool, it is active during mid-day; from May to September, it is active in mornings and late afternoon, but seeks cover during the hottest parts of the day. The breeding season is April to July. Females deposit 2 to 5 eggs in sandy hills or hummocks during May through July (Mayhew 1964; Jennings and Hayes 1994). Common predators of the Mojave fringe-toed lizard include burrowing owls, leopard lizards, badgers, loggerhead shrikes, roadrunners, various snakes, and coyotes (Jennings and Hayes 1994).

The Mojave fringe-toed lizard's distribution is fragmented because of the patchy natural distribution of its aeolian sand habitat (Murphy et al. 2006). Many local populations occur on small patches of sand and consist of relatively few animals. This fragmented distribution leaves local populations vulnerable to extirpation from habitat disturbance, further fragmentation, or unpredictable or random (i.e., stochastic) events (Murphy et al. 2006). Aeolian sand habitat is vulnerable to direct and indirect disturbances (Weaver 1981; Beatley 1994; Barrows 1996). Environmental changes that stabilize sand, affect sand sources, or block sand movement corridors will, in turn, affect Mojave fringe-toed lizard habitat and populations (Turner et al. 1984a; Jennings and Hayes 1994). Threats include habitat loss or damage from urban and agricultural development, vehicles, and indirect effects such as invasive weeds and increased habitat access by common ravens or other predators. Another important indirect disturbance is the disruption of sand source for the dune systems. Dune habitat that is cut off from its sand source will degrade over time as finer sands are blown away, leaving behind smaller dunes composed of coarser-textured sand.

The applicant conducted focused surveys for Mojave fringe-toed lizards in suitable habitat within the BSA (sand dunes along the gen-tie alignment, particularly the northern portion, and on approximately 2.5 acres in the western portion of the proposed solar generator site). The applicant reported 115 observations of Mojave fringe-toed lizards in sand dune habitats at the northern end of the gen-tie line. None were observed at the solar generator site.

There are no significant sand fields or dune systems downwind or downslope from the proposed solar generator site, and the project would not interrupt sand movement to offsite Mojave fringe-toed lizard habitat.

Habitat impacts on the gen-tie line are expected to recover quickly following construction disturbance in open aeolian sand because vegetation recovery is not required. Thus, habitat impacts for Mojave fringe-toed lizard would be short-term (in contrast to habitat impacts for most other species). Staff concludes that, without avoidance or mitigation, potential take of individual Mojave fringe-toed lizards for transmission line work could be significant under CEQA, but habitat impacts would not be significant.

Staff’s recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize potential impacts to Mojave fringe-toed lizards and potential habitat, including marginal habitat, during gen-tie line construction. Proposed Condition of Certification **BIO-5** would require that gen-tie line construction avoid any desert wash, desert microphyll woodland, or any aeolian sand habitat wherever feasible, and that where these sites cannot feasibly be avoided, that the Designated Biologist shall outline site-specific requirements to minimize impacts to habitat and wildlife, including Mojave fringe-toed lizard. Staff concludes that implementation of these measures would reduce potential impacts below a level of significance by avoiding construction activities in potential habitat where feasible, and implementing site-specific measures to avoid take of individual animals where habitat avoidance is infeasible.

### Banded Gila Monster and Rosy Boa

The banded Gila monster is rare in California with only 26 credible records documented within the past 153 years (Lovich and Beaman 2007). It is a large and distinctive lizard but is difficult to observe even at known locations.  As a result, little is known about its distribution, population status, and life history in California. Most historical observations in California have been in riparian areas or at moderate elevations of the higher desert mountain ranges, in rocky, incised topography (Lovich and Beaman 2007). In California, the Gila monster may be confined to the eastern deserts (east of 116° longitude) where summer rainfall makes up 25 percent of average annual precipitation (Lovich and Beaman 2007). Throughout its range, the Gila monster appears to be most active during or following summer rains. The Rio Mesa SEGF project site is near the western margin of the banded Gila monster’s range, and habitat on the site appears to be only marginally suitable. Its occurrence probability on the site is low to moderate, with rockier areas in the western portion of the site being the most likely potential habitat.

The rosy boa is found in rocky shrublands from sea level to about 6700 feet elevation. In the coastal regions, rosy boas are found south and west of the major mountain chains, in the interior valleys and mountains of Los Angeles, Riverside, San Bernardino, and Orange counties, southward to the coast in San Diego County and Baja California. In the deserts, rosy boas range throughout most of the Mojave Desert and much of the Colorado Desert, eastward into Arizona. They are active during warm seasons, and are primarily nocturnal. The CDFG considers rosy boa a “special animal” but it has no formal status under state or federal Endangered Species Acts. It was on the BLM Sensitive Species list but has been removed from that list. Habitat on much of the Rio Mesa SEGF project site is only marginally suitable for rosy boa due to the relatively flat topography and lack of boulders or rock crevices where they typically take cover. However, suitable habitat is found on the upper bajadas at the western portion of the site and in the rocky walls of arroyos throughout the site. Rosy boas may occur on the site, though probably at low density.

Neither Gila monsters nor rosy boas were reported on the project site. Both may be more likely to occur in Mule Mountains to the west. If present, direct impacts to either species could include habitat loss; being hit by vehicles on access roads; and mechanical crushing. Based on the low probability of occurrence and conservation status of the two species, staff concludes that the likelihood of impacts to either species is low and those impacts, if any, would be minimal and would not be significant under CEQA. Staff recommends no specific mitigation for this potential impact, but notes that recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to both species, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for any habitat loss through the acquisition and management of offsite lands.

### Desert Tortoise

#### *Baseline and Background Desert Tortoise Information*

The desert tortoise is listed as threatened under CESA, and the Mojave population (i.e., west of the Colorado River) is listed as threatened under the federal ESA. East of the Colorado River, the desert tortoise’s range extends into the Arizona deserts, and south through Sonora (Mexico). Tortoises east of the Colorado River have been considered a separate population of the same species, but recent evidence suggests that they should be recognized as a distinct species (Murphy et al. 2011). All wild desert tortoises in California are part of the state and federally listed Mojave population. The project site is not within designated critical habitat for the desert tortoise. The nearest designated critical habitat is the Chuckwalla Critical Habitat Unit, west of the Mule Mountains and about three miles west of the site (USFWS 1994b).

The USFWS reviewed desert tortoise biology and population status in the recent Revised Recovery Plan (USFWS 2011a). The following summary is based on that review and literature cited therein. Desert tortoises spend much of their lives in burrows. They enter hibernation during autumn. In late winter or early spring, they emerge from over-wintering burrows and typically remain active or partially active through fall. Activity decreases in summer, but tortoises often emerge after summer rain storms to drink and to take advantage of seasonal food availability during the few weeks following late summer rains. They may become dormant during extended periods of summer heat and dryness. A single tortoise may have a dozen or more burrows within its home range, and different tortoises may use these burrows at different times. Even during their active seasons, they are inactive during much of the day or night, within burrows or at "palettes" (partially sheltered flattened areas, often beneath shrubs or large rocks) or other shaded sites.

Adult desert tortoises lose water at such a slow rate that they can survive for more than a year without access to free water of any kind and can apparently tolerate large imbalances in their water and energy budgets. During periods of inactivity, their metabolism and water loss are reduced. Desert tortoises eat a wide variety of herbaceous vegetation, particularly grasses and the flowers of annual plants.

Desert tortoise habitats include many landforms and vegetation types of the Mojave and Sonoran Deserts, except the most precipitous slopes. Friable soils (i.e., soils that allow burrowing and will support burrows once they are dug) are important for burrow excavation and nesting, and the availability of suitable soils is a limiting factor to desert tortoise distribution. Dissected alluvial fans and upper bajadas are often considered important habitat areas.

The sizes of desert tortoise home ranges vary with respect to location and resource availability, and may vary among years. Male tortoises' home ranges can be as large as 200 acres, while females' long-term home ranges may be less than half that size. Core areas used within tortoises' larger home ranges depend on the number of burrows. Over its lifetime, a desert tortoise may use more than 1.5 square miles of habitat and may make periodic forays of several miles at a time.

Tortoises are long-lived and grow slowly. They require 13 to 20 years to reach sexual maturity. Their reproductive rates are low, though their reproductive lifespan is long. Mating may occur both during spring and fall. The number of clutches (set of eggs laid at a single time) and number of eggs that a female desert tortoise produces is dependent on habitat quality, seasonal food and water availability, and the animal's physiological condition. Egg-laying occurs primarily between April and July; the female typically lays 2-14 (average 5-6) eggs, which are buried near the mouth of a burrow or beneath a shrub. The eggs typically hatch 90 to 120 days later, between August and October. Clutch success rates are unknown and nest predation rates are variable, but predation appears to be an important cause of clutch failure.

Desert tortoise population trends have been difficult to discern. The USFWS (2011a) reviewed population monitoring efforts dating back to the 1980s, concluding that available data provide qualitative (not quantitative) insight to range-wide trends, and show appreciable declines at the local level in some areas. A more formal and consistent range-wide monitoring study was initiated in 2001, but no range-wide trend has been identified over that period.

Desert tortoise populations are threatened by several factors, each of which tends to be exacerbated by the others and most of which are associated with human land uses and other human activities. Most threats identified in the 1980s as the basis for state and federal listing continue to affect tortoise populations today. Habitat degradation and loss due to land use conversion, grazing, mining, energy development, and transportation projects have all contributed to declining tortoise numbers and fragmented populations. Off-road vehicle use degrades habitat and causes direct mortality from vehicle collision or crushed burrows. Desert tortoises are also vulnerable to vehicle collisions on roads and highways. Drought, habitat degradation, and weed invasion lead to reduced nutrient quality of food plants; this increases desert tortoise susceptibility to upper respiratory tract disease, and possibly other diseases, which can be fatal and transmittable among populations. Juvenile tortoises are vulnerable to predation by ravens, and both juvenile and adult tortoises are preyed upon by coyotes and domestic and feral dogs. Since infrastructure development and urbanization create perch sites and food and water sources for ravens, and typically increases the numbers of dogs and coyotes in a given area, those activities tend to elevate predation pressure on tortoises. Other factors affecting tortoises and their habitat include illegal collecting, vandalism, livestock grazing, feral burros, invasive non-native plants, changes to natural fire regimes, and environmental contaminants. Habitat fragmentation and development can isolate tortoise populations, further increasing risk of disease and reducing genetic diversity. This range of threats can kill or indirectly affect desert tortoises and their habitat, but little is known about the relative contribution each threat makes to tortoise demography. Current recovery planning (USFWS 2011a) focuses on expanding the knowledge of individual threats and their combined effects on tortoise populations.

The USFWS (2011a) identifies five recovery units for the desert tortoise based largely on geographic discontinuities or barriers that coincide with observed variation among tortoise populations. The Rio Mesa SEGF is located in the Colorado Desert Recovery Unit. In the Colorado Desert Recovery Unit, desert tortoises are found in the valleys, on bajadas, desert pavements, rocky slopes, and in the broad, well-developed washes (especially to the south) (USFWS 2011a).

Focused surveys for desert tortoise were conducted according to the 2010 USFWS 2010 pre-project field survey protocol (USFWS 2010a). The entire BSA was surveyed, and adjacent areas were surveyed on transects of 200, 400, and 600 meters from the BSA boundary. Additional observations of desert tortoises and their sign were made incidentally during other field surveys. All reported desert tortoises and tortoise sign locations are summarized in **Biological Resources Table 13** and shown on **Biological Resources Figures 6a** and **6b** respectively. A great majority of the tortoise observations and signs were located in the western portion of the BSA.

**Biological Resources Table 13**
**Desert Tortoises and Sign Detected within the BSA**

| | Focused Survey Results | Incidental Observations |
|---|---|---|
| Live Desert Tortoise | 6[1] | 8[2] |
| Active Tortoise Burrow | 15 | 3 |
| Inactive Tortoise Burrow | 44 | 2 |
| Possible Tortoise Burrow (burrow categories 2, 3, and 5) | 54 | --- |
| Tortoise Carcass | 37 | 29 |
| Tortoise Scat | 31 | 1 |
| Tortoise Drinking Pan | --- | --- |

| | Focused Survey Results | Incidental Observations |
|---|---|---|
| Tortoise Pallet | 4 | 1 |
| Total | 191 | 44 |

1 – Includes two adult tortoises observed in solar generator site and two observed in the zone of influence. One adult and one juvenile were also detected within the BSA but outside of the solar generator site.
2 – Includes two tortoises within the solar generator site and one within 500 feet of the site; all others were outside of project footprint.

Because of the project's proposed large-scale land use conversion and other habitat disturbances, particularly vehicle traffic for operations, staff believes that, absent mitigation recommended below, project construction and operation would cause desert tortoise mortality. To prevent tortoise mortality, staff recommends the translocation of any tortoises found within the solar generator site.

However, the actual number of desert tortoises on the project site cannot be determined from field survey data alone, due to the possibility that some tortoises may have been double-counted or overlooked during surveys (e.g., they may have been in deep burrows where they could not be seen). The USFWS (2010a; Table 3) provides a mathematical formula for estimating actual numbers of adult and sub-adult desert tortoises from field survey data. Statistical techniques can provide further estimates of minimum and maximum numbers of tortoises expected, within a 95 percent confidence interval. The applicant applied the USFWS formula to its protocol survey data, and estimates that the proposed 3,805-acre solar generator site could be expected to support a total of about 4 (95 percent confidence interval range of 2 to 15) adult and subadult desert tortoises.

The number of tortoise eggs expected on the site was estimated based on the assumption of a 1:1 sex ratio and any female tortoise on the site would be expected to lay eggs (clutch) in a given year. On average, female tortoises produce 1.6 egg clutches per year (Turner et al. 1984), and the average number of eggs per clutch is 5.8 (USFWS 1994). The applicant conservatively estimated the number eggs and juvenile tortoises that could be present on site in a given year based on the presence of 8 females (one half of the maximum estimate of 15 adults on site, see above). Using the life table estimation method, there would be approximately 48 eggs (6 eggs per female) and 124 juveniles (BS 2012v). Staff recommends that the applicant and USFWS consider the possibility that one or more juvenile tortoises or egg clutches could be found on-site during pre-construction surveys in preparation of the applicable desert tortoise take permits.

### *Direct Impacts to Desert Tortoise*

Project construction and operation would cause permanent and long-term direct impacts to 3,834 acres of occupied desert tortoise habitat (i.e., the entire solar generator site and impacts on the gen-tie line and access roads, excluding human-dominated land uses; see **Biological Resources Table 7**). The most important impact to desert tortoise would be loss of tortoises and their habitat at the solar generator site, which would be converted to an incompatible land use and fenced to prevent desert tortoises from accessing the site. The project would not affect desert tortoise critical habitat.

The gen-tie line would not be fenced and would not pose a barrier to movement for the desert tortoise. The main threat to the desert tortoise related to the transmission line would be risk of injury or mortality during construction or, after construction is complete, vehicle strikes on the access road.

During project construction, and possibly during operation, desert tortoises or eggs could be harmed or killed by vehicle strikes or by crushing or entombment within burrows during clearing, grading, and trenching activities or could become entrapped within open trenches and pipes. Other direct effects could include disruption of tortoise behavior during construction or operation of facilities, disturbance by noise or vibrations from the heavy equipment, and injury or mortality from encounters with workers' or visitors' pets. Desert tortoises may be attracted to the construction area by shade beneath vehicles, equipment, or materials or by water availability from water trucks or other sources, placing them at risk of injury or mortality.

For tortoises near but not within the site, fencing off habitat within their home ranges would likely cause displacement stress and risk of exposure (due to inaccessibility to burrows, water, or other habitat components), increased risk of predation, and increased intraspecific competition.

#### *Indirect Effects to Desert Tortoise*

Indirect effects to desert tortoises during construction and operation would be similar to those described for common wildlife, above. In addition, the project could cause an increased risk of predation by primarily ravens or other opportunistic predators attracted to the area by increased availability of food, water, and perch or nest sites. Project construction activities could provide resources in the form of trash, litter, or water, which attract and "subsidize" unnaturally high numbers of predators such as common ravens, coyotes, and feral dogs. Increased predator numbers and activity cause unnaturally high predation pressure on desert tortoises and other wildlife. Predation by ravens on juvenile desert tortoises has been researched extensively. Common raven populations in the California desert have increased in response to expanding human use of the desert. The current level of raven predation on juvenile desert tortoises is considered an unnatural occurrence (USFWS 2011a). Ravens and coyotes habituate to human activities and are subsidized by food (trash, road killed animals), water (irrigation or dust control overspray), and (for ravens) new perching, roosting, and nesting sites (transmission line structures and other structures) that are introduced or augmented by human encroachment. Feral dogs also have emerged as major predators of the tortoise. Dogs may range several miles into the desert and have been found digging up and killing desert tortoises (USFWS 2011a).

There are numerous anthropogenic (human-caused) subsidies for ravens and other predators already present in the area, and tortoises may already be subject to elevated predation. Additional loss of juvenile tortoises due to additional raven subsidies could have a long-term effect on the tortoise population by reducing juvenile tortoise survivorship (Boarman et al., 2006; Boarman, 2003). The population-level consequences of this effect may not be apparent for years because tortoises do not typically reach sexual maturity until approximately 15 to 20 years of age.

### *Mitigation Strategy for Desert Tortoise Impacts*

The applicant has proposed a series of measures to mitigate project impacts to desert tortoise (BS 2011). These measures are listed below:

- pre-construction clearance surveys to remove tortoise from construction areas;
- permanent desert tortoise exclusionary fence to preclude tortoises from entering the site;
- biological monitoring of construction activities and access road improvements;
- desert tortoise relocation, in coordination with BLM and the wildlife agencies;
- tortoise burrow excavation and follow-up collapsing, and relocation of tortoises removed from burrows;
- habitat compensation through an acreage-based mitigation formula as required by the NECO Plan;
- vehicle inspections, vehicle use and travel restrictions; and
- monitoring for ravens and other potential human-subsidized predators, per an agency-approved Raven Management Plan.

Staff's recommended strategy for mitigating direct and indirect project impacts to desert tortoise is substantially similar to the applicant's proposed measures. The project's impacts to native wildlife, including desert tortoises, can be mitigated in part through implementation of staff's recommended Conditions of Certification **BIO-1** through **BIO-5** (above) which would minimize overall project impacts to desert tortoise habitat, require worker training to minimize predator subsidies, and biological monitoring and reporting of worker activities. Desert tortoises encountered during construction work on transmission lines would be allowed to leave the construction area or moved short distances as described in staff's recommended Condition of Certification **BIO-5**. Staff recommends three additional conditions of certification to mitigate the project's impacts to desert tortoises. These are:

- **BIO-13** (Desert Tortoise Clearance Surveys, Exclusion Fencing, and Translocation) which would require the project owner to translocate all desert tortoises from the solar generator site to approved translocation sites, based on agency review and approval, and fence the site to prevent tortoises from entering (or re-entering);
- **BIO-14** (Desert Tortoise Habitat Compensation) which specifies selection criteria for off-site lands to be acquired and protected as compensation for desert tortoise habitat impacts; the acquisition, dedication, management, and security would be as recommended in **BIO-3**; and
- **BIO-15** (Raven Monitoring, Management, and Control Plan) which would require the project owner to prepare and implement a plan to control subsidies for ravens and other predators; monitor raven activity in the project area; report documentation of raven predation on desert tortoises to the wildlife agencies; and to fund the regional raven management and control project on a per-acre basis.

In combination, these measures are expected to effectively minimize potential for project-related increased predation on native species.

***Desert Tortoise Translocation***

Staff’s recommended Condition of Certification **BIO-13** would require the applicant to prepare and implement a Desert Tortoise Translocation Plan in consultation with staff, BLM, CDFG, and USFWS, to conform to USFWS (2010d) guidelines. The final plan would provide additional details, including scheduling and methods of exclusion fence construction; biologist qualifications and certifications; pre-construction clearance surveys; burrow excavation; tortoise health screening, transmitter attachment, and handling measures; selection of translocation sites; and applicable monitoring and disease testing requirements for resident and translocated tortoises.

All tortoises, including adults, subadults, and juveniles found during clearance surveys on the solar generator site and contiguous disturbance area would be translocated off the site to new locations. Desert tortoise clearance surveys and translocation, as described in staff’s proposed Condition of Certification **BIO-13** have inherent risks and could themselves result in direct adverse effects to desert tortoises, such as mortality, injury, or harassment of desert tortoises due to equipment operation, fence installation, removal of tortoise burrows, and tortoise translocation. These potential impacts are described in more detail below.

Because handling and translocation causes risk to tortoise survival, all translocated tortoises must be radio-tagged, tested for disease, and monitored to evaluate translocation success. If five or more tortoises are translocated, the USFWS (2010d) also requires disease testing of the “host population” at the translocation site and radio-tagging and follow up monitoring of an equal number of host population tortoises at the translocation site. In addition, USFWS requires radio-tagging and follow-up monitoring of an equal number of tortoises at a selected control site, where no translocated animals have been introduced. These requirements are intended to document the results of the translocation activity and to prevent spread of disease among tortoises. These requirements necessitate handling additional desert tortoises off the project site and consequent evaluation of impacts, including take of those tortoises.

Capturing, handling, and translocating desert tortoises can cause harassment and possibly injury or death. Tortoises moved outside their home ranges may attempt to return to the area from which they were moved, therefore making it difficult to isolate them from the potential adverse effects associated with project construction. Translocation impacts to desert tortoises may include elevated stress hormone levels, physiological dehydration due to voiding bladders during handling, changes in behavior and social structure dynamics, increased movement (caused by courting or aversive behavior with other tortoises, avoidance of predators or anthropogenic influence, homing, or seeking out of preferred or familiar habitat), spread of disease, increased competition for resources, or increased predation. Safely handling desert tortoises requires adherence to USFWS protocols, and only USFWS Authorized Biologists trained in those protocols may handle tortoises.

Mortality for translocated desert tortoise has been estimated at approximately 15 percent (Sullivan 2008), though evidence from the desert tortoise translocation effort conducted in support of the Fort Irwin Land Expansion Project indicates that mortality rates may be closer to 25 percent per year (Gowan and Berry 2010). The risks and uncertainties of translocation to desert tortoise are well recognized in the desert tortoise scientific community. The Desert Tortoise Recovery Office (DTRO) Science Advisory Committee (SAC) has made the following observation regarding desert tortoise translocations (DTRO 2009, p. 2):

> *… consensus (if not unanimity) exists among the SAC and other meeting participants that translocation is fraught with long-term uncertainties, notwithstanding recent research showing short-term successes, and should not be considered lightly as a management option. When considered, translocation should be part of a strategic population augmentation program, targeted toward depleted Populations in areas containing "good" habitat. The SAC recognizes that quantitative measures of habitat quality relative to desert tortoise demographics or population status currently do not exist, and a specific measure of "depleted" (e.g., ratio of dead to live tortoises in surveys of the potential translocation area) was not identified. Augmentations may also be useful to increase less depleted populations if the goal is to obtain a better demographic structure for long-term population persistence. Therefore, any translocations should be accompanied by specific monitoring or research to study the effectiveness or success of the translocation relative to changes in land use, management, or environmental condition.*

It is likely that some tortoises, particularly juveniles, and tortoise eggs would be overlooked during clearance surveys because of the cryptic nature of tortoises, especially the juveniles and hatchlings and location of egg clutches below ground. These tortoises and eggs would be at risk of injury or mortality during project construction and operation. Mortality would be minimized through staff's proposed Conditions of Certification **BIO-5** (Impact Avoidance and Minimization Measures) and **BIO-13 (**Desert Tortoise Clearance Surveys, Exclusion Fencing, and Translocation Plan). Any tortoises found on gen-tie alignment work sites would be moved from harm's way as needed. Impacts to desert tortoises in these areas would be avoided through staff's recommended Conditions of Certification **BIO-5** and **BIO-13**.

### *Desert Tortoise Habitat Compensation*

The project's long-term and permanent impacts to desert tortoise habit would be as described above under Native Vegetation and Wildlife Habitat. Staff recommends offsetting this habitat loss through acquiring, protecting, and enhancing off-site compensation habitat in perpetuity.

In order to fully mitigate impacts to desert tortoises, as required under Section 2081 of CESA, the compensation must include (1) permanent protection and management of the lands for desert tortoise habitat values, and (2) enhancement actions. Permanent protection would exclude threats and incompatible uses such as off-road vehicles (ORVs), roads and trails, recreational shooting, utility corridors, military operations, construction, mining, livestock, feral burros, invasive species, fire, and environmental contaminants. Enhancement actions to improve desert tortoise survival and reproduction could include habitat restoration, invasive plant control, road closures or road fencing, reducing livestock and burro grazing, and controlling ravens and other predators. These protection and enhancement measures will prevent desert tortoises and their habitat on the acquired lands from the threats that led to the tortoise's population declines and threatened status.

Staff's recommended compensation ratio for desert tortoise habitat is based in part on the rationale above (Habitat Compensation), the compensation ratios adopted in the NECO Plan by BLM and CDFG (2002), and on staff's review of the interagency Desert Tortoise Compensation Team's recommendations (1991), as adopted by the Desert Tortoise Management Oversight Group. Outside of desert tortoise critical habitat the NECO Plan requires desert tortoise compensation at a 1:1 ratio (page D-2, Appendix D, BLM and CDFG 2002); the USFWS concurs with this strategy in its Biological Opinion for the Plan (2005).

That report recommended compensation ratios based on habitat characteristics, term of effects, growth-inducing effects, and off-site effects. Habitat characteristics were ranked as Categories I (highest importance for desert tortoise conservation) through III (lowest value). The report recommended compensation at a 1:1 ratio for impacts to Category III habitat. At that time, habitat categories were mapped at low resolution on paper maps which apparently are not available online. More recent habitat value modeling by Nuessar at al. (2009) and the US Fish and Wildlife Service's critical habitat designation (1994) are the most current maps of desert tortoise habitat value as understood by experts.

The Desert Tortoise Compensation Team (1991) characterized habitat categories according to 4 criteria.  The Rio Mesa SEGF site appears to best fit Category III, as follows:

- Criterion 1. Habitat area not essential to maintaining viable populations. The USFWS (1994) delineated essential desert tortoise habitat and adopted that configuration in its designation of Critical Habitat. The Rio Mesa SEGF site is not within designated essential or critical habitat.
- Criterion 2. Most [land use] conflicts not resolvable. The Desert Tortoise Compensation Team did not describe its interpretation of "resolvable" land use conflicts, but the private/ public land ownership pattern, agricultural land uses to the east, and the applicant's proposed land use on the Rio Mesa SEGF site appear not to be resolvable with long-term desert tortoise habitat conservation on the Palo Verde Mesa.
- Criterion 3. Low to medium [desert tortoise] density, not contiguous with medium or high density. The Rio Mesa SEGF site and the adjacent lands surveyed by the applicant have low density of desert tortoise sign, and relatively low modeled habitat value (Nussear 2009). The site appears to meet the Category III characteristics for low desert tortoise density.
- Criterion 4. Stable or decreasing [desert tortoise] population. No demographic data are available to indicate any population trend.

Based on these criteria, staff concludes that the Rio Mesa SEGF is best characterized as Category III habitat, to be compensated at the 1:1 ratio according to the Desert Tortoise Compensation Team (1991). Therefore, staff's recommended Condition of Certification **BIO-14** (Desert Tortoise Habitat Compensation) would require the applicant to acquire and protect desert tortoise habitat at a 1:1 ratio for the project's impacts to desert habitat (i.e., 3,834 acres). Selection criteria for suitable compensation habitat are listed in **BIO-14**. Under **BIO-14**, the selection, acquisition, easement or title dedication, initial site enhancement, long-term management, funding, and security deposit for these activities would all be according to the terms in staff's recommended Condition of Certification **BIO-3**. This compensation requirement is consistent with measures in Incidental Take Permits issued by CDFG for projects in the region, and with requirements described in the NECO (BLM and CDFG 2002).

### *Raven Control*

Staff's recommended Condition of Certification **BIO-15** would require raven management on-site and payment on a per-acre basis into a region-wide raven management plan. Under **BIO-15**, the applicant would prepare and implement a Raven Monitoring, Management, and Control Plan for all project-related activities and components. The applicant would identify and prevent conditions that might attract or support ravens such as food or water sources; minimize creation of raven perches, nests, or roosts; monitor the effectiveness of raven subsidy management; and require notification to USFWS and CDFG of any evidence of raven predation on desert tortoises (e.g., tortoise shell fragments beneath an occupied raven nest).

In addition, **BIO-15** would require per-acre funding for regional raven management and control. The USFWS, in cooperation with BLM, National Park Service, Department of Defense, and Department of Agriculture, has developed a comprehensive, Regional Raven Management Program in the California Desert Conservation Area to address the regional, significant threat that increased numbers of common ravens pose to desert tortoise recovery efforts (USFWS 2010b). The program will implement recommendations in the USFWS E*nvironmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2008a). To mitigate the project's contribution to cumulative and indirect impacts on desert tortoise from raven predation, staff recommends that the applicant contribute funds toward the program, as described in staff's proposed Condition of Certification **BIO-15**. This condition would require the applicant to provide a one-time fee in the amount of $105.00 per acre to the REAT Account held by NFWF for the 3,834-acre project footprint area. The total payment would be $402,570.00, to be adjusted according to final project footprint. The payment would fund raven removal actions, education and outreach efforts, and surveying and monitoring activities. Staff concludes that implementation of these actions would be an effective means of reducing the project's cumulative contributions to desert tortoise predation from increased raven numbers.

### *Conclusion: Summary of Desert Tortoise Impacts and Mitigation*

Staffs concludes that the suite of recommended conditions of certification would mitigate the project's impacts to desert tortoises to a level less than significant according to CEQA and would fully mitigate the project's impacts to desert tortoises according to CESA. The project's impacts to native wildlife, including desert tortoises, would be mitigated in part through implementation of staff's recommended Conditions **BIO-1** through **BIO-5** (above) which would minimize overall project impacts to desert tortoise habitat, require worker training to minimize predator subsidies, and biological monitoring and reporting of worker activities, and a variety of additional impact avoidance and minimization measures to reduce the risk of injury and death to desert tortoise and other wildlife. Desert tortoises encountered during construction work on transmission lines would be allowed to leave the construction area or moved short distances as described in staff's recommended Condition of Certification **BIO-5**. In addition, staff's recommended Condition of Certification **BIO-13** which would require the project owner to translocate all desert tortoises from the solar generator site to approved translocation sites, and fence the site to prevent tortoises from entering (or re-entering); **BIO-14** would compensate for desert tortoise habitat loss through off-site habitat acquisition, and specifies selection criteria for off-site lands to be acquired and protected as compensation for desert tortoise habitat impacts at a ratio of 1:1, which is consistent with BLM, CDFG, and USFWS guidelines for the region; and **BIO-15** would require the project owner to prevent or minimize project-related activities and facilities from subsidizing ravens and other predators, and to fund the regional raven management and control project on a per-acre basis. In combination, these measures are expected to effectively minimize potential for project-related increased predation on native species. All of these measures would be monitored and verified according to provisions set forth in the conditions of certification.

### Special-Status Birds

### Overview of Impacts

The applicant has reported several special-status bird species observed or detected during field surveys for the project (**Biological Resources Table 5**), addressed further in the following subsections. In general, project impacts to special-status birds would be similar to impacts described above (see subsections entitled "Overview of Impacts to Wildlife" and "Nesting Birds"). Some special-status raptors of the area would utilize the project site for foraging but not nesting. Other special-status species may use the site during winter or migration season, but would not nest on the site. The effects of foraging, migration stopover, and wintering habitat loss for these species would be comparable to other habitat loss effects (see "Overview of Wildlife Habitat Impacts," above). All native birds, including special-status species described below, are protected under the federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code (see "Laws, Ordinances, Regulations, and Standards," above). The project's collision hazards and concentrated solar energy hazards have the potential to take any of the special-status bird species discussed below, and staff concludes that these hazards present a significant and unavoidable impact to each species (see "Operational Impacts to Wildlife," above).

### Bald and Golden Eagle

#### *Baseline and Background Bald and Golden Eagle Information*

Bald and golden eagles are protected under the federal Bald and Golden Eagle Protection Act (BGEPA), MBTA, and fully protected under the California Fish and Game Code. In addition, the golden eagle is a BLM Sensitive Species and USFWS bird of conservation concern. Neither species is listed under CESA or the federal ESA. Bald eagles were listed as endangered in 1978, then downlisted to threatened in 1995, and most populations were delisted in 2007. The Sonoran Desert population was reevaluated, then delisted in 2011 (USFWS 2011c).

Golden eagles are year-around residents throughout most of their range in the western United States. In the southwest, they are more common during winter when eagles that nest farther north migrate south into the region. They breed from late January through August, but mainly during late winter and early spring in the California deserts. In the desert, they generally nest in steep, rugged terrain, often on sites with overhanging ledges, cliffs or large trees that are used as cover. Golden eagles are wide-ranging predators, especially outside of the nesting season when they have no need to return daily to eggs or young at their nests. The mountain ranges to the north, west, and south of the proposed solar generator site provide suitable golden eagle nesting and foraging habitat. Golden eagle nesting territories generally comprise several nests within a given area. In any given year, the eagles may complete breeding by laying eggs and raising chicks, or may abandon breeding activities without ever laying eggs or successfully raising young. In any given year, all or most nests in a territory may be inactive, but eagles may return in future years to nest at previously inactive sites. Three inactive golden eagle nests have been documented within a 10-mile radius of the proposed Rio Mesa SEGF project site, to the north and south of the proposed solar generator site. One additional inactive nest was identified outside of the 10-mile radius to the north (approximately 12 miles from the solar generator site). The nearest inactive nests are about 8 miles to the south. These are two nests located about 0.25 mile apart, one on the east side and one on the west side of Palo Verde Peak. The closest nest where territorial or pre-nesting activity (but not breeding) was observed is more than 14 miles from the project site. In addition, two golden eagles were observed soaring over the BSA in early March 2011 (BS 2011).

Golden eagle foraging habitat consists of open terrain such as grasslands, deserts, savanna, and early successional forest and shrubland habitats, throughout the regional foothills, mountains, and deserts. They prey primarily on rabbits and rodents but will also take other mammals, birds, reptiles, and some carrion.

The proposed solar generator site and the gen-tie alignment do not provide suitable golden eagle nesting habitat but do provide suitable foraging habitat. Due to the site's proximity to several nest sites (inactive in 2011 and 2012 but that could be used in future years), mated pairs or nesting golden eagles could forage on the project site during breeding season. Non-nesting eagles also could forage there throughout the remainder of the year. These foraging birds could include wintering or migratory eagles (outside the breeding season) and unmated golden eagles or adult eagles whose nests may have failed (in the breeding season). Staff expects that golden eagles forage occasionally on the site at any time of year, particularly during winter and migration seasons due to larger numbers of golden eagles in the region and their larger winter foraging ranges.

Human intrusions near golden eagle nest sites have resulted in nest abandonment; high nestling mortality when young go unattended due to altered behavior by the parent birds; premature fledging; and ejection of eggs or young from the nest (reviewed by Pagel et al. 2010). Nest abandonment, if caused by project activities, would constitute take under the BGEPA. If the abandonment caused mortality of eggs or nestlings, then it also may constitute take under the MBTA and California Fish and Game Code. Based on the distance to suitable or documented golden eagle nesting locations, staff concludes that the Rio Mesa SEGF activities and facilities would not cause take due to nest disturbance or abandonment.

Bald eagles winter in the lower Colorado River Valley (Rosenberg et al 1991; Patten et al. 2003). They are seen regularly in the Colorado River Valley during winter, particularly around Topoc Marsh, south of Needles, and the Imperial and Cibola National Wildlife Refuges farther south. They are uncommon during breeding season, but occasionally are seen in the area. Most of these breeding-season sightings are unmated or non-nesting bald eagles. However, bald eagles have repeatedly attempted to nest at the Topoc Marsh (Rosenberg et al. 1991). Staff is not aware of successful breeding along the lower Colorado River. Bald eagles feed primarily of fish captured over open water, but also forage or scavenge opportunisticly. There is no suitable nesting habitat on the project site and the project area is not likely to serve as important foraging habitat for bald eagles, though they may occasionally forage or scavenge there. Bald eagles may be found in the project area at any time of year, particularly during winter, primarily as incidental “flyover” occurrences as they are en route between other habitat areas such as wetlands and open water at the Colorado River and Salton Sea.

### *Project Impacts to Bald and Golden Eagle*

**Habitat loss:** The project would eliminate 3,840 acres of suitable golden eagle foraging habitat within range of known nesting territories. Without mitigation, staff concludes that the loss of foraging habitat would be significant under CEQA. The USFWS considers that foraging habitat loss may be interpreted as take under the BGEPA if it causes territory abandonment or reduced productivity (USFWS 2007; USFWS 2009b). Staff believes that these effects, should they occur in local golden eagle nesting territories, would be difficult at best to attribute to any given land use or project site. Staff believes that golden eagle foraging habitat loss at the project site, with mitigation as recommended below, would not constitute take under state or federal LORS. However, staff believes that the cumulative loss of golden eagle foraging habitat throughout the region may result in abandonment of nesting territories during some years and that the project’s contribution to this impact, should it occur, would be considerable (see “Cumulative Impacts”).

**Operational Impacts:** The project would create collision hazards and concentrated solar energy hazards for bald and golden eagles (“Operational Impacts to Wildlife,” above). The applicant has evaluated these potential risks and concluded that no eagle take is expected to result from the project (URS 2012b). Staff recognizes that bald and golden eagles are uncommon throughout the area. But staff believes that the Rio Mesa SEGF has the potential to take one or more bald or golden eagles over the life of the project, due either to collision with project facilities or to injury or mortality caused by flying through concentrated solar energy over the heliostat field. Staff is coordinating with the US Fish and Wildlife Service to quantify expected take of eagles (if any). Staff concludes that the take of an eagle, should it occur, would be significant according to CEQA and could violate the California Fish and Game Code, due to the status of both species as migratory birds and fully protected species. In addition, unauthorized take of either species could violate the federal BGEPA and MBTA.

### *Mitigation for Impacts to Bald and Golden Eagle*

**Mitigation of habitat loss:** Staff’s recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to golden eagle foraging habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and would compensate for habitat loss through the acquisition and management of offsite lands. Staff believes that all compensation land meeting recommended requirements and selection criteria as desert tortoise habitat, creosote bush scrub, and blue palo verde – ironwood woodland according to Conditions of Certification **BIO-3** and **BIO-14** also would serve as suitable golden eagle foraging habitat. Taken together, staff concludes that these conditions of certification are feasible and effective and that their implementation would reduce the project's impacts to golden eagle foraging habitat to a level less than significant according to CEQA. Although staff is concerned that adequate compensation acreage for blue palo verde – ironwood woodland may not be available (see "Summary and Conclusion of Recommended Mitigation of Impacts to Native Vegetation and Wildlife Habitat" and "Waters of the State") staff concludes that foraging habitat impacts to golden eagles would be mitigated to a level less than significant through upland habitat compensation.

**Mitigation of operational impacts:** Staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring Operational Impacts to Birds and Bats) would require the project owner to prepare and implement an Eagle Conservation Plan (ECP) in coordination with the Energy Commission, BLM, CDFG, and USFWS. The ECP would specify the project owner's anticipated take (if any) of bald or golden eagles or other large raptors and would require retrofitting of existing off-site electrical distribution lines to reduce electrocution risk to remediate any anticipated or unanticipated take of eagles or other large raptors. Staff concludes that these measures are feasible and effective, and would offset any potential take of bald or golden eagles to below a level of significance according to CEQA.

Staff notes that any take of bald or golden eagles, even if mitigated as required under CEQA, could violate the state Fish and Game Code due to the both species' status as migratory birds and fully protected species, and could violate the federal BGEPA and MBTA. Staff's conclusion regarding CEQA significance of this impact does not imply conformance with these other LORS. Staff believes that if bald or golden eagles become a covered species under the Desert Renewable Energy Habitat Conservation Plan (in preparation) or another plan meeting state requirements as a Natural Community Conservation Plan, such take could be authorized under the law.

Staff also recommends Condition of Certification **BIO-16** (Construction Phase Golden Eagle Nesting Surveys) which would require annual breeding-season surveys for golden eagle nest activity within a 10-mile radius of the project area throughout the project construction phase. If nesting activity is observed, then the project owner would implement a Golden Eagle Nest Monitoring Plan to (1) identify any evidence of project-related alterations to golden eagle behavior, and (2) specify adaptive management actions in the event that behavioral changes are observed. These surveys would serve to document golden eagle nesting activity in the area and contribute to resource agencies' understanding of the species' response to ongoing land use changes in the region.

### Swainson's Hawk

Swainson's hawk is listed as threatened under CESA and is protected as a migratory bird under the state Fish and Game Code and federal MBTA. It is included as a fully protected species under the Fish and Game Code. In California, Swainson's hawks nest in the western Mojave Desert and north, and throughout much of western North America, but do not breed in the vicinity of the proposed Rio Mesa SEGF. They over-winter in South America. Swainson's hawks migrate through the region en route between their breeding range and wintering range. Swainson's hawk was observed during migration in or near the BSA during the applicant's baseline surveys (URS 2011). The proposed project would not affect breeding habitat or winter foraging habitat, though it may have a minimal or negligible effect on foraging habitat availability during migration.

The project would create collision hazards and concentrated solar energy hazards for Swainson's hawk ("Operational Impacts to Wildlife," above). Staff believes that the Rio Mesa SEGF has the potential (albeit a low potential) to take one or more Swainson's hawks over the life of the project, due either to collision with project facilities or to injury or mortality caused by flying through concentrated solar energy over the heliostat field. Staff concludes that the take of a Swainson's hawk, should it occur, would be significant according to CEQA.

Staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring Operational Impacts to Birds and Bats) would require the project owner to prepare and implement an Eagle Conservation Plan (ECP). The ECP would specify the project owner's anticipated take (if any) of bald or golden eagles or other large raptors, including Swainson's hawk, and would require retrofitting of existing off-site electrical distribution lines to reduce electrocution risk to offset any anticipated or unanticipated take that may exceed the estimated take (even if estimated take is zero). Staff concludes that these measures are feasible and effective, and would offset any potential take of Swainson's hawk to below a level of significance according to CEQA. In addition, staff concludes that distribution line retrofitting would fully mitigate the project's impacts to Swainson's hawk according to CESA. However, staff notes that take, should it occur, could violate the California Fish and Game Code and federal MBTA, due to the Swainson's hawk's status as a migratory bird. Staff's conclusions regarding CEQA and CESA do not imply conformance with these other LORS.

### Prairie Falcon

Prairie falcons breed throughout most of California. They are uncommon year-around residents, ranging from the southeastern deserts northwest through the Central Valley and along the inner Coast Ranges and Sierra Nevada. Prairie falcons forage over perennial grasslands, savannahs, rangeland, some agricultural fields, and desert shrublands. Prairie falcon biology is much like that described above for golden eagles, except that birds comprise a much larger proportion of prairie falcon prey (Johnsgard 1990). The prairie falcon was a CDFG Species of Special Concern, but was removed from this list in 2008 in response to data indicating populations in California are stable or potentially increasing (Shuford and Gardali 2008). The prairie falcon is now on CDFG's watch list and on the USFWS list of Bird Species of Conservation Concern.

Prairie falcons were reported over the BSA and nesting in surrounding mountain ranges (BS 2011a). There is no suitable nesting habitat on the site; however, suitable prairie falcon foraging habitat occurs throughout the project site and surrounding area. The project's potential impacts to prairie falcon nesting and foraging habitat would be similar to those described above for golden eagle. The proposed project has no potential to affect prairie falcon nest sites, but would eliminate foraging habitat within range of known nesting territories.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to prairie falcon foraging habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and would compensate for habitat loss through the acquisition and management of offsite lands. Taken together, staff concludes that these conditions of certification are feasible and effective and that their implementation would reduce the project's impacts to prairie falcon foraging habitat to a level less than significant according to CEQA.

Staff's assessment and conclusions regarding the collision hazard and concentrated solar energy hazard are addressed above, under Operational Impacts to Wildlife. Staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring Operational Impacts to Birds and Bats) would require the project owner to prepare and implement an Eagle Conservation Plan (ECP). The ECP would specify the project owner's anticipated take (if any) of bald or golden eagles or other large raptors, including prairie falcon, and would require retrofitting of existing off-site electrical distribution lines to reduce electrocution risk to offset any anticipated or unanticipated take that may exceed the estimated take (even if estimated take is zero). Staff concludes that these measures are feasible and effective, and would offset any potential take of prairie falcon to below a level of significance according to CEQA. However, staff notes that take, should it occur, could violate the California Fish and Game Code and federal MBTA, due to the prairie falcon's status as a migratory bird. Staff's conclusion regarding CEQA significance of this impact does not imply conformance with these other LORS.

### Elf Owl

The elf owl is listed as endangered under CESA. The project site is near the western margin of its geographic range, though nesting has been documented near Corn Springs, more than 40 miles west of the site (Garret and Dunn 1981). Elf owls are more common and widely distributed outside of California and probably have never been common in California due to limited geographic range and generally marginal habitat. Riparian woodland in the Colorado River Valley, the elf owl's primary habitat in California, has declined and been degraded due to agricultural land use conversion and invasion by tamarisk (Gould 1987). The elf owl is also listed as a Bird of Conservation Concern (BCC) by USFWS. It is migratory, spending winters in Mexico and southward. It arrives in California by March, and its breeding period extends from April to mid-July (Gould 1987).

The elf owl is a secondary cavity nester (it nests in cavities of trees and cacti, generally in disused woodpecker nests). Its nesting habitat is closely correlated with nesting habitat of woodpeckers, including Gila woodpecker (Hardy et al. 1999; Johnsgard 2002). In Arizona, both elf owl and Gila woodpecker are best known for nesting in saguaro cacti. However, both species also nest in numerous trees, particularly riparian woodland trees such as cottonwood and willow. With one exception (below) all elf owl reports in California have been in these riparian trees, generally along the Colorado River. Farther east in their range, both species also nest in mesquite (an upland microphyll species). Gila woodpeckers nest in blue palo verde (a significant component of the microphyll woodland on the Rio Mesa SEGF site), and elf owls have been documented nesting in blue palo verde near Wiley's Well, about five miles west of the project site by Robert McKernan (Director, San Bernardino County Museum; SBCM 2012a). The blue palo verde – ironwood woodland habitat on the site may provide suitable (albeit probably marginal) habitat for nesting elf owls. Staff observed a woodpecker nesting cavity, suitable as a nest site for elf owl or other secondary cavity nesting species, in a dead ironwood limb on the project site during its visit in January 2012.

The applicant surveyed the proposed solar generator site and lands to the north (formerly proposed as part of the project site) for elf owls, using methods recommended by staff and the REAT agencies, and modified by the applicant's elf owl experts, also consultation with staff and REAT agencies. Two elf owls were heard calling on April 15, 2012, in the northern part of the survey area (outside the proposed solar generator site). Biologists returned to the area on five nights for follow-up surveys, no elf owls were detected there or elsewhere. These surveys indicate that elf owls did not nest or engage in a persistent nesting attempt within the survey area in 2012. The applicant concludes that if the two elf owls heard within the survey area had been nesting or attempting to establish a nesting territory, they would likely have been heard on subsequent visits (URS 2012c). Instead, the birds were likely migrants passing through the study area.

Take of elf owl as defined by the California Fish and Game Code would necessitate permitting under Section 2081 of the code. Staff concludes that take of elf owls or substantial habitat loss or other adverse impacts would be significant under CEQA. In some years, elf owls may nest in blue palo verde – ironwood woodland on the project site. They also may stop over in this habitat during migration, as documented by the applicant (URS 2012c). Potential impacts to elf owl would be limited to the loss of suitable, but marginal and apparently unoccupied, breeding habitat and loss of the same lands as migratory stopover habitat. Although the habitat is only marginally suitable, it is extensive (708.9 acres would be directly impacted; see **Biological Resources Table 7**) and staff concludes that this habitat loss would be significant under CEQA. In addition, the project has a low likelihood of taking elf owls or their nests if elf owls were to nest on the site during initial clearing or grading activities.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to elf owl habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands at a 3:1 ratio. In addition, staff's recommended Condition of Certification **BIO-11** would require surveys and avoidance measures to prevent destruction of bird nests during construction and operations. Taken together, staff concludes that these conditions of certification would be effective and that their implementation would avoid any potential take of elf owls according to CESA and would reduce or avoid any potential impacts to elf owls to a level less than significant according to CEQA. Staff concludes that these measures are feasible, with the possible exception of **BIO-3**. Staff is uncertain whether offset of impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible (see "Habitat Compensation," above). If 3:1 compensation for this habitat is found infeasible then the project's impacts to elf owl habitat may be significant and unavoidable. Staff's assessment and conclusions regarding the collision hazard and concentrated solar energy hazard are addressed above, under “Operational Impacts to Wildlife.” Staff notes that take, should it occur, could violate the California Fish and Game Code and federal MBTA, due to the elf owl’s status as a migratory bird. Staff’s conclusion regarding CEQA significance does not imply conformance with these other LORS.

**Western Burrowing Owl**

The burrowing owl is a BLM Sensitive Species and a CDFG Species of Special Concern. Burrowing owls and their nests are also protected under federal and state laws and regulations (see **Biological Resources Table 1**, “LORS”). The burrowing owl is a small, terrestrial owl of open country. It ranges throughout most of the western U.S. It occurs year around in southern California, but may be more numerous during fall and winter, when migratory burrowing owls from farther north join the regional resident population. Burrowing owls favor flat, open annual or perennial grassland or gentle slopes and sparse shrub or tree cover. They use the burrows of ground squirrels and other rodents for shelter and nesting. Availability of suitable burrows is an important habitat component. Where ground squirrel burrows are not available, the owls may use alternate burrow sites or man-made features (such as drain pipes or debris piles). In the California deserts, burrowing owls generally occur in low numbers in scattered populations, but they can be found in much higher densities near agricultural lands where rodent and insect prey tend to be more abundant. Burrowing owl nesting season, as recognized by the California Burrowing Owl Consortium, is February 1 through August 31 (CBOC 1993) but may vary with latitude and climate (CDFG 2012c).

Focused breeding season surveys for burrowing owls were conducted in 2011 consistent with the 1993 California Burrowing Owl Consortium protocol (CBOC 1993). Several inactive burrows were identified during the surveys, but no burrowing owls were observed in the BSA. However, 18 owl burrows showing signs of past activity were observed in the BSA but none were active at the time of focused surveys (BS 2011, BS 2012l). Two burrowing owls were observed incidentally in September, 2011; one in the center of the site, the other just off site to the east (**Biological Resources Figure 3b**). The applicant concluded these were not resident in the area. An additional burrowing owl was observed in agricultural fields approximately 0.6 mile east of the solar generator site along Bradshaw Trail. There are numerous records of burrowing owls in the agricultural lands to the east of the project area, between 1 and 10 miles from the solar generator site. Based on these field surveys and incidental observations, staff concludes that the site is suitable burrowing owl habitat year around and is regularly occupied by burrowing owls, likely during the winter but also potentially during the breeding season. Burrowing owls could nest or winter on the site in future years.

Direct project impacts to burrowing owls would include the crushing of burrows, removal or disturbance of vegetation, increased noise levels from heavy equipment, increased human presence, and exposure to fugitive dust. These impacts could cause death or injury to burrowing owls, or could cause incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Indirect impacts could include the loss or degradation of habitat due to colonization by invasive weeds and mowing of native vegetation. Operational impacts include increased human presence from maintenance personnel that would flush or otherwise disturb burrowing owls, invasive plant control activities, and vehicular use of access roads.

The applicant suggests that the two burrowing owls incidentally observed on and near the solar generator site were migrants, and that burrowing owls are not resident and do not nest on the site. Burrows showing some sign of recent activity (i.e., within the past few months) were located on site indicate that wintering or breeding owls have occupied the site. Suitable habitat is present throughout the site and burrowing owls occur in nearby agricultural areas. Based on the observations of burrowing owls and their sign on the site, the ongoing decline in burrowing owl populations throughout their range, and habitat conditions on the project site, staff concludes that impacts of the proposed project would be significant.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to burrowing owl habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands at a 3:1 ratio. In addition, staff recommends Conditions of Certification **BIO-17** to reduce impacts to burrowing owl habitat and avoid take of burrowing owls. The revised 2012 CDFG Staff Report on Burrowing Owl Mitigation (CDFG 2012c) is the most recent guidance regarding mitigation for burrowing owls, and staff incorporates elements of this guidance into **BIO-17**. To avoid take or other direct impacts to burrowing owls that might be nesting or residing within burrows in the project impact area, **BIO-17** would require the project owner to survey the site for burrowing owls; passively relocate owls that may be on the site outside the breeding season; and designate a buffer area around occupied burrows to avoid any active nests during the breeding season. Due to the extent of the project area and length of expected construction period (35 months), passive relocation could cause repeated harassment of resident owls should they try to re-establish territories within the project footprint.

In addition, **BIO-17** would require acquisition and protection of 900 acres of suitable burrowing habitat to offset the project's impacts. Compensation acreage is based on estimates of burrowing owl home range sizes and number of territories on the proposed project site. Home ranges vary widely; the mean home range for burrowing owls at Naval Air Station in Lemoore, California was estimated at about 450 acres (CDFG 2012c). For the purposes of recommending compensation lands, staff estimates that each territory encompasses approximately 300 acres. This estimate takes into consideration the wide variation of territory size and that territories likely overlap. Burrowing owls may use between one and 11 burrows, with an average of about 5, within a territory (CDFG 2012c). Based on the applicant's report of 18 previously active burrows within the BSA, staff estimates that 3 burrowing owl territories are present on site. These compensation lands may be nested within the lands acquired for desert tortoise and native vegetation; provided that those lands also meet the selection criteria for burrowing owl habitat compensation (see **BIO-17**). Although staff is concerned that adequate compensation acreage for blue palo verde – ironwood woodland may not be available (see "Summary and Conclusion of Recommended Mitigation of Impacts to Native Vegetation and Wildlife Habitat" and "Waters of the State") staff concludes that habitat impacts to burrowing owls would be mitigated to a level less than significant through upland habitat compensation.

Staff concludes that Conditions of Certification **BIO-1** through **BIO-5** and **BIO-17** are feasible and would effectively mitigate the project's impacts to burrowing owls and their habitat by minimizing overall habitat impacts, providing for monitoring and worker training, excluding owls from the project area during construction, avoiding active nesting sites, and compensating for lost habitat. With implementation of these conditions of certification, staff concludes that the project's impacts to burrowing owls would be mitigated to less than significant under CEQA. Staff's assessment and conclusions regarding the collision hazard and concentrated solar energy hazard are addressed above, under Operational Impacts to Wildlife. Staff notes that take, should it occur, could violate the California Fish and Game Code and federal MBTA, due to the burrowing owl's status as a migratory bird. Staff's conclusion regarding CEQA significance does not imply conformance with these other LORS.

### Other Special-Status Raptors

In addition to raptors discussed above, several other special-status birds of prey are found seasonally, especially during winter, or as residents in the region. These include osprey, ferruginous hawk, Cooper's hawk, sharp-shinned hawk, northern harrier, peregrine falcon, merlin, Harris hawk, short-eared owl, and long-eared owl. With the exception of short-eared owl and long-eared owl, all of these species were observed in or near the BSA during surveys. Osprey and sharp-shinned hawk were observed flying over the solar facility during winter season point count surveys, but neither species is expected to nest in the area because the project study area is outside of the breeding range and there is no nesting habitat present on or near the proposed solar facility site. Outside their breeding seasons, these raptors need not return to their nests to feed young or tend eggs. Thus, they are able to forage over wide areas, where they capture birds, reptiles, or small mammals. Suitable winter or migratory season foraging habitat for all of these raptors, and breeding season foraging for residents, is widely available throughout the region. Due to the larger foraging ranges and greater behavioral flexibility of raptors outside the breeding season, staff concludes that the project's adverse impacts to foraging habitat for wintering and migratory raptors would be less than significant.

All of these species may be vulnerable to operations impacts of the proposed project, including collision with heliostats or other project facilities and injury or mortality from exposure to concentrated solar energy. Staff's description of collision and concentrated solar energy hazards are provided above, under "Operational Impacts to Wildlife."

Take, if any, of large raptor species can be offset through retrofitting of distribution lines that present electrocution hazards to large birds. Staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring Operational Impacts to Birds and Bats) would require the project owner to prepare and implement an Eagle Conservation Plan (ECP). The ECP would specify the project owner's anticipated take (if any) of bald or golden eagles or other large raptors, including osprey, ferruginous hawk, Harris' hawk, northern harrier, and peregrine falcon, and would require retrofitting of existing off-site electrical distribution lines to reduce electrocution risk to offset any anticipated or unanticipated take that may exceed the estimated take (even if estimated take is zero). Staff concludes that these measures are feasible and effective, and would offset any potential take of large raptors to below a level of significance according to CEQA.

Smaller special-status raptors are less vulnerable to power line electrocution and staff concludes that distribution line retrofitting would not mitigate take, if any, of those birds. The smaller special-status raptors of the area are Cooper's hawk, sharp-shinned hawk, merlin, short-eared owl, and long-eared owl. For these species, staff assessment and conclusions regarding the collision and concentrated solar energy hazards are provided above, under "Operational Impacts to Wildlife."

Staff notes that take of any special-status raptors, could violate the California Fish and Game Code and federal MBTA, due to the these species' status as migratory birds. In addition, the peregrine falcon is fully protected under the state Fish and Game Code and take (as defined by the Code) may violate regulations providing fully protected status. Staff's conclusion regarding CEQA significance does not imply conformance with these other LORS.

**Gila Woodpecker**

The Gila woodpecker is listed as endangered under CESA but has no status under the federal ESA. It is identified as a bird species of conservation concern by the USFWS. Its geographic range is generally in southern Arizona and southward into Baja California and western mainland Mexico. It occupies this range year around (i.e., it is not migratory). In California, the Gila woodpecker is known from riparian forests along the Colorado River and from desert wash woodlands in Imperial County. It excavates cavity nests in large riparian trees such as cottonwoods and (in upland habitats) saguaro cacti, and feeds largely on insects, mistletoe berries, and cactus fruits. Its primary habitat is cottonwood-willow riparian woodland, but it also uses thickets of other desert trees (e.g., desert ironwood), as well as upland habitats, especially outside the breeding season. Desert ironwood is generally too dense for nest excavation (though staff observed a woodpecker cavity in a dead ironwood limb on the site in January 2012). Where Gila woodpeckers occur in dry desert wash woodlands, they reportedly excavate cavity nests in large blue palo verde trees rather than ironwood. In suburban habitats, they nest in ornamental trees including athel (*Tamarix aphylla*), eucalyptus, and palms. Availability of suitable nesting trees is apparently a limiting factor in breeding habitat suitability.

There were six observations of Gila woodpeckers during the spring 2011 surveys in the BSA (**Biological Resources Figure 3b**), though proximity of incidental observations to point count surveys suggest that one or more birds may have been observed multiple times. Based on an estimate of 0.8 birds per square kilometer in similar habitat (Emlen 1974), the applicant has determined there is sufficient suitable nesting habitat on site to support up to four nesting pairs. While no nests were observed, their residential status indicates that Gila woodpeckers nested the palo verde-ironwood woodland during 2011 (BS 2011). The applicant conducted focused surveys throughout blue palo verde – ironwood woodland in the 2012 nesting season, and reported no Gila woodpecker observations. USFWS staff observed a Gila woodpecker on the site during a field visit in January 2012.

Take of Gila woodpecker as defined by the California Fish and Game Code would necessitate permitting under Section 2081 of the Code. Staff concludes that take of Gila woodpeckers or substantial habitat loss or other adverse impacts would be significant under CEQA. In some years, Gila woodpeckers apparently nest in blue palo verde –

ironwood woodland on the project site (BS 2011). Project impacts to Gila woodpecker would be the loss of 708.9 acres of suitable and intermittently occupied breeding habitat. Staff concludes that this habitat loss would be significant under CEQA. In addition, the project could take Gila woodpeckers or their nests if Gila woodpeckers were to nest on the site during initial clearing or grading activities.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to Gila woodpecker habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands at a 3:1 ratio. In addition, staff's recommended Condition of Certification **BIO-11** would require surveys and avoidance measures to prevent destruction of bird nests during construction and operations. Taken together, staff concludes that these conditions of certification would be effective and that their implementation would avoid any potential take of Gila woodpeckers according to CESA and would reduce impacts to Gila woodpeckers to a level less than significant according to CEQA. Staff concludes that these measures are feasible, with the possible exception of **BIO-3.** Staff is uncertain whether offset of impacts to blue palo verde – ironwood woodland at the recommended 3:1 ratio will be feasible (see "Habitat Compensation," above). If 3:1 compensation for this habitat is found infeasible then the project's impacts to Gila woodpecker habitat may be significant and unavoidable. Staff's assessment and conclusions regarding the collision hazard and concentrated solar energy hazard are provided above, under Operational Impacts to Wildlife. Staff notes that take, should it occur, could violate the California Fish and Game Code and federal MBTA, due to the Gila woodpecker's status as a migratory bird. Staff's conclusion regarding CEQA significance does not imply conformance with these other LORS.

### Special-Status Desert Shrubland Passerine Birds

Several special-status upland perching bird species are present or have the potential to occur in the BSA (see **Biological Resources Table 5**). Year-around or breeding season resident species observed during the applicant's surveys include loggerhead shrike, brown-crested flycatcher, horned lark, Le Conte's thrasher, Crissal thrasher rufous-crowned sparrow, and Lucy's warbler. Any of these special-status shrubland species, except perhaps brown-crested flycatcher, may nest on the site.

Loggerhead shrikes are uncommon residents throughout most of the southern portion of their range, including southern California. In southern California they are generally more common in interior desert regions than along the coast (Humple 2008), though breeding bird survey data indicate a significant population decline in the Colorado Desert. They are found in lowland, open habitats where suitable perches are present (e.g., trees or shrubs or, where these are absent, fence posts or other substitutes). In general, loggerhead shrikes prey upon large insects, small birds, amphibians, reptiles, and small rodents, usually impaling prey on thorns, wire barbs, or sharp twigs to cache for later feeding (Yosef 1996).

The Crissal thrasher occurs throughout the Colorado Desert and much of the east Mojave Desert. It typically inhabits dense brush along desert washes, mesquite thickets, and low-desert chaparral. It is often found in desert riparian habitats, such as along the Colorado River, where its habitat is threatened by land use conversion and possibly by invasive species such as tamarisk (Fitton 2008a). It is secretive and patchily distributed in California.

Le Conte's thrashers inhabit some of the hottest and driest habitats in the arid southwest, including the deserts of southeastern California where they occur year-around. Its preferred habitats include sparse desert scrub, alkali desert scrub, and desert succulent scrub. Habitats generally are on gentle to rolling slopes near dry desert washes, such as found in the project area. Nests are typically placed in prickly vegetation such as cacti or thorny shrubs (Sheppard 1996). Le Conte's thrasher population densities are among the lowest of passerine (perching) birds, estimated at fewer than five birds per square kilometer in optimal habitats (Fitton 2008b). Due to this low population density, Le Conte's thrashers often are not detected during field surveys, even on sites where they are present.

Black-tailed gnatcatchers generally nest in mesquite thickets or desert riparian scrub (e.g., in smoke tree or catclaw acacia). They were not reported on the project site though suitable habitat is present. It is considered common in the lower Colorado River watershed (most of Arizona and easternmost California; Rosenberg et al. 1991). Staff believes that it may occur year-around on or adjacent to the project site.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to nesting bird habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. In addition, staff's recommended Condition of Certification **BIO-11** would require surveys and avoidance measures to prevent destruction of bird nests during construction and operations. Taken together, staff concludes that these conditions of certification are feasible and effective and that their implementation would avoid any potential take of these species according to the California Fish and Game Code and would reduce impacts to their habitat to a level less than significant according to CEQA. Staff's assessment and conclusions of the project's potential collision hazard and concentrated solar energy hazard for these species is presented above, under Operational Impacts to Wildlife. Staff notes that take, should it occur, could violate the California Fish and Game Code and federal MBTA, due to the these species' status as migratory birds. Staff's conclusion regarding CEQA significance does not imply conformance with these other LORS.

### Special-Status Migratory and Wintering Birds

Species observed on and around the project site during winter or migration include greater sandhill crane, bank swallow, willow flycatcher, American white pelican, Vaux's swift, and yellow-headed blackbird (BS 2011). In general, these species are not expected to use the site for foraging or resting during migration or winter seasons. However, they are likely to fly over or near the site either during migration through the area or during shorter flights among regional wetland habitats, including wildlife refuges at the Salton Sea and along the Colorado River, several miles from the project site. Bank swallows are aerial foragers that may forage opportunistically on the project site during migration. The conservation status for each can be found in **Biological Resources Table 5**. The project's habitat impacts are not expected to meaningfully affect these species. Staff's assessment and conclusions of the project's potential collision hazard and concentrated solar energy hazard for these species is presented above, under Operational Impacts to Wildlife. Staff will continue coordinating with the applicant and resource agencies to review any potential for off-site habitat protection and enhancement, particularly in wetland areas and wildlife refuges, where habitat expansion or improvement may offset anticipated loss of migrating or overwintering birds. The greater sandhill crane, bank swallow, and willow flycatcher are state-listed species, and the greater sandhill crane is fully protected under the state Fish and Game Code; therefore mortality or other take (as defined in the Code) may violate CESA and the regulations for fully protect species. Staff's conclusion regarding CEQA significance does not imply conformance with these other LORS.

Staff is considering the possibility that installing bird flight diverters on project-related and existing power lines in the vicinity of the Colorado River would minimize and offset potential take of sandhill cranes associated with the Rio Mesa SEGF, as flight diverters have reduced power line collision mortality for this species in some studies (Murphy et al. 2009).

## Special-Status Mammals

### Nelson's Bighorn Sheep, Burro Deer, and Yuma Mountain Lion

None of these three species are listed as threatened or endangered species, nor are they considered to be at high risk of extirpation. Nelson's bighorn sheep and Yuma mountain lion are CDFG Species of Special Concern. All three species have high public interest and management priority.

Nelson's bighorn sheep, one of three recognized subspecies, are known from the Transverse Ranges, California Desert Ranges, Nevada, northern Arizona, and Utah. Threats to Nelson's bighorn sheep include habitat loss or degradation; barriers to local or regional movement; and competition for water with burros and livestock (BLM et al. 2005). Disease spread by domestic livestock has also impacted bighorn sheep in the California desert and continue to threaten populations (BLM and CDFG 2002). Small, isolated populations are at risk of unsustainable predation by mountain lions. Bighorn sheep are typically found on open, rocky, steep areas used for escape cover and shelter, with available water and herbaceous vegetation for forage. But they also use bajada and desert wash habitat for foraging (desert wash species generally provide more protein than creosote bush). Surface water is an essential habitat component for Nelson's bighorn sheep. They congregate near dependable water sources during the dry season (Beacham 2000). Females tend to choose particularly steep, safe areas for bearing and initial rearing of lambs. Alluvial fan areas are also used for breeding and feeding (Beacham 2000). In the California deserts, Nelson's bighorn sheep are found in partially isolated, localized populations associated with particular mountain ranges. Conservation and management of habitat corridors are addressed under Wildlife Movement, below.

The proposed Rio Mesa SEGF site is on a bajada at the base of the Mule Mountains. Bighorn sheep can be expected to forage on the site and to cross it for access to water in agricultural lands to the east.

The burro deer (also known as the desert mule deer) is a subspecies of mule deer endemic to southeastern California, through southern Arizona and New Mexico, and desert regions of mainland Mexico (Mackie et al. 2003). Burro deer tend to have larger home ranges than mule deer in other areas, probably because food and water are relatively scarce, necessitating longer travel among foraging and watering sites. Their habitats include desert mountain ranges, bajadas, and flats. The mountainous areas provide favored fawning habitat and, often, more reliable water sources (springs and bedrock sinks) than the flats (Fox and Krausman 1994). Dense vegetation is an important habitat element year-round for shaded cover and protection from predators (Tull et al. 2001). Burro deer generally drink daily during summer. Thus their summer range is limited to areas within a few kilometers of water sources. The proposed project site is on a lower bajada where abundant shaded cover is available in the blue palo verde – ironwood woodlands, and water is available at irrigated agricultural lands about a mile away. Thus, staff believes that the project site is likely to serve as important burro deer habitat, particularly during summer.

The Yuma mountain lion is recognized by some authors, but not all, as a distinct subspecies of the widespread North American mountain lion (Pierce and Bleich 2003). Interpretations of its geographic range vary, but by any account it is limited to the Colorado Desert in southern California and perhaps east into Arizona and south into Mexico (Kucera 1998). The Yuma mountain lion's life history is poorly documented. It is known largely from the bottomlands and foothills of the Colorado River Valley. Its principal prey are burro deer and bighorn sheep, described above and its range and habitat generally coincide with theirs (Cashman et al. 1992). Mountain lions are rare in the lower Colorado River Valley. For example, Germaine et al. (2000) were able to confirm sign of only three individuals during 687 person-days of field survey effort in southwestern Arizona. There is some concern that the Colorado Desert region may not support a viable mountain lion population, and that lions found in the eastern low desert have dispersed there from surrounding areas. Habitat loss is a serious concern for Yuma mountain lion, for two reasons. First, declining habitat availability and increasing habitat fragmentation affect its long-term population viability. Second, as habitat loss and fragmentation affect burro deer and bighorn sheep, any reduction of the available prey could lead to an insufficient prey base for a viable mountain lion population (Kucera 1998). Yuma mountain lion are likely to occasionally use habitat on the site for hunting and as a movement corridor among regional mountain ranges (see "Wildlife Movement," below).

The Rio Mesa SEGF project site provides suitable cover and foraging habitat for Nelson's bighorn sheep, burro deer, and Yuma mountain lion. All three species would be expected occasionally on the project site. All three species require regular access to drinking water, especially during summer, and may cross the site to reach irrigation water to the east. An important threat to all three species is the reduced opportunity for movement among isolated desert mountain ranges and (for Yuma mountain lion) the Colorado River corridor (see "Wildlife Movement," below).

Loss of habitat is likely to significantly affect Nelson's bighorn sheep, burro deer, or Yuma mountain lion in the area. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. Staff concludes that the project's impacts to habitat for these three species would be reduced below a level of significance by implementing these measures. Potential project impacts to regional wildlife movement for these and other species are addressed under "Wildlife Movement," below.

**American Badger and Desert Kit Fox**

The American badger is uncommon throughout most of the state, including the Colorado Desert. It is a CDFG Species of Special Concern. Badger numbers have declined in California due largely to agricultural and urban development, direct and secondary poisoning, and shooting and trapping for control (Williams 1986), though these factors probably have not been important threats to badgers in the Colorado Desert. They are found in open shrubland, forest, and herbaceous habitats with friable soils. In the deserts, badgers are typically found in creosote bush and sagebrush shrublands. They drink surface water where available but apparently do not require drinking water (Laudenslayer and Parisi 2007). Badgers are fossorial, digging large burrows in dry, friable soils. They have several dens within their home range and may move among them daily, or may use a den for a few days at a time (Sullivan 1996). Cover burrows are an average of 30 feet in length and are approximately 3 feet deep. Natal dens are larger and more complex than cover dens. In general, home ranges are several hundred acres in size, though they would likely be larger in the Colorado Desert due to low prey densities. American badger is known from the project site (BS 2011) and expected to occur uncommonly throughout the site.

Potential direct impacts to American badger include mechanical crushing of animals or burrows by vehicles and construction equipment, noise, dust, and loss of habitat. The tortoise exclusion fence could entrap badgers that are on the site when the fence is built. Animals trapped within the fence would almost surely die from direct or indirect effects of project construction (e.g., vehicle strike, inability to find sufficient food or thermal cover). Potential indirect and off-site impacts include construction and operational noise and disturbance, impediments to local or regional movement, alteration in prey base, introduction or spread of invasive plants, and risk of mortality by vehicle strikes.

Desert kit foxes are primarily nocturnal, and inhabit open level areas with patchy shrubs and soils suitable for digging and supporting dens. They use dens throughout the year for cover, thermoregulation, water conservation, and rearing pups. Kit foxes typically produce one litter of about four pups per year, with most pups born February through April (Ahlborn 2000). Estimates of kit fox home range size vary widely, and population densities fluctuate drastically depending on the prey availability, predation pressures, and other factors (Zoellick and Smith 1992; White and Garrott 1999; Arjo et al. 2003). In addition, many kit fox home ranges overlap considerably, often by 20 percent or more (Zoellick and Smith 1992). There has been an outbreak of canine distemper among desert kit foxes in the region.

Desert kit fox occurs on the Rio Mesa project site. The applicant reported 193 den complexes on the site (BS 2011), though it is not clear how many of the den complexes were active or how many kit foxes (single adults, paired adults, or family groups) inhabit the site. The desert kit fox is designated as a furbearer and, under Title 14 Section 460 of the California Code of Regulations, “may not be taken at any time.” The California Fish and Game Code defines “take” as to “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill” (§ 1-89.1). The CDFG does not issue Incidental Take Permits or Memoranda of Understanding to permit the capture or handling of desert kit fox.

The project has the potential to take desert kit fox during construction, operation, or decommissioning (e.g., by vehicle strikes or crushing or entrapment within burrows). The project’s security fence and tortoise exclusion fence are expected to entrap desert kit foxes within the fenced area; these animals would almost surely die from direct or indirect effects of project construction (e.g., vehicle strike, inability to find sufficient food or thermal cover). In order to avoid take, desert kit foxes should be relocated from the project site using “passive relocation” methods prior to initial site preparation activities. These methods are intended to force the animals to disperse from the project site, without capturing or handling them. Although passive relocation introduces some risk of mortality to kit foxes (e.g., if they are unable to find adequate food or shelter off-site), CDFG does not interpret properly implemented passive relocation as take pursuant to statute.

Passive relocation is implemented by excluding desert kit foxes from their burrows. If a burrow has been inactive for several days, it may be collapsed and compacted (to prevent the animals from rebuilding it). An active burrow (without pups) can be closed with one-way doors, preventing the adult animals from returning to it. Planning for effective passive relocation must take into consideration the numbers and locations of desert kit foxes on a project site, the size of the site, and the likely areas where the animals may establish new territories off-site. Passive relocation may be problematic for several reasons, including (but not limited to) the following:

- effective passive relocation is labor-intensive, time consuming and logistically challenging. Careful advance planning is needed, including baseline information on the numbers of desert kit foxes on the site; locations of active and alternate burrows; availability of field staff, supplies, and equipment; and seasonality (particularly breeding season);
- to avoid direct mortality of pups, passive relocation must be scheduled during seasons when young are no longer in dens or highly dependent on parents, or while females may be pregnant;
- desert kit foxes will attempt to return to project sites after passive relocation, (e.g., by digging under security fencing);
- on large sites, desert kit foxes excluded from one portion of the site may attempt to establish a new home range still within the project area boundaries. Forcing them to leave a large project area may require further planning;
- desert kit fox home range sizes are approximately 1-2 square miles; knowledge of suitable den availability outside the project area but (preferably) within the animals’ existing home ranges will be needed to plan successful passive relocation. Depending on resource availability and numbers of kit foxes in the surrounding area, the kit foxes excluded from the project area may need to travel extensively to locate new home ranges;

- management efforts such as construction of replacement burrows to provide off-site shelter and maximize likelihood of survival may be applicable, but also would have ground disturbing impacts (i.e., trenching for burrow construction) that would need to be analyzed in the FSA; and
- passive relocation has the potential to worsen the regional canine distemper virus outbreak in desert kit foxes, by either raising stress levels and causing increased susceptibility to infection, or causing increased movement of diseased animals, thereby increasing the spread of disease into new areas.

Staff believes that these factors will likely necessitate analysis and management efforts beyond those incorporated for prior projects in the area. The recent canine distemper outbreak along the Interstate 10 corridor near the proposed project area makes the issue of relocation or potentially infected kit foxes of particular concern.

The applicant has prepared a Draft Desert Kit Fox Management Plan (URS 2012: Applicant's Response to Data Requests, Set 2A [Nos. 155-172]) to develop its analysis of potential project impacts to desert kit fox. Staff is reviewing the plan and will provide comments and request revisions, if necessary.

Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. Staff's proposed Condition of Certification **BIO-18** would require the project owner to prepare and implement a Desert Kit Fox and American Badger Management Plan to passively exclude any desert kit foxes or American badgers from all work sites prior to any ground-disturbing project activity at each site. The plan would be subject to review and approval by the Energy Commission compliance project manager (CPM) in consultation with CDFG, BLM and USFWS. The plan would require describing all methods that may be used for desert kit fox and American badger passive relocation, including the components listed below. For kit foxes or badgers within 250 feet of project facilities, utility corridors, and access roads, the project owner would be required to minimize impacts, observe buffer areas around the burrows, and monitor work activities in the area. Female kit foxes or badgers with young would not be directed off-site until the young are ready to leave the dens. Staff concludes that implementation of these conditions would avoid take of American badger or desert kit fox and would offset the loss of habitat for desert kit fox and American badger by providing protection and enhancement for suitable habitat, as well as minimize habitat loss and other disturbance to desert kit fox and American badger. Implementation of these conditions of certification would reduce impacts to these species to less than significant levels under CEQA.

### Colorado Valley Woodrat

Colorado Valley woodrats are found in arid regions of southwestern Arizona and extreme southeastern California (Ingles 1965). Their habitats include creosote bush and other arid shrublands and cactus flats in desert areas. Dens are usually constructed of cactus pads and woody material from trees and shrubs; they may also nest in rock crevices or burrows under boulders (Mares 1999). In California, this woodrat is generally found in dense patches of beavertail cactus (*Opuntia basilaris*) or mesquite (*Prosopis* spp.) (Williams 1986), and often digs burrows under mesquite trees (Ingles 1965). Colorado Valley woodrat is not listed or proposed for listing as threatened or endangered and is not ranked as a species of special concern by CDFG. Williams (1986) reported no evidence indicating that it was threatened and no Colorado Valley woodrat account is included in a more recent compilation of California mammals of special concern or watch list (Bolster 1998). However, the CDFG status S1S2 indicates that Colorado Valley woodrat distribution is very restricted in California, possibly to the point of endangerment. No dense stands of mesquite or beavertail cactus were noted on the project site and the probability that Colorado Valley woodrat may occur on the site is low. However, suitable habitat is found off-site in mesquite bosque habitat. Groundwater pumping for the project has the potential to adversely affect this habitat (see "Hydrology and Groundwater Dependent Vegetation," above).

Staff's recommended Condition of Certification **BIO-8** (Desert Dry Wash Woodland Monitoring Plan and Off-site Impact Compensation) is recommended to minimize project impacts to off-site groundwater dependent vegetation (see "Mitigation of Impacts to Native Vegetation and Wildlife Habitat," above). It would require the project owner to monitor groundwater levels and plant health and vigor in adjacent desert dry wash woodland and mesquite bosque areas; if plant stress or mortality occurs and is determined to be related to project activities, then the project owner shall either refrain from pumping, reduce pumping to allow for recovery of the groundwater table, or provide additional habitat compensation as described in staff's recommended Condition of Certification **BIO-3.** Staff concludes that implementation of this condition is feasible and effective, and would identify and mitigate any adverse project impacts to Colorado Valley woodrat habitat to a level that is less than significant according to CEQA.

### Special-Status Bats

Knowledge of bat distributions and occurrences is sparse. Several special-status bats (pallid bat, western mastiff bat, western red bat, California leaf-nosed bat, pocketed free-tailed bat, big free-tailed bat, cave myotis and Townsend's big-eared bat) could use the site for foraging. Four of these species, pallid bat, pocketed free-tailed bat, western red bat, and western mastiff bat, were detected on the site during spring 2012 acoustic monitoring for bats. Two others, California leaf-nosed bat and cave myotis, were not detected on-site, but are expected to occur there due to the proximity of roosts in the Roosevelt and Hodge mines to the west (URS 2012d).

Roosting habitat for special-status bats varies by species, but most regional special-status bats roost in habitats not available on the project site, such as caves, tunnels, buildings, crevices, or crevices in cliffs and rock outcrops (see **Biological Resources Table 5**). The majority of adverse impacts to bat populations in the region result from disturbance of roosting or hibernation sites, especially where large numbers of bats congregate; physical closures of old mine shafts, which eliminates roosting habitat; elimination of riparian or desert wash microphyll vegetation which is often productive foraging habitat; more general habitat loss or land use conversion; and agricultural pesticide use which may poison bats or eliminate their prey-base (Pierson & Rainey 1998; Gannon 2003).

Bat life histories vary widely. Some species hibernate during winter, or migrate south. During the breeding season, bats generally roost during the day, either alone or in communal roost sites, depending on species. All bats addressed in **Biological Resources Table 5** are insectivorous, catching their prey either on the wing or on the ground. Some species feed mainly over open water where insect production is especially high, but others forage over open shrublands such as found on the project site. No special-status bats are expected to roost on-site, but several species could forage over the site or fly across the site en route between roosting areas in the Mule Mountains to agricultural lands to the east.

Project construction would significantly impact special-status bats through the elimination of desert shrubland foraging habitat, especially the 708.9 acres of blue palo verde – ironwood woodland. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands, including offset for blue palo verde – ironwood woodland at a 3:1 ratio. Staff concludes that these measures would effectively mitigate habitat impacts for special-status bats. Staff also concludes that the measures are feasible, with the possible exception of **BIO-3.** Staff is uncertain whether offset of impacts to blue palo verde – ironwood woodland at the recommended 3:1ratio will be feasible (see "Habitat Compensation," above). If 3:1 compensation for this habitat is found infeasible then the project's impacts to special-status bat habitat may be significant and unavoidable.

## WILDLIFE MOVEMENT

The extent, distribution, and accessibility of suitable habitat affect the long-term viability of regional wildlife populations. Fragmentation and isolation of natural habitat leads to a loss of some native species within the fragmented landscape (Soulé et al. 1988). Wildlife movement among habitat areas is important to long-term genetic variation and demography. In the short term, it may also be important to individual animals' ability to occupy their home ranges, if their ranges extend across a potential movement barrier. These considerations are especially important for rare, threatened, or endangered species such as the desert tortoise, and uncommon wide-ranging species such as large mammals. Therefore, this discussion of potential project impacts to wildlife movement focuses on desert tortoise and large mammals, especially burro deer.

In landscapes where native habitats exist as partially isolated patches surrounded by other land uses, planning for wildlife movement generally focuses on "wildlife corridors" to provide animals with access routes among habitat patches. In largely undeveloped areas, wildlife habitat is available in extensive open space areas throughout the region, but specific linear barriers may impede or prevent movement. In these landscapes, wildlife movement planning focuses on sites where animals can cross linear barriers, but may not emphasize linear corridors among habitat areas.

The Palo Verde Mesa is an extensive and intact landscape between the Mule Mountains to the west and the irrigated agricultural lands to the east. Animals are now able to move freely throughout the area, and to move between the mountains and water sources in the agricultural lands. With development of the project, movement and dispersal habitat for terrestrial wildlife across the solar generator site would be eliminated. Movement north and south across the mesa would be limited to steeper foothill slopes to the west and to the flat lands between the project's eastern boundary and the irrigated agricultural lands approximately one mile to the east. Movement opportunities east and west, between the mountains and the irrigated lands, would be eliminated along the approximately 2.5 mile length of the project, but would not be obstructed in an extensive wash immediately south of the proposed solar generator site, or along the gen-tie alignment to the north.

Desert tortoises and other less-mobile animals may live out their entire lives within a "corridor" area between larger habitat blocks; for these species, movement among habitat regions may take place over the course of several generations (Beier and Loe 1992). The Rio Mesa SEGF would impede tortoise movement north to south across the mesa. More limited movement habitat would remain in place east and west of the project site. More important to long-term desert tortoise conservation, habitat to the north of the site is constrained to the north by existing lands uses in the I-10 corridor. Due to its location, the project would not interfere with important movement corridors for desert tortoise genetic exchange or demography. The proposed project site is not located between designated critical habitat units or Desert Wildlife Management Areas (BLM and CDFG 2002).

Larger and more mobile animals such as Nelson's bighorn sheep, burro deer, and Yuma mountain lion may travel east and west across the valley regularly, as a part of daily or seasonal movement patterns. The proposed project would adversely affect east-west movement habitat for these species, and would likely cause animals to change their movement routes between the mountains and irrigated lands. These large mammals are wide-ranging by their nature, and staff believes that local populations would adapt to the changed land use.

Staff concludes that the project would adversely affect wildlife movement in the Palo Verde Mesa, for desert tortoises and other "corridor dweller" species and for wide-ranging large mammals. However, staff concludes that this impact would be less than significant according to CEQA.

## FACILITY CLOSURE AND DECOMMISSIONING

When the facility is closed, whether planned or unexpected, it must be done so that it protects the environment and public health and safety. A closure plan would be prepared by the project owner prior to any planned closure. To address unanticipated facility closure, an "on-site contingency plan" would be developed by the project owner and approved by the Energy Commission CPM. Facility closure requirements are discussed in more detail in the **General Conditions** section of this PSA – Part A. Facility closure mitigation measures would also be included in the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) prepared by the project owner and described in staff's proposed Condition of Certification **BIO-2.**

The AFC does not specify site closure plans, but indicates that "a decommissioning plan will be submitted to the CEC for approval prior to decommissioning." Upon decommissioning, reclamation will be necessary to prevent adverse effects such as erosion, dust, invasion and spread of weeds, and hazards to wildlife from abandoned project infrastructure. Staff concludes that these potential effects of facility closure and decommissioning would be a significant. Decommissioning activities are likely to cause soil disturbance and weed infestation as described above for the construction and operation phases of the proposed project. If weed control is halted upon decommissioning then the site is likely to become wholly infested with invasive weeds which then would propagate and spread further beyond the project boundaries into surrounding undisturbed desert lands. Staff's recommended Condition of Certification **BIO-7** (Integrated Weed Management Plan) would require the project owner to continue implementation of the weed management plan throughout the closure phase and a follow-up monitoring period; and recommended Condition of Certification **BIO-20** (Facility Closure, Revegetation, and Reclamation Plan and Financial Security) would require revegetation or reclamation of the project site after closure to prevent weed invasions and other adverse impacts on the decommissioned solar generator site and gen-tie alignment. Staff anticipates that these measures may reduce impacts from facility closure and decommissioning to less than significant, and will provide a conclusion upon reviewing the applicant's draft plan and calculation of proposed financial security.

Staff notes that the project's impacts to native vegetation and habitat, as well as several special-status biological resources, would be mitigated to levels less than significant though staff's recommended **Conditions of Certification BIO-1** through **BIO-19**, including several conditions that would require compensation lands to offset habitat impacts. The recommended mitigation for on-site significant impacts of facilities closure is not intended to restore native vegetation or wildlife habitat conditions to pre-disturbance conditions. Instead, **BIO-20** is intended to prevent the site from becoming a source of dust or invasive weeds, and prevent further site degradation due to erosion or invasion by weeds. Staff anticipates that the Facility Closure, Revegetation, and Reclamation Plan will focus on dust and erosion control, and on revegetation using fast-growing native species such as rabbitbrush, cheesebush, bunchgrasses, and similar early-successional species to reestablish native vegetation cover.

In addition, **BIO-20** would require that the facility closure plan provide for revegetation or reclamation to be implemented in the event of a planned or an unexpected permanent closure and must also include financial security to ensure sufficient funds are available for decommissioning and habitat restoration. Planned or unexpected permanent facility closure must also provide for the removal of the transmission conductors and poles to minimize bird collisions and raven nest or perch sites. In order to fully evaluate whether the Facility Closure, Revegetation, and Reclamation Plan and Financial Security will reduce this impact below a level of significance, staff will need to review a draft plan prior to completing its analysis for the FSA, and staff requests that the applicant prepare and submit a draft plan, including its estimate of the necessary financial security to implement the plan.

## CUMULATIVE IMPACTS

"Cumulative" impacts refer to a proposed project's incremental effect viewed over time together with other closely related past and present projects and projects in the reasonably foreseeable future whose impacts may compound or increase the incremental effect of the proposed project (Public Resources Code Section 21083;

California Code of Regulations, Title 14, Sections 15064[h], 15065[c], 15130, and 15355). The following subsections present a definition of the geographic extent within which cumulative impacts are analyzed and an analysis of the project's potential incremental effects when combined with other past, present, and future projects.

The standard for a cumulative impacts analysis is defined by the use of the term "collectively significant" in the CEQA Guidelines section 15355; the analysis must assess the collective or combined effect of development. Cumulative impact assessments cannot conclude that contributions to cumulative impacts are not significant because the contributions represent a small percentage of the overall problem. Doing so could improperly omit facts relevant to an analysis of the collective effect that the project and other related projects would have upon biological resources. The result could be approval of projects based on an analysis that avoided evaluating the severity of impacts which, when taken in isolation appear insignificant, but when viewed together appear significant.

## GEOGRAPHIC EXTENT

The geographic scope of staff's preliminary analysis of cumulative effects to biological resources encompasses the NECO planning area and makes a broad, regional evaluation of the impacts of reasonably foreseeable future projects that threaten native vegetation and special-status species in the Colorado Desert region west of the Colorado River. For some biological resources, a different geographic scope was warranted, such as the use of watershed boundaries to analyze cumulative effects to desert washes. The specific geographic scope is identified for each resource analyzed below under the subsection "Analysis of Cumulative Effects to Biological Resources."

## EXISTING CUMULATIVE CONDITIONS

Over the past two hundred years, California's southern deserts have been subject to major human-induced changes that have threatened native plant and animal communities by habitat loss, fragmentation, and degradation. Some of the most conspicuous threats are those activities that have resulted in large-scale habitat loss due to urbanization, agricultural uses, landfills, military operations, and mining activities, as well as activities that fragment and degrade habitats such as roads, off-highway vehicle activity, recreational use, and grazing (Berry et al. 1996; Boarman and Sazaki 2006; Avery 1997; Jennings 1997). In addition, these development pressures facilitated the introduction of non-native plant species and increases in predators such as ravens, which contribute to population declines and range contractions for many special-status plant and animal species (Boarman 2002).

## PROJECTS CONTRIBUTING TO CUMULATIVE EFFECTS TO BIOLOGICAL RESOURCES

Past and present projects in the Palo Verde Mesa and Valley and adjacent areas in the Colorado Desert that have contributed to cumulative impacts to biological resources found in the project study area include:

- conversion of natural communities for agriculture and groundwater pumping for irrigated agriculture during the last century, fragmenting and isolating populations;

altering surface drainage patterns (dispersal pathways) and surface and groundwater hydrology; and introducing agricultural weeds into the local ecosystem;

- development of military installations and military training activities;
- past and present residential, commercial, institutional, and industrial development in the Palo Verde Mesa and Valley environs, fragmenting populations, increasing the risk of fire, off-road vehicles, and the spread of invasive plants;
- construction of highways and other roads, modifying surface runoff patterns and acting as vectors for the spread of invasive plants;
- transmission corridors, another common vector for weed spread; and
- BLM grazing allotments (sheep and cattle grazing), which also contributed to the spread of invasive weeds, particularly red brome and cheat grass.

Reasonably foreseeable future actions that are expected to contribute to cumulative impacts are identified in **Executive Summary Table 1** in the **Executive Summary** section of PSA – Part A, and include the following large-scale projects in the general vicinity of the Rio Mesa SEGF:

- Desert Quartzite (solar PV project on 7,724 acres; 8 miles from Rio Mesa SEGF);
- Colorado River Substation Expansion (10 miles from Rio Mesa SEGF);
- Mule Mountain Solar Project (2,684 acres; 15 miles from Rio Mesa SEGF);
- Blythe Airport Solar I Project (640 acres; 20 miles from Rio Mesa SEGF);
- NextEra (FPL) McCoy (7,700 acres on BLM land and 470 acres on private land with a 16-mile gen-tie; 22 miles from Rio Mesa SEGF);
- McCoy Soleil Project (1,959 acres and 14-mile gen-tie; 24 miles from Rio Mesa SEGF);
- Blythe Solar Power Project (7,540 acres; 25 miles from Rio Mesa SEGF);
- Big Maria Vista Solar Project (2,684 acres; 25 miles from Rio Mesa SEGF);
- Devers-Palo Verde No. 2 Transmission Line Project (New 500 kV transmission line parallel to the existing Devers-Palo Verde Transmission Line from Midway Substation, approximately 10 miles southeast of Blythe, to the SCE Devers Substation, near Palm Springs);
- Desert Southwest Transmission Line (118 mile 500 kV transmission line from a new substation/switching station near the Blythe Energy Project to the existing Devers Substation located approximately 10 miles north of Palm Springs);
- Genesis Solar Energy Project (1,950 acres, under construction; 30 miles from Rio Mesa SEGF);
- Additional renewable energy developments over 30 miles from the project site;
- Residential and commercial developments within 20 miles of the project site; and
- Infrastructure development associated with urban expansion and renewable energy development

Approximately 69 percent of the NECO planning area is public lands managed by the BLM. The BLM manages land for multiple uses. While maintenance of habitat features and functions is a priority, the BLM must allow uses that stand in direct conflict with many conservation goals. Mining claims, grazing leases, renewable energy and other project development, and recreational uses may all be permittable under certain circumstances.

## ANALYSIS OF CUMULATIVE EFFECTS TO BIOLOGICAL RESOURCES

This qualitative assessment of cumulative effects was based on a review of the project's onsite and offsite survey data, databases, literature, and consultation with regional experts. In addition to the combined effects of habitat loss and direct mortality, staff identified a range of indirect effects that combine with similar effects from other past, present, and foreseeable future project that must be factored into the cumulative analysis. This suite of indirect impacts to which the project would contribute includes: increase in ravens, coyotes, and other predators; introduction and spread of invasive weeds; the effects of groundwater pumping on springs and other dependent ecosystems; altered surface drainage patterns; fragmentation; increased risk of fire; erosion and sedimentation of streams; potential for the introduction and or spread of wildlife diseases; diminished habitat values from increased noise and lighting; exotic wildlife invasions; dust and air pollution; road kills; human disturbance; and other factors contributing to a significant cumulative effect.

### Cumulative Impacts – Native Vegetation and Wildlife Habitat

Threats to vegetation in the NECO planning area include habitat loss and fragmentation due to development, fire, off-highway vehicle activity, cattle and sheep grazing, overdrawn groundwater, and the spread of invasive plant species (BLM and CDFG 2002). Current and foreseeable renewable energy developments in the planning area contribute cumulatively to impacts to vegetation communities through loss and fragmentation of habitat, contribution to groundwater depletion, and contribution to the spread of nonnative and invasive weeds. Cumulatively, impacts of these projects to vegetation communities in the NECO planning area would be considerable.

The Rio Mesa SEGF would contribute incrementally to the cumulatively significant impacts of existing and future renewable energy projects to native vegetation, including microphyll woodland. Large, intact blocks of habitat such as that in the Palo Verde Mesa are important to wildlife movement and to foraging and breeding habitat for wildlife, including special-status species and state- and federally listed species. The Rio Mesa SEGF's contribution to regional cumulative impacts to these habitat values are addressed below, under special-status species and wildlife movement.

Staff's proposed Conditions of Certification **BIO-1** through **BIO-8** would minimize the proposed project's contribution to cumulative loss of native desert vegetation and habitat, including rare and groundwater-dependent vegetation. While acquisition per **BIO-3** does not prevent the net loss of habitat that would result from the Rio Mesa SEGF, it is expected to minimize future loss of protected habitat by placing a permanent conservation easement and deed restrictions on private lands that could otherwise be converted for urban, agricultural, or energy development. With the incorporation of mitigation measures described above, the Rio Mesa SEGF's contribution to the loss of native vegetation and wildlife habitat in the region is not cumulatively considerable.

## Cumulative Impacts – Jurisdictional Waters

The geographic extent of this analysis of cumulative impacts to jurisdictional waters is the NECO planning area. A variety of playas, seeps, lakes, and drainages are found throughout the planning area. Some of these range over large acreages. Most of the jurisdictional desert washes and channels in the planning area flow ephemerally in response to heavy rain storms. Desert wash habitats, which make up the majority of jurisdictional waters in the planning area, provide habitat for a variety of species and play an important role in conveying surface flows during storm events. Threats to jurisdictional waters include large-scale land use conversion, including agriculture, infrastructure, and commercial and residential development, as well as off-road vehicle use, pesticide use, and mining. Current and foreseeable renewable energy developments in the NECO planning area contribute to the loss and alteration/damage of jurisdictional waters. Cumulatively, impacts of these projects to jurisdictional waters in the NECO planning area are significant.

The Rio Mesa SEGF would contribute incrementally to cumulatively significant impacts to jurisdictional waters in the NECO Planning Area. Jurisdictional waters in the Palo Verde Mesa generally consist of dry desert washes and ephemeral drainages that drain from the west to the east into drains and culverts that ultimately discharge to the Colorado River, an interstate water, and thus are within the geographic jurisdiction of the RWQCB and USACE under Sections 401 and 404 (respectively) of the federal CWA. These ephemeral channels also may fall under jurisdiction of the state under Sections 1600-1616 of the California Fish and Game Code, based upon CDFG's jurisdictional criteria (i.e., presence of bed and banks). Additionally, the state holds jurisdiction of riparian vegetation adjacent to jurisdictional streambeds, and the primary regional (desert) riparian habitat is microphyll woodland. Numerous well-defined ephemeral washes originating in the mountains to the west drain eastward across the Rio Mesa SEGF site, and support microphyll woodland. The Rio Mesa SEGF's incremental contribution to cumulative impacts to jurisdictional waters would be minimized to less than cumulatively considerable through the implementation of staff's proposed Conditions of Certification **BIO-3, BIO-7, BIO-9,** and **BIO-19**. **BIO-3** specifies the habitat ratios, management requirements, and funding requirements for compensation of project impacts to numerous biological resources. **BIO-7** (Revegetation of Temporary Construction Areas), would require the applicant to revegetate native vegetation in the temporary construction area, including jurisdictional wetlands and waters of the state, to minimize further degradation due to erosion and weed infestation that could contribute to regional cumulative impacts. **BIO-19** (Facility Closure, Revegetation, and Reclamation Plan) would require the project owner to restore natural contours and flow patterns, and revegetate the solar generator site upon the project's retirement. **BIO-9** (State Waters Impact Compensation, Avoidance, and Minimization Measures) would require compensation for streambed impacts through the acquisition, protection, and management of comparable streambeds offsite at a ratio of 3:1 (i.e., three acres of state waters compensation for each acre impacted by the project). Staff's rationale for the 3:1 ratio is presented in the "Impacts to Native Vegetation and Wildlife Habitat" subsection, above. In addition, **BIO-9** would require implementation of

Best Management Practices (BMPs) during project construction and operation. However, if 3:1 compensation for these impacts is found infeasible then the project's incremental contribution to cumulative impacts to jurisdictional waters may remain cumulatively considerable.

## Cumulative Impacts – Special-Status Plants

The geographic scope of this preliminary analysis of cumulative effects to special-status plants encompasses the Palo Verde Mesa and adjacent valleys within the Colorado Desert region in California. The qualitative assessment was based on a review of the project's offsite survey data, databases, literature, and consultation with regional experts.

The Rio Mesa SEGF's incremental contribution to cumulative impacts to special-status plants would be minor. Three special-status species would be impacted by the Rio Mesa SEGF: Harwood's milk-vetch, Utah vine milkweed, and desert unicorn plant. Harwood's milk-vetch within the project area is at the western limits of its geographic distribution. Utah vine milkweed and desert unicorn-plant are widespread in the Colorado Desert, and are not rare in this region (see "Special-Status Plants," above).

In addition to the project's contribution to the reduction and fragmentation of local populations from construction, the project also contributes to the cumulative, interactive, and synergistic impacts of multiple indirect threats from a variety of sources, including past, present, and future urban and energy development, agriculture (crop lands), grazing, roads, and other infrastructure development.

Existing and future projects discussed above are expected to combine with the Rio Mesa SEGF project's effects of fragmentation and isolation of populations, introduction and spread of invasive weeds, increased risk of fire, altered surface drainage patterns, and the interruption of dispersal pathways. Cumulatively, these impacts are significant.

Staff considered the mitigated effect of the project after implementation of **BIO-7** (Integrated Weed Management Plan) and **BIO-10** (Special-Status Plant Impact Avoidance, Minimization and Habitat Compensation). With implementation of avoidance and minimization measures included in conditions of certification **BIO-7** and **BIO-10,** the Rio Mesa SEGF would not make a considerable contribution to the cumulative regional impacts to special-status plants.

## Cumulative Impacts – Special-Status Wildlife

### Desert Tortoise

The geographic extent of the analysis of cumulative impacts to desert tortoise includes the Colorado Desert Recovery Unit, as identified in the Revised Recovery Plan for the Mojave Population of the Desert Tortoise (USFWS 2011a). The proposed project is located in the Palo Verde Mesa which occurs in the eastern portion of the Colorado Desert Recovery Unit. The portion of the Palo Verde Mesa where the Rio Mesa SEGF is located has limited connectivity to adjacent valleys that support tortoises (including designated critical habitat to the west and southwest), and is bounded to the south by the Palo Verde Mountains, to the west by the Mule Mountains, and to the east by the Colorado River and associated floodplain developed for agriculture.

Urbanization/loss of habitat, deteriorating habitat quality from off-highway vehicles, invasion of non-native grasses and weeds, predation by ravens, collection, livestock grazing, and spread of an upper respiratory tract disease have all contributed to the decline of desert tortoise populations. In response to this decline, large expanses of desert tortoise critical habitat and numerous Areas of Critical Environmental Concern (ACECs) and Desert Wildlife Management Areas (DWMAs) areas have been identified or established within the Colorado Desert Recovery Unit. Cumulatively, the impacts of these projects to desert tortoises in the Mojave population would be significant.

The Rio Mesa SEGF's incremental contribution to cumulative impacts to desert tortoise would be similar to the impacts of other solar developments in the Colorado Desert Recovery Unit, and would include loss of habitat, interference with regional movement, stress and potentially illness or mortality from translocation, and indirect impacts from an increase in predators such as the common raven.

Based on staff's field observations, surveys conducted by the applicant, and historic land uses in portions of the project site, the entire project area is suitable desert tortoise habitat, and the site is occupied habitat. The observations of desert tortoises of different age class, numerous burrows, and their sign suggest the site remains actively populated.

Mitigation measures to reduce project-level impacts to desert tortoise include: construction minimization measures (**BIO-5**); clearance surveys and exclusion fencing (**BIO-13**); preparation and implementation of a translocation plan (**BIO-13**); acquisition and conservation of compensation lands (**BIO-3** and **BIO-14**); and preparation and implementation of a plan to control ravens (**BIO-15**). Together these measures would reduce project-level impacts to less than significant under CEQA and would fully mitigate those impacts under CESA. After implementation of these measures, the project's contribution to significant cumulative effects to desert tortoises would not be cumulatively considerable.

### Mojave Fringe-Toed Lizard

Regionally, the loss of habitat and interference with sand migration corridors from the development of large-scale projects such as renewable energy developments contribute to cumulatively significant impacts to the Mojave fringe-toed lizard. The Rio Mesa SEGF's impacts to Mojave fringe-toed lizard would largely be limited to construction-related impacts during construction of the northern portion of the gen-tie line. Potential habitat on the solar generator site is marginal, patchy, and not extensive; and no fringe-toed lizards were identified on the generator site during focused surveys. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize potential impacts to Mojave fringe-toed lizards and potential habitat, including marginal habitat, during gen-tie line construction. If the Rio Mesa SEGF causes an increase in predators such as the common raven due to food and nesting habitat subsidies, then these indirect project impacts could affect the Mojave fringe-toed lizard population in the dunes at the northern end of the gen-tie line. Staff's proposed Condition of Certification **BIO-15** requires the preparation and implementation of a Raven Monitoring, Management, and Control Plan to minimize the potential for increases in raven populations related to implementation of the Rio Mesa SEGF; therefore, the incremental contribution of the project to cumulative impacts to the Mojave fringe-toed lizard would not be cumulatively considerable.

### Western Burrowing Owl

The Rio Mesa SEGF would contribute incrementally to the cumulative loss of burrowing owl habitat that is likely used for wintering, and possibly breeding. Recently active burrows were identified on site during surveys in 2011 and 2012. However, there were no sightings of the owls themselves during the breeding season surveys (although two were observed incidentally in spring and one in winter). The condition of the previously active burrows suggests that burrowing owls had used the site as wintering habitat, earlier in the year. Although no burrowing owls were known to have nested on the site in 2011 or 2012, habitat on site appears suitable for nesting, at least in some years. Impacts from the Rio Mesa SEGF would be similar to other solar developments in the region, and could include loss of breeding or wintering habitat, disturbance due to human activities, and destruction of active (nesting or wintering) burrows. The potential loss of habitat from all proposed future projects is cumulatively significant, and the project's unmitigated contribution to that effect is cumulatively considerable. The project will also contribute to a cumulatively significant impact from habitat fragmentation, edge effects, noise and lighting, increased road kills, increased risk of fire from weed invasion and increased ignition sources (vehicles), and an increase in avian predators, all of which ultimately degrade the function and values of the remaining habitat. The project's contribution to these indirect effects and loss of habitat would be mitigated to a level less than cumulatively considerable through implementation of staff's proposed Conditions of Certification **BIO-1** through **BIO-5,** which would minimize overall project impacts to habitat, require worker training to minimize disturbances, require biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. Condition of Certification **BIO-17** outlines burrowing owl survey requirements, eviction guidelines and the requirement for a Burrowing Owl Relocation and Mitigation Plan, and specific requirements for burrowing owl mitigation lands. Condition of Certification **BIO-7** requires the development and implementation of an integrated Weed Management Plan.

### Golden Eagle

The Rio Mesa SEGF would contribute to the cumulatively significant loss of golden eagle foraging habitat. The solar generator site does not provide suitable golden eagle nesting habitat, but there are inactive recent golden eagle nest sites known within 10 miles of the proposed project site (BBI 2012), and these sites could be used again in the future. The entire Rio Mesa SEGF project site, including the proposed gen-tie line alignment, provides potential foraging habitat and is within foraging range of known or potential nest sites. Other existing and proposed renewable projects in the NECO planning area would have similar impacts to foraging habitat, and cumulative development in the California deserts would have significant impacts on golden eagle foraging habitat. The cumulative loss of golden eagle foraging habitat throughout the region may result in abandonment of nesting territories.

Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to golden eagle foraging habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and would compensate for habitat loss through the acquisition and management of offsite lands. Taken together, staff concludes that these conditions of certification are feasible and effective and that their implementation would reduce the project's contribution to cumulative impacts to golden eagle foraging habitat (staff's concern regarding feasibility of acquiring adequate compensation for blue palo verde – ironwood woodland habitat would not limit the feasibility of acquiring adequate golden eagle foraging habitat). However, because of the magnitude of ongoing loss of foraging habitat across large portions of its range, combined with overall population declines, the project's contribution to cumulatively significant impacts to golden eagle foraging habitat would remain considerable even with the implementation of mitigation.

Staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring Operational Impacts to Birds and Bats) would require the project owner to prepare and implement an Eagle Conservation Plan (ECP) that would include measures to offset any potential take of golden eagles to less than cumulatively considerable. Staff also recommends Condition of Certification **BIO-16** (Construction Phase Golden Eagle Nesting Surveys) which would require annual breeding-season surveys for golden eagle nest activity within a 10-mile radius of the project area throughout the project construction phase. If nesting activity is observed, then the project owner would implement a Golden Eagle Nest Monitoring Plan to (1) identify any evidence of project-related alterations to golden eagle behavior, and (2) specify adaptive management actions in the event that behavioral changes are observed. These surveys would serve to document golden eagle nesting activity in the area and contribute to resource agencies' understanding of the species' response to ongoing land use changes in the region. Even with implementation of these measures, the Rio Mesa SEGF's contribution to cumulative impacts to golden eagles from disturbance, net loss of foraging habitat, or other take would be cumulatively considerable.

### Special-Status Birds and Raptors

Past, present, and reasonably foreseeable projects in the Palo Verde Mesa and surrounding areas have contributed to significant cumulative effects to birds. These effects include the loss of habitat, disturbance from increased noise and lighting, road kills, habitat fragmentation, spread of invasive species, and hydrological impacts. The Rio Mesa SEGF would contribute incrementally to the cumulative loss of habitat and direct and indirect effects to several migratory, wintering, and resident special-status birds. Sixteen special-status birds and eleven special-status raptors, in addition to those discussed above, were identified on site (see **Biological Resources Table 5**). The Rio Mesa SEGF's primary impacts to resident and migratory birds include habitat loss, disturbance to foraging and breeding, and risk of injury or mortality due to collision with project features or solar flux hazards. These effects, when combined with the anticipated effects to remaining habitat and populations described above, are cumulatively considerable. The project's contribution to these effects would be reduced through implementation of several conditions of certification designed to address direct and indirect effects as well as habitat loss; however, staff has determined that residual impacts of project operation are still expected. These conditions of certification include **BIO-1** through **BIO-5** which would minimize overall project impacts to nesting bird habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands. **BIO-5** also requires transmission lines and all electrical components to be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee guidelines. **BIO-11** requires surveys and avoidance measures to prevent destruction of bird nests during construction and operations. **BIO-12** requires the project owner to monitor and mitigate operational impacts to birds and develop and implement a Bird and Bat Conservation Strategy. **BIO-8** requires development and implementation of a Desert Dry Wash Woodland Monitoring Plan to ensure impacts to groundwater-dependent vegetation do not result in habitat degradation for species that depend on this habitat, including special-status birds and raptors. **BIO-8** also requires remedial action if monitoring detects impending ecosystem changes.

Staff concludes that the project would have a considerable contribution to cumulatively significant effects to special-status migratory birds including small raptors due to potential take of birds during project operation from collision with facilities or exposure to concentrated solar energy. Although conditions of certification recommended above would reduce the severity of impacts, these effects would not be mitigable to a level less than cumulatively considerable. Staff's recommended Condition of Certification **BIO-12** (Mitigation and Monitoring Operational Impacts to Birds and Bats) would require the project owner to prepare and implement an Eagle Conservation Plan (ECP) that would include measures to offset any potential take of golden eagles to less than cumulatively considerable. These measures, including retrofitting power poles to minimize electrocution risks and the remediation of other existing hazards, would also offset potential take of other large raptors. Therefore, the project's incremental contribution to cumulative impacts to large raptors would be mitigated to less than cumulatively considerable.

### Special-Status Bats

Several special-status bats are known to occur in the region, and pallid bat, pocketed free-tailed bat, western red bat, and western mastiff bat were recorded on the Rio Mesa SEGF site. Roosting habitat for special-status bats varies by species, but most regional special-status bats roost in habitats not available on the project site, such as caves, tunnels, buildings, crevices, or crevices in cliffs and rock outcrops. The majority of adverse impacts to bat populations in the region result from disturbance of roosting or hibernation sites, especially where large numbers of bats congregate; physical closures of old mine shafts, which eliminates roosting habitat; elimination of riparian or desert wash microphyll vegetation which is often productive foraging habitat; more general habitat loss or land use conversion; and agricultural pesticide use which may poison bats or eliminate their prey-base. Of these regional impacts, the Rio Mesa SEGF would contribute incrementally only to the cumulatively significant loss of foraging habitat, particularly desert wash microphyll vegetation. The project's contribution to the loss of habitat would be cumulatively considerable. However, the project's contribution to these effects would be reduced to a level less than cumulatively considerable through implementation of several conditions of certification designed to address indirect effects as well as habitat loss. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands, including compensation for desert wash microphyll vegetation (blue palo verde – ironwood woodland) at a 3:1 ratio. Staff notes, however, that feasibility of acquiring adequate compensation for blue palo verde – ironwood woodland habitat has not been confirmed.

### Large Mammals (Nelson's Bighorn Sheep, Burro Deer, and Yuma Mountain Lion)

The Rio Mesa SEGF would contribute incrementally to the cumulative loss of habitat used for foraging by bighorn sheep and burro deer, hunting by Yuma mountain lion, and movement and cover by all three species. Cumulative impacts to movement and habitat connectivity are discussed below. The entire Rio Mesa SEGF project site, including the proposed gen-tie line alignment, provides suitable forage and cover habitat. All three species would be expected to use the site regularly but uncommonly. Other renewable developments and other large-scale development projects, both existing and proposed, in the NECO planning area would have similar potential impacts, and cumulatively, development in the California deserts would have significant impacts on Nelson's bighorn sheep, burro deer, and Yuma mountain lion. The Rio Mesa SEGF's contribution to the loss of habitat would be cumulatively considerable. However, the project's contribution to these cumulatively significant effects would not be considerable with the implementation of several conditions of certification designed to address indirect effects as well as habitat loss. Staff's recommended Conditions of Certification **BIO-1** through **BIO-5** would minimize overall project impacts to habitat, require worker training to minimize disturbances, biological monitoring and reporting of project disturbances, and compensate for habitat loss through the acquisition and management of offsite lands.

### American Badger and Desert Kit Fox

Reasonably anticipated cumulative effects to American badger and desert kit fox include habitat fragmentation and diminished habitat values of remaining habitat from numerous direct and indirect human disturbances. A recent outbreak of canine distemper has affected the regional desert kit fox population, particularly areas along the I-10 corridor in the vicinity of the Rio Mesa SEGF. The outbreak's cause is unknown, but passive desert kit fox relocation has the potential to worsen the canine distemper outbreak by either raising stress levels and causing increased susceptibility to infection, or causing increased movement of diseased animals, thereby increasing the spread of disease into new areas. The cumulative effects of canine distemper and habitat loss and degradation to desert kit foxes are significant.

Without mitigation the Rio Mesa SEGF's contribution to the loss of habitat, increased noise and lighting, road kills, fragmentation, and the spread of invasive weeds, and potential contribution to the regional canine distemper outbreak in desert kit fox, would be considerable. However, the project's contribution to these effects would be reduced through implementation of several conditions of certification designed to address indirect effects as well as habitat loss. These include development and implementation of a Desert Kit Fox and American Badger Management Plan to include badger and kit fox specific pre-construction surveys, as well as impact avoidance and minimization measures in **BIO-18**. **BIO-5** (General Impact Avoidance and Minimization Measures) contains specific measures to minimize noise and lighting impacts; **BIO-7** (Integrated Weed Management Plan) contains measures to minimize the introduction and spread of invasive weeds; and **BIO-3** requires acquisition and preservation of compensatory mitigation lands for loss of wildlife habitat, including habitat for badger and kit fox, which will also minimize future fragmentation in the vicinity of the project area by protecting lands from future development. With implementation of these measures, the project would not contribute considerably to the cumulatively significant effects.

### Cumulative Impacts – Wildlife Movement and Connectivity

Wildlife movement within the Palo Verde Mesa area is largely unrestricted. The project would have an adverse but less than significant effect on north-south wildlife movement and biological connectivity, especially for desert tortoises and other “corridor dwelling” wildlife species. The project also would have an adverse but less than significant effect on movement and connectivity for wide-ranging large mammals moving east to west across the site to access the Mule Mountains and the irrigated lands to the east. Staff concludes that the impacts of past, present, and reasonably foreseeable future projects to wildlife movement on the Palo Verde Mesa are not cumulatively significant, and that the proposed Rio Mesa SEGF would not have a considerable contribution to a cumulative impact to wildlife movement.

## CUMULATIVE IMPACTS - SUMMARY OF CONCLUSIONS

Cumulative Impacts: Staff concludes that without mitigation, the Rio Mesa SEGF would contribute to the cumulatively significant loss of regional resources, including the state and federally threatened desert tortoise and other special-status species discussed above. Impact avoidance and minimization measures described in staff’s analysis and included in the conditions of certification would help reduce impacts to these resources. These and additional compensatory measures are necessary to offset project-related losses, and to assure compliance with state and federal laws such as CESA and the federal ESA. With the implementation of Conditions of Certification BIO-1 through BIO-20, staff concludes that the Rio Mesa SEGF’s contributions to cumulative significant impacts to biological resources would not be considerable, with three possible exceptions:

1. Desert microphyll woodlands (also called dry desert wash woodlands, or blue palo verde – ironwood woodlands; these woodlands also meet jurisdictional criteria as waters of the state, and the cumulative impacts conclusion for waters of the state is the same); if the prescribed 3:1 compensation for impacts to jurisdictional waters and habitats is found infeasible, then the project’s incremental contribution to cumulative impacts to blue palo verde – ironwood woodland and the wildlife species which depend on them may remain cumulatively considerable.

2. Operational impacts to native birds including special-status birds and raptors; and

3. Foraging habitat for golden eagles.

## COMPLIANCE WITH LORS

The proposed project must comply with state and federal LORS that address state and federally listed species, as well as other sensitive species and habitats. The Energy Commission has a one-stop permitting process for all thermal power plants rated 50 MW or more under the Under the Warren-Alquist Act (Pub. Resources Code § 25500).

The Energy Commission's certification is "in lieu of" other state, local, and regional permits. Accordingly, Energy Commission staff has coordinated joint environmental review with the California Department of Fish and Game. Staff has generally incorporated the required terms and conditions that might otherwise be included in state permits into the Energy Commission's certification process, and will provide conclusions on resources normally administered through CDFG programs in the FSA. The conditions of certification described below satisfy the following state LORS and take the place of terms and conditions that, but for the Commission's exclusive authority, would have been included in the following State permits.

**Biological Resources Table 14** provides a summary of the proposed project's compliance with federal, state, and local LORS.

**Biological Resources Table 14**
**Summary of the Rio Mesa Solar Electric Generating Facility's Compliance with LORS**

| Applicable LORS | Description | Conclusions and Rationale for Compliance |
|---|---|---|
| **FEDERAL** | | |
| Federal Endangered Species Act (Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq.) | Designates and provides for protection of threatened and endangered plant and animal species and their critical habitat. "Take" of a federally-listed species is prohibited without an incidental take permit, which may be obtained through Section 7 consultation (between federal agencies) or a Section 10 Habitat Conservation Plan. | Yes. BLM will consult with USFWS per Section 7 of the ESA regarding project impacts to desert tortoise (federally listed as threatened). Proposed Conditions of Certification BIO-1 through BIO-7 and BIO-13 through BIO-15 would require measures to avoid or mitigate impacts to desert tortoise, including translocation off-site and protection of compensation habitat. These measures would ensure that the project is not likely to jeopardize the continued existence of desert tortoise. |
| Migratory Bird Treaty (Title 16, United States Code, sections 703 through 711) | Makes it unlawful to take or possess any migratory nongame bird (or any part of such migratory nongame bird) as designated in the Migratory Bird Treaty Act unless permitted by regulation (e.g., duck hunting). | No. Condition of Certification BIO-11 would require preconstruction nest surveys and a Nesting Bird Management Plan to include no-disturbance buffers around active nests and monitoring of nests to minimize impacts to nesting birds; BIO-4 would require a Worker Environmental Awareness Program to educate workers about compliance with environmental regulations including MBTA; BIO-16 would require golden eagle nesting surveys during the construction phase; and BIO-12 would require a Bird and Bat Conservation Strategy, an Eagle Protection Plan, and a Bird and Bat Monitoring Study to address potential bird injury or mortality during operation, including adaptive management actions. However, even with these avoidance and minimization measures, take of birds covered by the MBTA is expected, primarily from collision and solar flux hazards during operation of the project. |

| Applicable LORS | Description | Conclusions and Rationale for Compliance |
|---|---|---|
| Clean Water Act (Title 33, United States Code, sections 1251 through 1376, and Code of Federal Regulations, part 30, section 330.5(a)(26)) | Requires the permitting and monitoring of all discharges to surface water bodies. Section 404 requires a permit from the U.S. Army Corps of Engineers (USACE) for a discharge from dredged or fill materials into waters of the US, including wetlands. Section 401 requires a permit from a regional water quality control board (RWQCB) for the discharge of pollutants. | Yes. BLM or the applicant will consult with USACE and RWQCB to obtain necessary permits under Sections 404 and 401 of the CWA. |
| Bald and Golden Eagle Protection Act (Title 16, United States Code section 668) | Provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds. Defines the ''take'' of an eagle to include a broad range of actions, including disturbance (i.e., to agitate or bother an eagle to a degree that causes, or is likely to cause, injury, decreased productivity by substantially interfering with behavior, or nest abandonment. | Yes. BIO-3 would require compensation habitat for wildlife including golden eagle foraging habitat; BIO-16 would require golden eagle nesting surveys during the construction phase; and BIO-12 would require a Bird and Bat Conservation Strategy, an Eagle Protection Plan, and a Bird and Bat Monitoring Study to address potential injury or mortality of birds, including eagles, during operation of the project. These plans also would include adaptive management actions. |
| Eagle Permits (Title 50, Code of Federal Regulations, Part 22) | Authorizes take of bald eagles and golden eagles where the take is compatible with the preservation of the bald eagle and the golden eagle; necessary to protect an interest in a particular locality; associated with but not the purpose of the activity; and (1) For individual instances of take: the take cannot practicably be avoided; or (2) For programmatic take: the take is unavoidable even though advanced conservation practices are being implemented. Also provides for the take of eagle nests under certain circumstances, such as where they pose a human health and safety risk or pose a functional hazard that renders a human-engineered structure unusable for its intended function. Take authorization for eagles and nests must be obtained through consultation with the USFWS. | Yes. BIO-16 would require golden eagle nesting surveys during the construction phase; BIO-12 would require a Bird and Bat Conservation Strategy, an Eagle Protection Plan, and a Bird and Bat Monitoring Study to address potential injury or mortality of birds, including eagles, during operation of the project. These plans also include adaptive management actions. |
| Federal Land Policy and Management Act of 1976 (FLPMA) 43 U.S.C. 1701 section 102 | Governs the way in which the public lands administered by the BLM are managed. | Yes. BLM will prepare an EIS in compliance with NEPA for the portions of the proposed project on public lands under BLM's jurisdiction, and will evaluate the proposed solar generator project as a connected action. |
| California Desert Conservation Area Plan 1980, as amended (reprinted in 1999) | Administered by the BLM; requires that projects are compatible with policies that provide for the protection, enhancement, and sustainability of fish and wildlife species, wildlife corridors, riparian and wetland habitats, and native vegetation resources. | Yes. Staff's proposed Conditions of Certification BIO-1 through BIO-20 minimize, avoid, and compensate for impacts to biological resources covered by the CDCA Plan. The BLM will evaluate plan conformance of project components proposed on BLM lands and potential requirement for Plan Amendment in its NEPA analysis. |

| Applicable LORS | Description | Conclusions and Rationale for Compliance |
|---|---|---|
| Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) | BLM land use plan amendment that resolves issues of resource demands, use conflicts, and environmental quality in the 5.5-million acre planning area located primarily within the Colorado Desert in southeastern California; provides land use management for the desert tortoise, integrated ecosystem management for special status species and natural communities for all federal lands, and regional standards and guidelines for public lands (BLM and CDFG 2002). | Yes. Staff's proposed Conditions of Certification BIO-1 through BIO-20 minimize, avoid, and compensate for impacts to biological resources covered by the NECO. |
| Executive Order 11312 | Prevent and control invasive species. | Yes. BIO-7 would require an Integrated Weed Management Plan to prevent and control invasive weeds. |
| Desert Tortoise (Mojave Population) Recovery Plan (USFWS 1994) and Revised Recovery Plan (USFWS 2011a) | Describes a strategy for recovery and delisting of the desert tortoise. | Yes. BIO-1 through BIO-7 and BIO-13 through BIO-15 would require measures to avoid or mitigate impacts to desert tortoise, including translocation off-site and protection of compensation habitat. These measures would ensure that the project is not likely to jeopardize the recovery efforts or the continued existence of desert tortoise. |
| **STATE** | | |
| California Endangered Species Act of 1984 (Fish and Game Code, sections 2050 through 2098) | Protects listed rare, threatened, and endangered species; "take" of a state-listed species except as authorized under Section 2081. | Yes. BIO-1 through BIO-8 and BIO-11 through BIO-15 would fully mitigate project impacts to the state listed desert tortoise and Swainson's hawk (if any).<br>Staff concludes that the project has a low potential to take state-listed birds, including willow flycatcher, bank swallow, greater sandhill crane, Gila woodpecker, and elf owl, due to potential collision or concentrated solar energy hazards. |
| California Code of Regulations (Title 14, sections 670.2 and 670.5) | Lists the plants and animals of California that are declared rare, threatened, or endangered. | Yes. BIO-1 through BIO-8 and BIO-11 through BIO-15 would fully mitigate project impacts to the state listed desert tortoise and most potential impacts to other listed species.<br>Staff concludes that the project has the potential to take state listed birds, including Swainson's hawk, willow flycatcher, bank swallow, greater sandhill crane, Gila woodpecker, and elf owl. |
| Protected furbearing mammals (California Code of Regulations, Title 14, section 460) | Fisher, marten, river otter, desert kit fox, and red fox may not be taken at any time. | Yes. BIO 1 thorough BIO-5 and BIO-18 would require measures to avoid take and mitigate impacts to desert kit fox. |

| Applicable LORS | Description | Conclusions and Rationale for Compliance |
|---|---|---|
| Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515) | Designates certain species as fully protected and prohibits the take of such species or their habitat unless for scientific purposes (see also California Code of Regulations, Title 14, section 670.7). | No. Condition of Certification BIO-12 would require a Bird and Bat Conservation Strategy, an Eagle Protection Plan, and a Bird and Bat Monitoring Study to address potential bird injury or mortality during operation of the project, including adaptive management actions. However, even with these avoidance and minimization measures staff concludes that the project has the potential to take fully protected birds, including golden eagle, peregrine falcon, and greater sandhill crane. |
| Nest or Eggs (Fish and Game Code section 3503) | Protects California's birds, making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. | Yes. BIO-11 would require preconstruction nest surveys and a Nesting Bird Management Plan, to include no-disturbance buffers around active nests and monitoring of nests; BIO-4 would include a Worker Environmental Awareness Program to educate workers about compliance with environmental regulations, including Fish and Game Code section 3503. |
| Birds of Prey (Fish and Game Code section 3503.5) | Birds of prey are protected making it "unlawful to take, possess, or destroy any birds of prey (in the order Falconiformes or Strigiformes)." | No. BIO-11 would require preconstruction nest surveys and a Nesting Bird Management Plan, to include no-disturbance buffers around active nests and monitoring of nests; BIO-4 would include a Worker Environmental Awareness Program to educate workers about compliance with environmental regulations, including Fish and Game Code section 3503.5; BIO-12 would require a Bird and Bat Conservation Strategy, an Eagle Protection Plan, and a Bird and Bat Monitoring Study to address potential bird injury or mortality during operation of the project, including adaptive management actions. However, even with these avoidance and minimization measures, take of covered birds is expected, primarily from collision and solar flux hazards during operation of the project. |

| Applicable LORS | Description | Conclusions and Rationale for Compliance |
|---|---|---|
| Migratory Birds (Fish and Game Code section 3513) | Protects California's migratory birds by making it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame birds. | No. BIO-11 would require preconstruction nest surveys and a Nesting Bird Management Plan, to include no-disturbance buffers around active nests and monitoring of nests; BIO-4 would include a Worker Environmental Awareness Program to educate workers about compliance with environmental regulations, including Fish and Game Code section 3503.5; BIO-12 would require a Bird and Bat Conservation Strategy, an Eagle Protection Plan, and a Bird and Bat Monitoring Study to address potential bird injury or mortality during operation of the project, including adaptive management actions. However, even with these avoidance and minimization measures, take of covered birds is expected, primarily from collision and solar flux hazards during operation of the project. |
| Streambed Alteration Agreement (Fish and Game Code sections 1600-1616) | Regulates activities that may divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake in California designated by CDFG in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit. Impacts to vegetation and wildlife resulting from disturbances to waterways are also reviewed and regulated during the permitting process. | Yes. BIO-9 would include measures to minimize, avoid, and compensate for impacts to jurisdictional waters of the state; staff is coordinating with CDFG to determine whether the conditions conform to the state LSAA program. |
| **LOCAL** | | |
| Riverside County General Plan: Land Use and Multipurpose Open Space Elements of the County General Plan (2003) | Contains specific policies to preserve the character and function of open space that benefits biological resources. It also contains specific policies and goals for protecting areas of sensitive plant, soils and wildlife habitat and for assuring compatibility between natural areas and development. The Rio Mesa SEGF area and most of eastern Riverside County is designated as Open Space Conservation in the General Plan. Although the Rio Mesa SEGF is not within one of the 19 area plans contained within the General Plan, it is addressed in the Eastern Riverside County Desert Areas (Non-Area Plan). | Yes. BIO-1 through BIO-20 would ensure that the project remains in compliance with the Riverside County General Plan regarding biological resources. |
| Lower Colorado River Multi-Species Conservation Program | Intended to balance the use of the Colorado River water resources with the conservation of native species and their habitats. Includes general and species-specific conservation measures for twenty-six covered species and five evaluation species. The project site is within one mile of the LCRMSCP planning area, and proposed access road improvements and drainage crossing upgrades are within LCRMSCP Reach #4. | Yes. The proposed project is not a "covered activity" as defined in the LCRMSCP. BIO-1 through BIO-20 would minimize and avoid impacts to resources covered under the LCRMSCP. |

## NOTEWORTHY PUBLIC BENEFITS

The Rio Mesa SEGF would result in significant impacts to sensitive biological resources, and would permanently diminish the extent and value of native plant and animal communities in the region. Staff has therefore concluded that the Rio Mesa SEGF would not provide any noteworthy public benefits related to biological resources.

## ADDITIONAL INFORMATION STAFF REQUIRES FROM THE APPLICANT IN ORDER TO COMPLETE THE FSA

- The Renewable Energy Action Team (REAT), consisting of the USFWS, CDFG, BLM, and Energy Commission staff, requested that the applicant provide a full year of bird and bat surveys for the Rio Mesa SEGF to better determine the scope and scale of use at the site (CEC 2012h, 2012y; REAT 2011a, 2012a), beginning in early 2012. This information is essential to characterize risk during project operation, and to provide information needed for the applicant's Bird and Bat Conservation Strategy and Eagle Conservation Plan, according to staff's proposed Condition of Certification **BIO-12**. The applicant recently submitted a quarterly report summarizing its spring 2012 migratory bird survey, which is under review by staff and will be incorporated in the FSA. Staff anticipates that the full year of field work will be completed in the first quarter of 2013 and the applicant is expected to provide the full data set promptly following completion of field work for inclusion in the FSA.
- Late-season botany surveys. The applicant's Biological Resources Technical Report (URS, Oct 3, 2011) noted that late summer or fall botanical surveys should be completed in a future year. The summer of 2012 was a strong monsoonal season, providing adequate rainfall throughout the area to allow for germination and growth of late-season special-status plants. The applicant has indicated that it was monitoring late-season growth and flowering, and would conduct botanical surveys during late summer or fall 2012. Staff will incorporate that survey data into its analysis of the project's impacts to special-status plants and, if necessary, revise proposed Condition of Certification **BIO-10**.
- Clarification of the total acreages of permanent and temporary, direct and indirect impacts by vegetation type (including all project features identified in **Project Description Table 3-1** in the **Project Description** section of PSA – Part A. Staff's estimates of the project's direct impacts to native vegetation and wildlife habitat are based on data presented in the Biological Resources section of Applicant's Environmental Enhancement proposal (BS 2012v), which apparently does not include several project components noted in **Project Description Table 3-1.** In order to finalize the analysis of impacts to biological resources and several recommended conditions of certification, staff will need a full accounting by vegetation type of all project disturbance to native vegetation and wildlife habitat, including all permanent or temporary disturbance on the gen-tie alignment, tmporary logistics area, proposed 33-kV service line, and Colorado River Substation gen-tie area.
- Lake and Streambed Alteration Agreement (LSAA) Notification and Incidental Take Permit (ITP) application to CDFG. The Energy Commission's responsibilities and

authority pursuant to the Warren-Alquist Act include LSAA and CESA authorization under the California Fish and Game Code. Energy Commission staff will be reluctant to make any recommendation to the Commissioners on either issue until after conferring with CDFG to ensure consistency with CDFG's LSAA and ITP programs. CDFG will review the project upon receipt of the applicant's documentation with both programs. Therefore, staff has requested (CEC 2012h) that the applicant (1) provide to CDFG a complete LSAA Notification with up-to-date state waters delineation, project impacts, proposed mitigation, and any other supporting documents, (2) provide to CDFG an ITP Application for desert tortoise, including an impact assessment, proposed mitigation, and supporting documents, (3) provide to CDFG the appropriate filing fee(s) for both documents, and (4) docket copies of both documents with the Energy Commission.

- Facility Closure, Revegetation, and Reclamation Plan and Financial Security. In order to fully evaluate whether the applicant's facility closure measures will reduce the environmental impacts of site closure (i.e., dust, erosion, and weed infestation and spread) below a level of significance, staff will need to review a draft Facility Closure, Revegetation, and Reclamation Plan and Financial Security prior to completing its analysis for the FSA. Therefore, staff requests that the applicant prepare and submit a draft plan, including its estimate of the necessary financial security to implement the plan.

## PROPOSED CONDITIONS OF CERTIFICATION

Staff's proposed conditions of certification would require the project owner to prepare numerous documents for review and approval by the Energy Commission Compliance Project Manager (CPM) in consultation with other resource agency staff, including BLM staff. Staff recommends that BLM's review should apply to any documents or portions of documents pertaining to project components affecting federal land under BLM management (i.e., the gen-tie line), but that consultation with BLM staff generally would not be applicable or necessary for documents addressing project components on non-federal lands.

## DESIGNATED BIOLOGIST, AUTHORIZED DESERT TORTOISE BIOLOGIST, AND BIOLOGICAL MONITORS: SELECTION, QUALIFICATIONS, RESPONSIBILITIES, AND AUTHORITY

**BIO-1** **A. Designated Biologist**. The project owner shall assign at least one Designated Biologist as agency field contact representative to the project. The project owner shall submit the resume of the proposed Designated Biologist, with at least three references and contact information, to the Energy Commission compliance project manager (CPM) for approval in consultation with Bureau of Land Management (BLM), California Department of Fish and Game (CDFG), and U.S. Fish and Wildlife Service (USFWS). The project owner shall ensure that at least one Designated Biologist is assigned throughout the life of the project, including construction, operation, and post-project closure phases, and any subsequent monitoring and reporting period. The Designated Biologist's qualifications shall be as listed below. These requirements may be adjusted over the life of the project depending on specific agency policies and status of special-status species in the vicinity, and the nature of ongoing project activities (e.g., during operations) by agreement among the CPM, BLM, CDFG, and USFWS. The Designated Biologist may, or may not, also be assigned as an Authorized Desert Tortoise Biologist.

The Designated Biologist must have the following minimum qualifications:

1. a bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field;

2. three (3) years of experience in field biology or current certification of a nationally recognized biological society such as The Ecological Society of America or The Wildlife Society; and

3. one (1) year of field experience with biological resources found in or near the project area;

In lieu of the above requirements, the Designated Biologist may be approved, provided the resume demonstrates to the satisfaction of the CPM in consultation with BLM, CDFG, and USFWS, that the proposed Designated Biologist has the appropriate training and background to effectively implement the conditions of certification.

The project owner shall ensure that the Designated Biologist performs the activities described below during any site mobilization activities, construction-related ground disturbance, grading, boring, or trenching activities. The Designated Biologist may be assisted by approved Biological Monitor(s) but remains the primary contact person among the project owner, the CPM, BLM, CDFG, and USFWS. The Designated Biologist duties and responsibilities shall include, but shall not be limited, to those listed below.

1. Advise the project owner's construction, operation, and closure managers on the implementation of the biological resources conditions of certification throughout the life of the project.

2. Consult on the preparation of the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) to be submitted by the project owner as set forth in Condition of Certification **BIO-2**.

3. Supervise, conduct, and coordinate mitigation, monitoring, reporting, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as special-status species or their habitat, evaporation ponds, and other locations as described in conditions of certification.

4. Provide weekly verbal or written updates to the CPM, BLM, CDFG, and USFWS throughout the project’s construction phase on progress and implementation of the BRMIMP and all activities related to listed threatened or endangered species.

5. Ensure that all biological monitors and contract biologists are qualified for specific tasks they are assigned, such as desert tortoise clearance surveys, botanical surveys, nesting bird surveys, and other biological assignments required by conditions of certification.

6. Ensure that all Biological Monitor(s) (below) are appropriately trained regarding project-specific duties and responsibilities; training shall include familiarity with the conditions of certification, BRMIMP, WEAP, and USFWS guidelines on desert tortoise surveys and handling procedures.

7. Present WEAP training to all on-site personnel according to requirements of Condition of Certification **BIO-5**.

8. Immediately notify the project owner and CPM, BLM, CDFG, and USFWS of any non-compliance with any biological resources condition of certification.

9. Respond directly to inquiries of the CPM, BLM, CDFG, and USFWS regarding biological resource issues;

10. Maintain written records of the tasks specified above and those included in the BRMIMP and make those records available to the CPM, BLM, CDFG, and USFWS.

11. Conduct monthly compliance inspections of all project activities.

12. Prepare and submit Monthly Compliance Reports (MCRs) to the CPM, summarizing all project compliance, monitoring, and avoidance activities related to biological resources conditions, including all listed or special-status species observations and copies of California Natural Diversity Data Base (CNDDB) report forms.

13. Prepare and submit Annual Compliance Reports (ACRs) to the CPM, summarizing status of the project construction and operation activities; the ACRs shall include copies of the BRMIMP table to indicate implementation status of each condition of certification, and (as appropriate) a brief assessment of the efficacy of these conditions and recommendations for revision, and a summary of any modifications to the BRMIMP.

14. Train and supervise Biological Monitors as appropriate, and ensure their familiarity with the BRMIMP, Worker Environmental Awareness Program (WEAP) training, and USFWS guidelines on desert tortoise surveys and handling procedures <www.fws.gov/ventura/speciesinfo/protocols_guidelines>.

15. Maintain ability for regular, direct communication with the CPM, BLM, CDFG, and USFWS.

16. Notify the CPM, BLM, CDFG, and USFWS of dead or injured state or federally listed threatened or endangered species.

**B. Authorized Desert Tortoise Biologist**. The project owner shall assign at least one Authorized Desert Tortoise Biologist. The project owner shall submit the resume of the proposed Authorized Desert Tortoise Biologist, with at least three references and contact information, copies of the completed USFWS Desert Tortoise Authorized Biologist Request Form(s) (online: <www.fws.gov/ventura/speciesinfo/protocols_guidelines>), and written authorization from USFWS and CDFG (as described below) to the CPM for approval in consultation with BLM, CDFG, and USFWS. The project owner shall ensure that at least one Authorized Desert Tortoise Biologist is assigned at any time during the life of the project for which handling or translocation of a desert tortoise may be required, including construction, operation, and post-project closure phases, and any subsequent monitoring and reporting period. The Authorized Desert Tortoise Biologist may, or may not, also be assigned as a Designated Biologist.

The Authorized Desert Tortoise Biologist must hold the following qualifications:

1. USFWS authorization to handle desert tortoises (i.e., USFWS designation as Authorized Biologist) including approval to hold or transport tortoises, draw blood or tissue samples, and any other activities required for compliance with of Condition of Certification **BIO-9** that may constitute "take" of desert tortoise according to federal Endangered Species Act (ESA). Authorized Desert Tortoise Biologists must meet all applicable qualifications listed or described by USFWS in *Desert Tortoise Authorized Biologist and Monitor Responsibilities and Qualifications* (2008b) and *Desert Tortoise Field Manual* (2009a) or more current guidelines. Note that biologists who meet previous criteria may not meet current criteria due to requirements to assess health and draw blood; biologists must obtain training such as that offered through the Desert Tortoise Conservation Center in Las Vegas.

2. A Memorandum of Understanding (MOU) from CDFG pursuant to California Endangered Species Act (CESA) Section 2081(a) to handle desert tortoises, hold or transport tortoises, draw blood or tissue samples, and any other activities required for compliance with of Condition of Certification **BIO-9** that may constitute "take" of desert tortoise according to CESA.

The project owner shall ensure that only Authorized Desert Tortoise Biologists handle desert tortoises or carry out any other activity that may be constitute "take" of desert tortoise according to ESA or CESA (except to remove a desert tortoise from immediate harm's way as specified in conditions of Certification **BIO-4** and **BIO-9**). The Authorized Desert Tortoise Biologist's responsibilities shall include all responsibilities described by the USFWS (2008b; 2009a; or more current guidelines). She or he shall be directly responsible for implementing or overseeing all field activities related to desert tortoises, such as clearance surveys, tortoise handling, relocation, and health assessments. Additional responsibilities of the Authorized Desert Tortoise Biologists shall include but shall not be limited to:

1. Training and mentoring all Biological Monitor(s) (below); training shall include familiarity with the conditions of certification, BRMIMP, WEAP, and USFWS guidelines on desert tortoise surveys and handling procedures;

2. The Authorized Desert Tortoise Biologist shall be on site during all ground disturbance activities during construction of the desert tortoise exclusion fence; all pre-construction clearance surveys within or outside the fenced area; all initial site preparation (e.g., vegetation clearing or grubbing, or initial grading) within the fenced area; and all project-related ground disturbing activities in potential desert tortoise habitat outside the fenced area;

3. Directly supervising biological monitors and only assigning monitors to specific activities based on the monitor's demonstrated skills, knowledge and qualifications; an Authorized Desert Tortoise Biologist shall have direct voice and sight contact with the monitor during all desert tortoise clearance surveys; and

4. All handling of desert tortoises or other activities that may be constitute "take" of desert tortoise according to ESA or CESA.

5. If a desert tortoise is injured as a result of project-related activities during construction, the Authorized Desert Tortoise Biologist shall immediately take it to a CDFG-approved wildlife rehabilitation or veterinarian clinic (cost of treatment shall be the responsibility of the project owner); the Authorized Desert Tortoise Biologist shall notify the CPM, BLM, CDFG, and USFWS by telephone or email within two working days; notification shall include the date, time, location, circumstances of the incident, and the name and location of the facility where the animal was taken; and

6. If a desert tortoise is killed by project-related activities or if a desert tortoise is otherwise found dead, the Authorized Desert Tortoise Biologist shall notify the CPM, BLM, CDFG, and USFWS by telephone or email within two working days; notification shall include the date, time, location, and circumstances of the incident; the desert tortoise carcass shall be salvaged according to guidelines described in Salvaging Injured, Recently Dead, Ill, and Dying Wild, Free-Roaming Desert Tortoise (Berry 2001); the project owner shall be responsible for the cost of carcass transport and necropsy.

**C. Biological Monitor**. The project owner, Designated Biologist, and Authorized Desert Tortoise Biologist will appoint Biological Monitors as needed for the construction, operations, and closure phases of the project. The project owner shall submit the resume, at least three references, and contact information of each proposed Biological Monitor to the CPM. The resume shall demonstrate, to the satisfaction of the CPM in consultation with BLM, CDFG, and USFWS, the appropriate education and experience to accomplish the assigned biological resource tasks. The Biological Monitor shall hold the responsibilities described by the USFWS designated Desert

Tortoise Monitor (USFWS 2008b) and shall work only under direct supervision of the Authorized Desert Tortoise Biologist for any desert tortoise surveys, translocation activities, or related activities. In addition, the Biological Monitors shall assist the Designated Biologist in conducting surveys and in monitoring of site mobilization activities, construction-related ground disturbance, grading, boring, or trenching. Regardless of the biological Monitor's qualifications, the Designated Biologist and Authorized Desert Tortoise Biologist shall have final responsibility for duties listed in Parts A and B of this condition (above). The project owner and Designated Biologists shall ensure that a Biological Monitor, under the supervision of the Designated Biologist, is available for monitoring and reporting of any project activities that may affect biological resources during the life of the project.

**D. Designated Biologist, Authorized Desert Tortoise Biologist, and Biological Monitor Authority.** The project owner's construction, operation, or closure manager shall act on the advice of the Designated Biologist, Authorized Desert Tortoise Biologist, and Biological Monitor ("Biology Staff") to ensure conformance with the biological resources conditions of certification. The Designated Biologist, Authorized Desert Tortoise Biologist, and Biological Monitors shall have the authority to immediately stop any activity that is not in compliance with conditions of certification or to order any reasonable measure to comply with these conditions. The project owner's construction, operation, or closure manager shall halt any site mobilization, ground disturbance, grading, boring, trenching, and operation activities as specified by the Designated Biologist, Authorized Desert Tortoise Biologist, or Biological Monitor. The Designated Biologist and Authorized Desert Tortoise Biologist shall:

1. Require a halt to any or all activities that would cause an unauthorized adverse impact to biological resources if the activities continued;

2. Require a halt to any or all activities that would cause take of a desert tortoise or other protected species or listed threatened or endangered species;

3. Inform the project owner and the construction/operation manager when to resume activities;

4. Notify the CPM if there is a halt of any activities and advise them of any corrective actions that have been taken or would be instituted as a result of the work stoppage; and

5. If the Designated Biologist and Authorized Desert Tortoise Biologist are unavailable for direct consultation, the Biological Monitor shall halt work as necessary on their behalf.

**Verification:** No fewer than 30 days prior to construction-related ground disturbance, the project owner shall submit the name(s) and resume(s) of the proposed Designated Biologists(s) and Authorized Desert Tortoise Biologist(s) to the CPM for review and final approval in consultation with BLM, CDFG, and USFWS. No construction-related ground disturbance, grading, boring, or trenching shall commence until a Designated Biologist and Authorized Desert Tortoise Biologist have been approved and are available to be on the site.

If the Designated Biologist or Authorized Desert Tortoise Biologist must be replaced, the specified information of the proposed replacement must be submitted to the CPM at least 10 working days prior to the termination or release of the preceding biologist. In an emergency, the project owner shall immediately notify the CPM to discuss the qualifications and approval of a short-term replacement while a permanent replacement is proposed to the CPM for consideration.

The Designated Biologist shall provide copies of all written reports and summaries that document biological resources compliance activities in the MCRs submitted to the CPM. During project operation, the Designated Biologist shall submit record summaries in the ACR.

The Authorized Desert Tortoise Biologist shall prepare all reporting of desert tortoise related activities and shall provide all written documentation to USFWS and CDFG in conformance with requirements of each agency's authorization or MOU. The Authorized Desert Tortoise Biologist shall also provide copies to the Designated Biologist for inclusion in the MCRs and ACRs , above.

The Authorized Desert Tortoise Biologist shall submit a written statement to the CPM confirming that each Biological Monitor has been trained, including the date when training was completed. The resume, references, contact information, and documentation of training for each proposed Biological Monitor shall be submitted to the CPM for approval in consultation with BLM, CDFG, and USFWS at least 10 days prior to the first day of that person's monitoring activities.

The project owner shall ensure that the biology staff notifies the CPM immediately (and no later than the morning following the incident, or Monday morning in the case of a weekend) of any non-compliance or a halt of any site mobilization, ground disturbance, grading, construction, and operation activities. The project owner shall notify the CPM of the circumstances and actions being taken to resolve the problem.

Whenever corrective action is taken by the project owner, a determination of success or failure will be made by the CPM in consultation with BLM, CDFG, and USFWS as appropriate, within five working days after receipt of notice that corrective action is completed, or the project owner would be notified by the CPM that coordination with other agencies would require additional time before a determination can be made.

## BIOLOGICAL RESOURCES MITIGATION IMPLEMENTATION AND MONITORING PLAN

**BIO-2** The project owner in coordination with the Designated Biologist shall prepare a Draft Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP), to the CPM for review and approval in consultation with BLM, CDFG, and USFWS. Upon revision and approval, the project owner shall implement the final BRMIMP. The BRMIMP shall incorporate all avoidance and minimization measures described in conditions of certification and all related plans as required therein, including but not limited to: the Revegetation Plan; the Integrated Weed Management Plan; the Desert Dry Wash Woodland Monitoring Plan; the Long-Term Habitat Management Plan for Off-site Compensation Land; appropriate action plan(s) for plant salvage, horticultural propagation and re-introduction, or off-site habitat enhancement for special-status plants; the Protected Plant Salvage Plan; the Nesting Bird Management Plan; the Eagle Protection Plan; the Bird and Bat Conservation Strategy; the Bird and Bat Monitoring Study; the Desert Tortoise Translocation Plan; the Raven Monitoring, Management, and Control Plan; the Golden Eagle Monitoring and Management Plan, the Burrowing Owl Relocation and Mitigation Plan; the Desert Kit Fox and American Badger Management Plan; and the Closure, Revegetation, and Reclamation Plan.

The BRMIMP shall include accurate and up-to-date maps depicting the locations of sensitive biological resources that require temporary or permanent protection during construction and operation. The BRMIMP shall include complete and detailed descriptions of the following:

1. All biological resources mitigation, monitoring, and compliance measures proposed and agreed to by the project owner;

2. All biological resources conditions of certification adopted by the Energy Commission to avoid or mitigate impacts, and cross-reference to all measures as specified in compliance documents as required under those conditions;

3. All biological resource mitigation, monitoring, and compliance measures required in federal agency terms and conditions, such as those provided in the USFWS Biological Opinion and any additional BLM or USFWS stipulations;

4. A list of all construction and operations activities requiring that the Designated Biologist, Authorized Desert Tortoise Biologist, or Biological Monitor must be on the site;

5. A list of all specific requirements and obligations of the project owner to inspect, monitor, mitigate or avoid impacts to biological resources, specifying the individual responsibilities for each item;

6. An inspection schedule detailing all measures that shall be taken to avoid or mitigate take of special-status species or damage to biological resources, and temporary or indirect disturbances from project activities;

7. Duration for each type of compliance monitoring and a description of monitoring methodologies and frequency;

8. Performance standards to evaluate whether required mitigation is or is not successful;

9. Remedial measures to be implemented if performance standards are not met;
10. All facility closure measures relating to biological resources, including a description of funding mechanism(s); and
11. A process for proposing plan modifications to the CPM and any other appropriate agencies for review and approval.

**Verification:** The project owner shall provide the CPM with written notice of intent to start ground disturbance at least 30 days prior to the start of these activities. The project owner shall submit the final BRMIMP, as reviewed and approved by the CPM in coordination with BLM, CDFG, and USFWS to the CPM at least 30 days prior to start of any preconstruction site mobilization and construction-related ground disturbance, grading, boring, and trenching. No construction-related ground disturbance, grading, boring, or trenching may occur prior to approval of the final BRMIMP by the CPM in consultation with the other agencies.

The BRMIMP shall be a comprehensive summary of all permit requirements and conditions of certification relating to biological resources. If any related permit or agreement is revised or finalized after the BRMIMP is approved, then a copy of the revised or finalized permit shall be submitted to the CPM within five days and the BRMIMP shall be revised or supplemented to reflect the permit conditions within 10 days of their receipt by the project owner. No ground disturbance shall proceed except as specified and in compliance with all permit requirements and conditions of certification.

To verify that the extent of construction disturbance does not exceed that described in this analysis, the project owner shall submit aerial photographs, at an approved scale, taken before and after construction to the CPM. The first set of aerial photographs shall reflect site conditions prior to any preconstruction site mobilization and construction-related ground disturbance, grading, boring, and trenching, and shall be submitted at least 30 days prior to initiation of such activities. The second set of aerial photographs shall be taken subsequent to completion of construction, and shall be submitted to the CPM no later than 90 days after completion of construction. The project owner shall also provide a final accounting of the acreages of vegetation and land use types before and after construction and a depiction of the approved project boundaries superimposed on the post project aerial photograph. If final acreages or disturbance footprints exceed those previously approved, the CPM shall coordinate with project owner, in consultation with BLM, CDFG, and USFWS to determine appropriate mitigation for such impacts. Such mitigation may exceed the requirements as outlined in these conditions of certification (i.e., higher mitigation ratios may be imposed for unauthorized habitat impacts).

No changes to the approved BRMIMP (including the project footprint) may be made except as approved by the CPM in consultation with BLM, CDFG, and USFWS.

Implementation of all BRMIMP measures shall be reported in the MCR by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval in consultation with BLM, CDFG, and USFWS, a written construction termination report identifying which items of the BRMIMP have been completed, a list and description of any modifications to conditions of certification or permit conditions made during the project's preconstruction site mobilization and construction-related ground disturbance, grading, boring, and trenching, a list of all mitigation and monitoring requirements that are still outstanding, and a timeline for implementing outstanding items.

## COMPENSATORY MITIGATION: OFFSET FOR LOSS AND DEGRADATION OF NATIVE VEGETATION AND WILDLIFE HABITAT

**BIO-3** The project owner shall provide compensatory mitigation acreage to offset the project's adverse impacts to native vegetation and wildlife. Compensation ratios shall be as follows:

- Creosote bush scrub: 1:1;
- Desert dry wash woodlands (blue palo verde – ironwood woodlands): 3:1
- Other special-status plant communities: 3:1
- Off-site desert dry wash woodlands (see **Condition of Certification BIO-8**);
- Jurisdictional waters of the state: 3:1 (see **Condition of Certification BIO-9**)
- Special-status plant habitat:
- Suitable and occupied desert tortoise habitat: 1:1 (see **Condition of Certification BIO-14**)
- Burrowing owl foraging habitat: 900 acres (see **Condition of Certification BIO-17**)
- Golden eagle foraging habitat 1:1

The project owner will acquire and protect in perpetuity no fewer than 5,175.5 acres of habitat lands, to be adjusted to reflect the final project footprint, as specified in this condition. For purposes of this condition, the project footprint means all lands disturbed in the construction and operation of the project, including all linear project components, as well as undeveloped areas inside the project's security fence that will no longer provide viable long-term habitat for desert tortoise or other special-status wildlife. In addition, the project owner shall provide funding for initial improvement and long-term maintenance, enhancement, and management of the acquired lands for protection and enhancement of habitat values, and comply with other related requirements of this condition. Staff's estimated costs of the habitat compensation requirements are presented in **Biological Resources Table 8**.

The project owner shall provide financial assurances as described below in the amount of $ 30,253,666. In lieu of acquiring lands itself, the project owner may satisfy the requirements of this condition by depositing funds into a REAT Account established with the National Fish and Wildlife Foundation (NFWF), below. If the project owner elects to establish a REAT NFWF Account and have NFWF and the agencies complete the required habitat compensation, then the total estimated cost of complying with this condition shall be $ 30,997,331. The amount of security or NFWF deposit shall be adjusted up or down to reflect any revised cost estimates recommended by REAT.

The actual costs to comply with this condition will vary depending on the final footprint of the project, the costs of acquiring compensation habitat, the costs of initially improving the habitat, and the actual costs of long-term management as determined by a Property Analysis Report (PAR) or similar analysis (below). Compensation acreage and funding requirements shall be adjusted up or down if there are changes in the final footprint of the project or the costs of evaluation, acquisition, management, and other factors listed in **Biological Resources Table 8**. Regardless of actual cost, the project owner shall be responsible for funding all requirements of this condition.

**Compensation Land Acquisition**

1. Method of Acquisition. Compensation lands shall be acquired by either of the two options listed below. Regardless of the method of acquisition, the transaction shall be complete only upon completion of all terms and conditions described in this condition of certification.

    a. The project owner shall transfer title and/or conservation easement of compensation lands to a state or federal land management agency (if agency policy is compatible with habitat conservation in perpetuity) or to a third-party land management organization, as approved by the CPM in consultation with BLM, CDFG, and USFWS; staff recommends transfer in fee title to the lands to CDFG under terms approved by CDFG. Alternately, a CDFG-approved non-profit organization qualified pursuant to California Government Code § 65965 may hold the fee title or a conservation easement over the lands. In the event an approved non-profit holds title, a conservation easement shall be recorded in favor of CDFG in a form approved by CDFG; in the event an approved non-profit holds a conservation easement over the lands, CDFG shall be named third party beneficiary; or

    b. The Project owner shall deposit funds into a project-specific subaccount within the REAT Account established with the NFWF, in the amount as indicated in **Biological Resources Table 8** (adjusted to reflect final project footprint and any applicable REAT adjustments to costs).

2. Selection Criteria for Compensation Lands. All compensation lands shall meet the following selection criteria. In addition, lands designated by the project owner as compliance for specific resource compensation according to recommended Conditions of Certification **BIO-8** through **BIO-10, BIO-14,** and **BIO-17** shall also meet any additional selection criteria named in those conditions. In general, the compensation lands shall provide habitat conditions, quality, and function that are equal or better than those present on the habitat to be impacted. Compensation lands shall:

    a. Contribute to wildlife habitat connectivity;

b. Be generally undisturbed or have disturbance levels comparable to the habitat on the project site prior to construction, and have capacity to regenerate naturally when existing or ongoing disturbances are removed;

c. Be near larger blocks of lands that are in public or private ownership providing protection for biological resources and habitat values, planned for resource protection by a public or private entity; or which could feasibly be protected long-term by a public resource agency or a non-governmental organization dedicated to habitat preservation;

d. Have no extensive damage to soils, vegetation, or other disturbance from recreational, mining, or other land uses that might cause future erosion or other habitat damage, and make habitat recovery and restoration infeasible;

f. Have non-native weeds or invasive species that might jeopardize habitat recovery and restoration on the proposed compensation lands and adjacent to them at abundance less than or (at most) similar to their abundance on the project site prior to construction, either on or immediately adjacent to the parcels under consideration;

g. Not contain hazardous wastes that cannot be removed to the extent that the site could not provide suitable habitat; and

h. Have water and mineral rights included as part of the acquisition, unless the CPM, in consultation with BLM, CDFG, and USFWS, agrees in writing to the acceptability of land without these rights.

3. Review and Approval of Compensation Lands Prior to Acquisition. The project owner shall submit a formal acquisition proposal to the CPM describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands in relation to the criteria listed above and in Conditions of Certification **BIO-8** through **BIO-10, BIO-14,** and **BIO-17**. The CPM will review the proposal in consultation with BLM, CDFG, and the USFWS.

4. Compensation Lands Acquisition Conditions: The project owner shall comply with the following conditions relating to acquisition of the compensation lands after the CPM, in consultation with BLM, CDFG, and USFWS, has approved the proposed compensation lands:

   a. Preliminary Report: The Project owner or an approved third party shall provide a recent preliminary title report, initial hazardous materials survey report, biological analysis, and other necessary or requested documents for each proposed compensation parcel to the CPM for review and approval in consultation with BLM, CDFG, and USFWS. For conveyances to the state, approval may also be required from the California Department of General Services, the Fish and Game Commission, and the Wildlife Conservation Board.

b. Title/Conveyance: The project owner shall acquire and transfer fee title to the compensation lands, a conservation easement over the lands, or both as required by the CPM in consultation with CDFG. Any transfer of a conservation easement or fee title must be to CDFG, an approved non-profit organization qualified to hold title to and manage the compensation lands (pursuant to California Government Code § 65965), or to BLM or other public agency (if agency policy is compatible with conservation in perpetuity) approved by the CPM in consultation with CDFG. If an approved non-profit organization holds fee title to the compensation lands, a conservation easement shall be recorded in favor of CDFG or another entity approved by the CPM. If an approved non-profit holds a conservation easement, CDFG shall be named a third party beneficiary. If an entity other than CDFG holds a conservation easement over the compensation lands, the CPM may require that CDFG or another entity approved by the CPM, in consultation with CDFG, be named a third party beneficiary of the conservation easement. The project owner shall obtain approval from the CPM, in consultation with CDFG, of the terms of any transfer of fee title or conservation easement to the compensation lands.

c. Property Analysis Record. Upon identification of the compensation lands, the project owner shall conduct a Property Analysis Record (PAR) or PAR-like analysis to establish the appropriate amount of the long-term maintenance and management fund to pay the in perpetuity management of the compensation lands. The analysis must be approved by the CPM, in consultation with CDFG, before it will be used to establish funding levels or management activities for the compensation lands.

5. Compensation Lands Acquisition Costs: The project owner shall pay all other costs related to acquisition of compensation lands and conservation easements. In addition to actual land costs, these acquisition costs shall include but shall not be limited to the items listed below. Management costs including site cleanup measures are described separately, in the following section of this condition of certification.

   a. Level 1 Environmental Site Assessment;

   b. Appraisal;

   c. Title and document review costs;

   d. Expenses incurred from other state, federal, or local agency reviews;

   e. Closing and escrow costs;

   f. Overhead costs related to providing compensation lands to CDFG or an approved third party;

g. Biological survey(s) to determine mitigation suitability and conformance to selection criteria; and

h. Agency costs to accept the land (e.g., writing and recording of conservation easements; title transfer).

**Compensation Land Habitat Improvement**

1. Land Improvement Requirements: The project owner shall fund activities that the CPM, in consultation with BLM, CDFG, and USFWS, determines are required for the initial protection and habitat improvement of the compensation lands. These activities will vary depending on the condition and location of the land, but may include surveys of boundaries and property lines, installation of signs, trash removal and other site cleanup measures, construction and repair of fences, invasive plant removal, closure and removal of roads, gate installation, or other measures to protect and improve habitat quality.

2. The per-acre costs of these activities are estimated in **Biological Resources Table 8** but will vary depending on specific measures that may be required for the compensation lands. A non-profit organization, CDFG or another public agency may hold and expend the habitat improvement funds if it is qualified to manage the compensation lands (pursuant to California Government Code § 65965), if it meets the approval of the CPM in consultation with CDFG, and if it is authorized to participate in implementing the required activities on the compensation lands. If CDFG takes fee title to the compensation lands, the habitat improvement fund must be paid to CDFG or its designee.

**Compensation Land Long-Term Habitat Management**

1. Long-term Management Requirements: Long-term habitat management will be required to ensure that the compensation lands are managed and maintained to protect habitat values for the biological resources affected by the project. Management activities may include maintenance of signs, fences, weed removal, habitat or trespass/ land use monitoring, security and enforcement, and control or elimination of unauthorized use.

2. Long-term Habitat Management Plan. The project owner shall prepare and submit a Long-term Habitat Management Plan for the compensation lands for review and approval by the CPM in consultation with BLM, CDFG, and USFWS. The plan shall describe site-specific maintenance and management measures on each proposed compensation parcel.

3. Long-Term Maintenance and Management Funding. The project owner shall fund the long-term maintenance and management of the compensation lands. The amount of required funding is initially estimated as $1,450 for every acre of compensation lands. The final cost of funding will be determined through an approved PAR or PAR-like analysis of the compensation lands. If compensation lands are not identified and the PAR

or PAR-like analysis is not completed within the time period specified for this payment (see the “Verification” subsection at the end of this condition), the project owner shall provide initial payment of $10,297,260 calculated at $1,450 an acre for 7627.6 acres (i.e., the sum of columns 1 and 4 in Biological Resources Table 8; see “Habitat Compensation,” above) into an account for long-term maintenance and management of the compensation lands. The amount of the required initial payment or security for long-term maintenance and management shall be adjusted for any change in the project footprint as described above. Regardless of the amount of an initial payment, the project owner shall deposit additional money as may be needed to provide the full amount of long-term maintenance and management funding indicated by a PAR or PAR-like analysis, once the analysis is completed and approved. Conversely, if the PAR or PAR-like analysis indicates that a smaller amount will be required for long-term maintenance and management, the difference will be returned to the project owner.

The project owner will propose an entity to receive and hold the long-term maintenance and management fund and to manage the compensation lands. The CPM will review the proposed entity in consultation with the project owner and CDFG. The CPM may approve the project owner’s proposed entity or may designate another qualified entity (e.g., a state agency or non-profit organization) to hold the funds and manage the lands.

If CDFG takes fee title to the compensation lands, CDFG shall determine whether it will hold the long-term management fee in a special deposit fund (ii., below), leave the money in the NFWF Account, or designate another entity to manage the long-term maintenance and management fee for CDFG and with CDFG supervision.

The project owner shall ensure that an agreement is in place with the long-term maintenance and management fee holder/manager to ensure the following conditions:

i. Interest. Interest generated from the initial capital shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the compensation lands, including reasonable administrative overhead, biological monitoring, habitat improvements, law enforcement measures, and any other action approved by CDFG to protect or improve the habitat values of the compensation lands.

ii. Withdrawal of Principal. The long-term maintenance and management fee principal shall not be drawn upon unless such withdrawal is deemed necessary by the CPM, in consultation with CDFG, or the approved third-party long-term maintenance and management fund manager to ensure the continued viability of biological resources on the compensation lands. If CDFG takes fee title to the compensation lands, monies received by CDFG pursuant to this provision shall be deposited in a special deposit fund established solely for the purpose to manage lands in perpetuity unless CDFG designates NFWF or another entity to manage the long-term maintenance and management fee for CDFG.

iii. Pooling Funds. A CPM approved non-profit organization qualified to hold long-term maintenance and management funds solely for the purpose to manage lands in perpetuity, may pool the fund with other funds for the operation, management, and protection of the compensation lands. However, for reporting purposes, the Rio Mesa SEGF long-term maintenance and management fund must be tracked and reported individually to the CDFG and CPM.

iv. Reimbursement Fund. The project owner shall provide reimbursement to CDFG or an approved third party for reasonable expenses incurred during title, easement, and documentation review; expenses incurred from other state or state-approved federal agency reviews; and overhead related to providing compensation lands.

**Compensation Land Security**

1. Compensation Land Security: The project owner shall provide security sufficient for funding acquisition, improvement, and long-term management of all compensation lands. Financial assurance can be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("Security"). Prior to submitting the Security to the CPM, the Project owner shall obtain the CPM's approval, in consultation with BLM, CDFG, and USFWS of the form of the Security.

   The security amount shall be based on the estimates provided in **Biological Resources Tables 6** and **9.** This amount shall be updated and verified prior to payment and shall be adjusted to reflect actual costs or more current estimates as agreed upon by the REAT agencies.

   The project owner shall provide verification that financial assurances have been established to the CPM with copies of the document(s) to BLM, CDFG and USFWS, to guarantee that adequate funding is available to fully implement all mitigation measures required by condition of certification and recommended **Conditions of Certification BIO-8, BIO-9, BIO-14**, and **BIO-17**.

   In the event that the project owner defaults on the Security, the CPM may use money from the Security solely for implementation of the requirements of this condition. The CPM's use of the security to implement measures in this condition may not fully satisfy the project owner's obligations under this condition. Any amount of the Security that is not used to carry out mitigation shall be returned to the project owner upon successful completion of the associated requirements in this condition.

Security for the requirements of this condition shall be provided in the amount as specified in **Biological Resources Table 8**. Regardless of the amount of the security or actual cost of implementation, the project owner shall be responsible for implementing all aspects of this condition.

2. The project owner may elect to comply with some or all of the requirements in this condition by providing funds to implement the requirements into the REAT Account established with NFWF. To use this option, the project owner must make an initial deposit to the REAT Account in an amount equal to the estimated costs of implementing the requirement (as set forth in the "Security" section of this condition, paragraph 1, above). If the actual cost of the acquisition, initial protection and habitat improvements, long-term funding or other cost is more than the estimated amount initially paid by the project owner, the project owner shall make an additional deposit into the REAT Account sufficient to cover the actual acquisition costs, the actual costs of initial protection and habitat improvement on the compensation lands, the long-term funding requirements as established in an approved PAR or PAR-like analysis, or the other actual costs that are estimated in the table. If those actual costs or PAR projections are less than the amount initially transferred by the applicant, the remaining balance shall be returned to the project owner. In addition, if the project owner elects to use the REAT NFWF account, the project owner also shall fund NFWF fees to establish a project-specific account; manage the sub-account for acquisition and initial site work; and manage the sub-account for long term management and maintenance as shown in **Biological Resources Table 8**.

3. The responsibility for acquisition of compensation lands may be delegated to a third party other than NFWF, such as a non-governmental organization supportive of desert habitat conservation, by written agreement of the Energy Commission. Such delegation shall be subject to approval by the CPM, in consultation with BLM, CDFG, and USFWS, prior to delegation of land acquisition responsibility. Agreements to delegate land acquisition to a third party, or to manage compensation lands, shall be executed and implemented within 18 months of the Energy Commission's certification of the project.

4. The project owner may request the CPM to provide it with all available information about any funds held by the Energy Commission, CDFG, or NFWF as project security, or funds held in a NFWF sub-account for this project, or other project-specific account held by a third party. The CPM shall also fully cooperate with any independent audit that the project owner may choose to perform on any of these funds.

**Verification:** The mitigation actions required under this condition shall be completed at least 30 days prior to the start of ground-disturbing activities. Or, if these actions are not completed at least 30 days prior to the start of ground-disturbing activities, the following verification schedule requirements shall apply:

1. No later than 30 days prior to beginning project ground-disturbing activities: The project owner shall provide verification to the CPM and CDFG that an approved Security has been established in accordance with this condition of certification. Financial assurance may be in the form of an irrevocable letter of credit, a pledged savings account or another form of security (“Security”) only as approved the CPM and CDFG. Prior to submitting the Security verification, the project owner shall obtain the CPM’s approval of the form of the Security, in consultation with BLM, CDFG, and USFWS.

2. No later than 12 months after the start of ground-disturbing project activities: The project owner shall submit a formal acquisition proposal to the CPM describing the parcels intended for purchase or transfer, for CPM review and approval in consultation with BLM, CDFG, and USFWS. If NFWF or another approved third party is handling all or part of the acquisition, the project owner shall fully cooperate with the third party and ensure that funds needed to accomplish the acquisition are transferred in timely manner to facilitate the planned acquisition and to ensure the land can be acquired and transferred prior to the 18-month deadline.
   a. No later than 60 days after the CPM approves the proposed compensation lands: The project owner shall complete and submit to the CPM a PAR or PAR-like analysis of the anticipated long-term maintenance and management costs of the compensation lands.
      i. No later than 30 days after the CPM approves the PAR or PAR-like analysis: The project owner shall provide written verification to the CPM, BLM, CDFG, and USFWS to confirm that the long-term maintenance and management costs have been fully funded.
   b. No later than 60 days after the CPM determines the activities required for initial protection and habitat improvement on the compensation lands: The project owner shall make funding available for those activities and shall provide written verification to the CPM of the funds that are available and how the habitat improvement costs will be paid.
      i. No later than six months after the CPM’s determination of the required activities: Initial protection and habitat improvement activities shall be completed, and written verification shall be provided to the CPM.

3. No later than 18 months after the start of project ground-disturbing activities: The project owner or an approved third party shall complete the acquisition and all required transfers of the compensation lands, and provide written verification to the CPM, BLM, CDFG, and USFWS.
   a. No later than 180 days after the land or easement purchase, as determined by the date on the title: The project owner, or an approved third party shall provide the CPM, BLM, CDFG, and USFWS with a draft management plan for the compensation lands The CPM, in consultation with the other agencies, shall review and approve the management plan upon incorporation of all needed revisions.

4. No later than 90 days after completion of all project related ground disturbance: The project owner shall provide to the CPM, BLM, CDFG, and USFWS a final accounting, based on aerial photography and Geographic Information System (GIS) analysis, of the amount of habitat disturbed during project construction. If this analysis shows that more lands were disturbed than were anticipated, the project owner shall provide the Energy Commission with additional compensation lands and funding commensurate with the added impacts and applicable mitigation ratios set forth in this condition. If the analysis shows that fewer acres were disturbed than were anticipated, then compensation requirements will only be reduced if the deadlines established under this condition for transfer of compensation lands and funding have been met prior to completion of the analysis.

## WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

**BIO-4** The project owner shall prepare and implement a project-specific Worker Environmental Awareness Program (WEAP) and shall secure approval for the WEAP from the CPM in consultation with BLM, CDFG, and USFWS. The WEAP shall be administered to all on-site personnel at the solar generator site, and gen-tie line alignment, including but not limited to all surveyors, construction engineers, employees, contractors, contractor's employees, supervisors, inspectors, and subcontractors. The WEAP shall be implemented throughout project preconstruction, construction, operation, and closure. The WEAP shall:

1. Be developed by or in consultation with the Designated Biologist and Authorized Desert Tortoise Biologist and consist of a training presentation, printed training material, and electronic media, including photographs of protected species, and be distributed to all participants;

2. Discuss the locations and types of sensitive biological resources on the project site and adjacent areas; explain the reasons for protecting these resources; provide information to participants that no snakes, other reptiles, bats, or any other wildlife shall be harmed or harassed;

3. Place special emphasis on special-status plants, desert tortoise, burrowing owl, golden eagle, nesting birds, desert kit fox, and American badger, including information on physical characteristics, distribution, behavior, ecology, sensitivity to human activities, legal protection, penalties for violations, reporting requirements, and protection measures; this information shall also be included in printed training material and electronic media (above);

4. Include a discussion of fire prevention measures to be observed by workers during all project activities; require that workers dispose of cigarettes and cigars appropriately;

5. Describe the temporary and permanent habitat protection measures to be implemented at the project site;

6. Identify whom to contact if there are further comments and questions about the material discussed in the program;

7. Prominently display posters and descriptions in offices, conference rooms, employee break rooms, and other areas where employees may congregate, of desert tortoises, burrowing owls, golden eagles, nesting birds, desert kit fox, roosting bats, and American badger, with brief descriptions of behavior, ecology, sensitivity to human activities, legal protection, penalties for violations, reporting requirements, and protection measures;

9. Direct all WEAP trainees to report all observations of listed species or their sign to the Designated Biologist for inclusion in the MCR; and

10. Include a training acknowledgment form to be signed by each worker indicating that they received training and shall abide by the guidelines.

The program may be administered by the Designated Biologist or another person as approved by the Designated Biologist.

**Verification:** At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, BLM, CDFG, and USFWS with the a final draft of the WEAP and all supporting written materials and electronic media, as reviewed and approved by the CPM in coordination with the other agencies. Any further modifications to the approved WEAP shall be made only in consultation with the CPM, BLM, CDFG, and USFWS. The project owner also shall submit a resume of each person administering the program.

The project owner shall provide the names and number of people who have completed the training in each MCR.

Throughout the life of the project, the WEAP shall be repeated annually for permanent employees, and shall be routinely administered within one week of arrival to any new construction, maintenance, or operations personnel, foremen, contractors, subcontractors, and other personnel potentially working within the project area. Upon completion of the training, employees shall sign a form stating that they attended the program and understand all protection measures. These forms shall be maintained by the project owner and shall be made available to the CPM upon request. Workers shall receive and be required to visibly display a hardhat sticker or certificate that they have completed the training.

Training acknowledgement forms signed during construction shall be kept on file by the project owner for at least 6 months after the start of commercial operation. During project operation, signed statements for operational personnel shall be kept on file for 6 months following the termination of an individual's employment.

## IMPACT AVOIDANCE AND MINIMIZATION MEASURES

**BIO-5** The project owner shall undertake the following measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to biological resources. All measures shall be subject to review and approval by the CPM.

1. Limit Disturbance Areas and Perimeter Fencing. The boundaries of all areas to be disturbed (including staging areas, access roads, and sites for temporary placement of spoils) shall be delineated with stakes and flagging in consultation with the Designated Biologist prior to and ground disturbing activities within those areas. All ground disturbance, project vehicles, and equipment shall be confined to the flagged areas. Spoils and topsoil shall be stockpiled in areas already disturbed or to be disturbed by construction, so that stockpile sites do not add to total disturbance footprint. Parking areas, staging and disposal site locations shall similarly be located in areas without native vegetation or special-status species habitat. Any sensitive biological resource areas within or adjacent to any project work site shall be clearly marked and biology staff shall inspect these areas at appropriate intervals for compliance with regulatory terms and conditions.

2. Minimize Road Impacts. The limits of any new or improved access route shall be clearly marked as above prior to ground disturbance for the access route. All vehicles passing or turning around shall do so within the marked construction disturbance area.

3. Minimize Traffic Impacts. Vehicle and equipment traffic during project construction and operation shall be confined to existing designated routes of travel to and from the project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited. The speed limit shall not exceed 15 miles per hour within any part of the project area, maintenance roads for linear facilities, or unpaved access roads to the project site where desert tortoise clearance surveys and translocations have not been completed.

4. Monitor During Construction. Due to the possibility that desert tortoises, especially juveniles, may persist on the site after desert tortoise clearance surveys and exclusion fencing are completed, the biology staff shall be present at the construction site during all clearing, grubbing, or initial grading activities. Biology monitors shall walk immediately ahead of equipment during brushing and grading activities. Any time over the life of the project that a desert tortoise is found within the exclusion fencing, the Designated Biologist or Authorized Desert Tortoise Biologist shall immediately contact the CPM, CDFG, and USFWS; monitor the tortoise's location and activities; and translocate the animal in accordance with the approved Desert Tortoise Translocation Plan, in consultation with the USFWS, CDFG, and CPM.

5. Minimize Impacts of Transmission/Pipeline Alignments, Roads, and Staging Areas. Staging and equipment laydown areas for construction on the solar generator site shall be within the desert tortoise exclusion fencing area. For transmission line construction or other activities outside of the solar generator site, all disturbance areas including access roads, pulling sites and staging, laydown or parking areas shall be designed,

installed, and maintained to minimize impacts to native vegetation and wildlife habitat. Biology staff shall evaluate potential for special status biological resources at every potential disturbance site on these project components prior to any construction-related disturbance, including access improvements. Specifically, site selection of any area to be permanently or temporarily disturbed on the gen-tie line alignment or other linear components shall avoid any desert wash, desert microphyll woodland, or any aeolian sand habitat wherever feasible. Where these sites cannot feasibly be avoided, the Designated Biologist shall outline site-specific requirements to minimize impacts to habitat and wildlife. These requirements may include, but would not be limited to, pre-construction clearance surveys, exclusion fencing (e.g., for desert tortoise or Mojave fringe-toed lizard), on-site monitoring, and post-construction remediation.

6. Implement APLIC Guidelines. The gen-tie line, all distribution lines, and all other electrical components shall be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee's (APLIC's) *Suggested Practices for Avian Protection on Power Lines* (APLIC 2006) and *Mitigating Bird Collisions with Power Lines* (APLIC 1994) to reduce the likelihood of large bird electrocutions and collisions.

7. Avoid Toxic Substances on Road Surfaces. Soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to wildlife and plants.

8. Evaporation Ponds. Prior to any discharge into the evaporation ponds, the project owner shall cover the ponds with 2-cm (about ¾-inch) mesh netting to exclude birds and other wildlife from drinking or landing on the ponds; the netting shall be monitored regularly to verify that it remains intact, functions to exclude birds and other wildlife from the ponds, and does not pose an entanglement threat to birds and other wildlife; the ponds and netting shall be designed and maintained so that the netting does not contact the water.

9. Minimize Lighting Impacts. Facility lighting shall be designed, installed, and maintained to prevent side casting of light towards wildlife habitat.

10. Minimize Bird Attraction to SRSG Towers. FAA lighting on SRSG towers shall be only red lights with the longest permissible interval between flashes and the shortest permissible flash duration, and with flashes synchronized to increase the flash effect. These shall be red strobe lights if consistent with FAA requirements and staff's recommended Condition of Certification **TRANS-8** (Obstruction Marking and Lighting).

11. Minimize Noise Impacts. To minimize disturbance to wildlife nesting or breeding activities in surrounding habitat, loud construction activities (e.g., pile driving, steam blows) shall be avoided to the extent feasible from February 1 to August 31. Loud construction activities may be permitted from February 1 to August 31 only according to the provisions of the

Nesting Bird Management Plan (recommended Condition of Certification **BIO-14**).

12. Avoid Vehicle Impacts to Desert Tortoise. Parking and equipment storage shall be within the area enclosed by desert tortoise exclusion fencing to the extent feasible. The project owner will coordinate with the Designated Biologist and CPM to locate employee and contractor vehicle parking at designated sites to minimize likelihood of impacts to desert tortoises and need for inspections. No vehicles or construction equipment parked outside the fenced area shall be moved prior to an inspection of the ground beneath the vehicle for the presence of desert tortoise. If a desert tortoise is observed, it shall be left to move on its own. If it does not move within 15 minutes, the Authorized Desert Tortoise Biologist may remove and relocate the animal to a safe location if temperatures are within the range described in the USFWS's (2009a) *Desert Tortoise Field Manual* (http://www.fws.gov/ventura/speciesinfo/protocols_guidelines). All access roads outside of the fenced project footprint shall be delineated with temporary desert tortoise exclusion fencing on either side of the access road, unless otherwise authorized by the CPM, in consultation with BLM, CDFG, and USFWS.

13. Avoid Wildlife Entrapment:

    a. Backfill Trenches. At the end of each work day, biology staff shall ensure that all potential wildlife pitfalls (trenches, bores, temporary detention basins, and other excavations) have been backfilled, covered, or sloped to allow wildlife egress. All potential pitfalls outside the permanent desert tortoise exclusion fencing shall be inspected no less than three times throughout the day and at the end of each workday. All potential pitfalls outside the exclusion fencing will be backfilled, sloped at a 3:1 ratio at the ends to provide wildlife escape ramps, covered completely to prevent wildlife access except as necessary for ongoing project activities. Should a desert tortoise or other wildlife become trapped, the Designated Biologist or Biological Monitor shall remove and, if applicable, relocate it as described in the Desert Tortoise Translocation Plan. In addition, Biology Staff will periodically inspect areas with high vehicle activity (e.g., parking lots) for animals in harm's way. Any wildlife encountered during the course of construction shall be allowed to leave the construction area unharmed.

    b. Avoid Entrapment of Desert Tortoise. Any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches aboveground for one or more nights, shall be inspected for tortoises before the material is moved, buried, or capped. As an alternative, all such structures may be capped before being stored outside the fenced area, or placed on pipe racks.

    c. Avoid entrapment of nesting or migratory birds. All pipes or other construction materials or supplies will be covered or capped in storage or laydown areas at the end of each work day. No pipes or tubing of sizes or inside diameters ranging from 1 to 10 inches will be left open either temporarily or permanently.

14. Minimize Standing Water. Standing water could attract desert tortoises, common ravens, and other wildlife to construction sites. Dust abatement on access routes or other areas of the project site shall use the minimal amount of water needed to meet safety and air quality standards to minimize pooling or puddles. Biology staff shall inspect road watering, water tanks, pump sites, and other facilities to ensure water does not pool and shall report standing water to the Designated Biologist for follow up with the project owner's Environmental Compliance Manager (ECM).

15. Dispose of Road-killed Animals. Road-killed animals or other carcasses detected on or near the project area shall be collected and delivered to the biology staff. The Designated Biologist shall retain the carcass in a freezer on-site and contact CDFG within 30 working days for guidance on disposal or storage. For any road-killed special-status species, the Biological Monitor shall contact CDFG and USFWS (for golden eagle or federally-listed species, including desert tortoise) within one working day of receipt of the carcass for guidance on disposal or storage of the carcass. The Designated Biologist shall report the special-status species record to the CNDDB.

16. Minimize Spills of Hazardous Materials. All vehicles and equipment shall be maintained in proper condition to minimize the potential for fugitive emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Designated Biologist shall be informed of any hazardous spills immediately as directed in the project Hazardous Materials Plan. Hazardous spills shall be immediately cleaned up and the contaminated soil shall be properly handled or disposed of at a licensed facility. Servicing of construction equipment shall take place only at a designated area as approved by the CPM. Service and maintenance vehicles shall carry a bucket and pads to absorb leaks or spills.

17. Worker Guidelines. All trash and food-related waste shall be placed in self-closing containers and removed regularly from the site to prevent overflow. Workers shall not feed wildlife or bring pets to the project site. Except for law enforcement personnel, no workers or visitors to the site shall bring firearms or weapons.

18. Erosion Control Measures. Erosion control measures and BMPs shall be taken to minimize erosion and off-site or downstream sediment run-off. All spoils or other materials shall be placed such that heavy rains will not cause materials to wash off-site or into waters of the state. All disturbed soils and roads within the project site shall be stabilized to reduce erosion potential, both during and following construction, except that soil stabilizers may not be used within or adjacent to special-status species

locations on or off the project site, or on road crossings of washes or stream channels, as consistent with applicable water quality requirements.

19. Monitor Ground-Disturbing Activities Prior to Pre-Construction Site Mobilization. If pre-construction site mobilization requires ground-disturbing activities such as geotechnical borings or hazardous waste evaluations, biology staff shall be present to monitor any actions that could affect desert tortoise, or disturb soil, vegetation, or wildlife.

20. Remove Unused Material and Equipment. All unused material and equipment, including soil and rock piles, will be removed upon completion of any construction or maintenance activities outside the permanently fenced area.

21. Control and Regulate Fugitive Dust. To reduce the potential for the transmission of fugitive dust, the project owner shall implement dust control measures as described in staff's recommended Conditions of Certification **AQ-SC4, AQ-SC5**, and **AQ-SC7** in the **Air Quality** section of this Staff Assessment.

**Verification:** All mitigation measures listed above and the project owner's proposed methods for implementing them shall be included in the BRMIMP and shall be implemented. Throughout the life of the project, implementation of the measures shall be reported in the MCRs and ACRs by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report identifying how measures have been completed.

## REVEGETATION OF TEMPORARY CONSTRUCTION AREAS

**BIO-6** The project owner shall prepare and implement a Revegetation Plan for all temporary (albeit long-term) project disturbance areas, including work areas on the gen-tie alignment, temporary construction disturbance areas to the east of the solar generator site, and all areas within the solar generator site where underground infrastructure construction, temporary access, temporary lay-down areas, construction equipment staging areas, or other project construction activities caused temporary disturbance to soils and vegetation. Upon completion of construction, all temporarily disturbed areas shall be restored to pre-project grade and topography, or recontoured as needed to prevent surface hydrology alterations from causing undue erosion.

Revegetation objectives will be to prevent or minimize further site degradation; stabilize soils; maximize the likelihood of vegetation recovery over time; and minimize soil erosion, dust generation, and weed invasions. The nature of site reclamation, revegetation, or restoration will vary according to each site, its pre-disturbance condition, and the nature of the construction disturbance (e.g., drive and crush, vs. blading). The revegetation plan shall conform to the following requirements:

1. Plan Details. The revegetation plan shall include at minimum: (a) top soil storage and handling methods, if proposed; (b) seed collection guidelines;

(c) planting or seeding schedule, to coincide with winter rain season (i.e., seeding prior to mid-December); (d) seeding or planting methods; (e) a description of the irrigation system and irrigation scheduling, if used; (f) measures to control invasive species (to be coordinated with the project's Integrated Weed Management Plan, below); (h) success criteria; and (i) a detailed monitoring program. All habitats dominated by non-native species prior to project disturbance shall be revegetated using appropriate native species to minimize re-infestation. This plan shall also contain contingency measures for failed revegetation efforts (those not meeting success criteria).

2. Seed and Nursery Stock. Only seed or potted nursery stock of locally occurring native species shall be used for revegetation. Seeds shall contain a mix of short-lived early pioneer species such as native annuals and perennials and subshrubs. Seeding and planting shall be conducted as described in Chapter 5 of *Rehabilitation of Disturbed Lands in California* (Newton and Claassen 2003). A list of plant species suitable for Colorado Desert region revegetation projects, including recommended seed treatments, are included in Appendix A-9 of the same report. The list of plants observed during the special-status plant surveys of the project area can also be used as a guide to site-specific plant selection for revegetation. In conformance with BLM policy, the project owner shall include salvaged or nursery stock yucca (all species), and cacti (excluding cholla species, genus *Cylindropuntia*), in revegetation plans and implementation affecting BLM lands.

3. Monitoring. Revegetation monitoring will be on an annual basis and shall continue for a period of no less than five (5) years or until the defined success criteria are achieved. If the survival and cover requirements have not been met, the project owner will be responsible for replacement seeding or planting to achieve these requirements or other remedial action as agreed to by the CPM in consultation with BLM, CDFG, and USFWS. Remediation sites shall be monitored with the same survival and growth requirements as required for original revegetation. Remediation activities (e.g., additional planting, removal of non-native invasive species, or erosion control) shall be undertaken during the monitoring as necessary to ensure success. If any revegetation site fails to meet the established performance criteria after the maintenance and monitoring period, monitoring and remedial activities shall extend until the criteria are met or unless otherwise specified by the CPM in consultation with BLM, CDFG, and USFWS.

4. Replacement. If a fire occurs in a revegetation area within the monitoring period, the owner shall be responsible for a one-time replacement. If a second fire occurs, no replanting is required, unless the fire is caused by the owner's activity (e.g., as determined by BLM or other firefighting agency investigation).

**Verification:** At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, BLM, CDFG, and USFWS with the a final draft of the Revegetation Plan, as reviewed and approved by the CPM in coordination with the other agencies. Any further modifications to the approved Revegetation Plan shall be made only in consultation with the CPM, BLM, CDFG, and USFWS. The project owner shall include all revegetation and monitoring activities in the ACRs submitted to the CPM. The report shall include: a summary of revegetation, monitoring, and remediation activities for the year; a discussion of whether revegetation performance standards for the year were met; and recommendations for remedial action, if warranted, planned for the upcoming year.

## INTEGRATED WEED MANAGEMENT PLAN

**BIO-7** The project owner shall prepare and implement an Integrated Weed Management Plan (IWMP) that meets the approval of the CPM, in consultation with BLM, CDFG, and USFWS. The IWMP shall address California Department of Food and Agricultural "A" and "B" rated weeds, BLM "A" and "B" ranked weeds, and Californian Invasive Plan Council (Cal-I PC) "High" and "Moderate" ranked weeds. At minimum, the IWMP shall include the following:

1. An assessment of nonnative and invasive weeds occurring on the site and within a one-mile adjacent buffer area prior to construction activities;

2. An assessment of nonnative and invasive weeds that could be introduced into the project area (e.g., via seeds adhering to construction equipment);

3. A prevention plan, to include installation and maintenance of vehicle wash or inspection stations, and close monitoring of materials brought onto the site;

4. A monitoring plan, to ensure early timely detection of weed invasions; the plan should describe methods to be used to monitor the presence and abundance, and evaluate threat, of introduced weeds during construction, operation, and decommissioning; monitoring shall continue from project initiation, through the life of the project, and through the closure and a five-year follow-up monitoring phase; surveying for new invasive weed populations and the monitoring of identified and treated populations shall be required throughout the project area and an appropriate surrounding buffer area; weed monitoring must occur at least twice each year to detect infestations of invasive species germinating in winter and in summer;

5. An action or mobilization plan to ensure timely and appropriate control or eradication of infestations before they go to seed, to prevent further expansion; treatment of weed infestations shall occur at least once annually; when no new seedlings or resprouts are observed at treated sites for three consecutive normal rainfall years, the infestation can be considered eradicated and weed control efforts may cease for that impact site; control methods shall meet the following criteria:

a. Manual. Well-timed removal of plants or seed heads with hand tools; seed heads and plants must be disposed of in accordance with guidelines from the Riverside County Agricultural Commissioner;

b. Chemical. Only state and BLM-approved herbicides will be used, and all herbicide applicators will possess a qualified herbicide applicator license from the state; all herbicide applications will be in accordance with federal, state, and local laws and regulations follow U.S. Environmental Protection Agency label instructions; herbicides having residual toxicity, such as preemergents and pelts, shall not be used in natural areas or within channels (engineered or not) where they could run off into downstream areas. Only the following application methods may be used: wick (wiping onto leaves); inner bark injection; cut stump; frill or hack & squirt (into cuts in the trunk); basal bark girdling; foliar spot spraying with backpack sprayers or pump sprayers at low pressure or with a shield attachment to control drift, and only on windless days, or with a squeeze bottle for small infestations;

c. Specific and detailed guidelines for herbicide use to prevent overspray onto surrounding areas where it would adversely affect wildlife or native plants and to avoid herbicide use in or around any environmentally sensitive areas or special-status species locations within or adjacent to the project site.

6. Monitoring and weed control methods shall be consistent with BLM's Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (BLM 2007) and the National Invasive Species Management Plan (NISC 2008); to include the following information for each herbicide that may be used for the project:

    a. Herbicide common name, trade name, formulation, and chemical composition;

    b. Proposed use and application method;

    c. Toxicity, leaching potential, persistence in soil;

    d. State- or agency specific restrictions; and

    e. Analysis of potential for exposure to adjacent desirable vegetation, potential pollution of surface water based on proximity and topography, potential pollution of groundwater based on geology/soils and depth to groundwater, and potential exposure of wildlife including aquatic species; and

7. Reporting schedule and report contents.

The final IWMP shall only include weed control measures for target weeds with a demonstrated record of success, based on the best available information from sources such as: The Nature Conservancy's The Global

Invasive Species Team, Cooperative Extension, California Invasive Plant Council: <http://www.cal-ipc.org/ip/management/plant_profiles/index.php>, and the California Department of Food & Agriculture Encycloweedia: <http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_h p.htm>.

In addition to the requirements listed above, the final IWMP shall include at minimum the following Best Management Practices (BMPs) to prevent the spread and propagation of weeds:

- Provide for coordination with the project's Special-status Plant Impact Avoidance and Minimization Measures, Revegetation Plan and Facility Closure, Revegetation, and Reclamation Plan, described in Conditions of Certification **BIO-6, BIO-9,** and **BIO-19** to reestablish native vegetation on disturbed sites and avoid adverse impacts to special-status plants;
- Use only weed-free straw or hay bales used for sediment barrier installations, and weed-free seed;
- Control weeds in areas where irrigation and mirror washing take place;
- Prohibit on-site storage or disposal of mulch or green waste from weed material to prevent inadvertent introduction and spread of invasive plants beyond the immediate vicinity of the infestation; mulch or green waste shall be removed from the site in a covered vehicle to prevent seed dispersal and transported to a licensed landfill or composting facility;

**Verification:** At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, BLM, CDFG, and USFWS with the a final draft of the IWMP, as reviewed and approved by the CPM in coordination with the other agencies. Any further modifications to the approved IWMP shall be made only in consultation with the CPM, BLM, CDFG, and USFWS. A summary report on weed management on the project site shall be submitted in the ACRs during facility operations, closure, and a five-year follow-up monitoring period.

## DESERT DRY WASH WOODLAND MONITORING PLAN AND OFF-SITE IMPACT COMPENSATION

**BIO-8** The project owner shall prepare and implement a Desert Dry Wash Woodland Monitoring Plan (DDWWMP) upon review and approval by the CPM, in consultation with BLM, CDFG, and USFWS. The project owner shall not commence project-related groundwater pumping until the plan has been revised and approved by the CPM in consultation with the other agencies. The Plan shall outline the following information and actions:

1. Prior to project operations, the baseline health and vigor of groundwater-dependent plant species (desert ironwood, blue palo verde, mesquite, and bush seepweed) shall be recorded within four zones: immediately off-site at the eastern project boundary, and at ¼-mile, ½-mile and 1-mile distances from proposed project groundwater supply well locations. At least one "control" site, at least 2 miles from the supply well locations, shall also be sampled. The number of plants for each of the target species to be sampled at each site will be large enough to provide valid

comparison of data among sites. The DDWWMP will provide maps and text description of each study site.

2. A qualified botanist or plant physiologist shall develop a sampling protocol to be carried out at each sampling zone (above) and the control site to monitor stress and mortality of target plants once operations begin. The protocol shall include a measure of pre-dawn water potential, as measured by standard plant physiology techniques.

3. The DDWWMP shall identify thresholds constituting a significant difference in plant stress or mortality. If a significant difference in plant stress or mortality is shown at one or more sample locations in comparison to the control site, the project owner shall coordinate with the CPM, BLM, CDFG, and USFWS to interpret the results. The sample site and control site data shall be evaluated in terms of the project's groundwater usage, climate factors, and groundwater monitoring data collected for staff's recommended Condition of Certification **WATER SUPPLY-4**. If plant stress or mortality is determined to be related to project activities, then the project owner shall either refrain from pumping, reduce groundwater pumping to allow for recovery of the groundwater table, or provide additional habitat compensation as described below.

If results of the groundwater monitoring program under **WATER SUPPLY-4** indicate that the project pumping has resulted in groundwater level decline of 1 foot or more below the baseline trend, and vegetation monitoring for plant stress, mortality, and water potential have documented one or more of the sampling sites for the four groundwater-dependent plant species as reaching the threshold (above), the project owner will reduce groundwater pumping until water levels stabilize or recover, provide for temporary supplemental watering, or compensate for additional impacts to desert dry wash woodland (blue palo verde–ironwood woodland) at the ratio of 3:1, consistent with Condition of Certification **BIO-3**. Estimated acreage of additional dry wash woodland impacts will be submitted to the CPM for review in consultation with BLM, CDFG, and USFWS for approval. Upon approval, the project owner will initiate and complete further compensation according to the requirements and conditions described in **BIO-3**.

At the conclusion of the monitoring period (i.e., throughout construction phase and for an additional three (3) years) following completion of project construction), the project owner, CPM, BLM, CDFG, and USFWS shall jointly evaluate the effectiveness of the DDWWMP and determine if monitoring frequencies or procedures should be revised, extended to the operation and decommissioning periods, or eliminated. Should additional data be forthcoming to demonstrate that this potential impact is not verifiable or attributable to this specific project, it may be modified or eliminated.

**Verification:** At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, BLM, CDFG, and USFWS with the a final draft of the DDWWMP, as reviewed and approved by the CPM in coordination with the other agencies. Any further modifications to the approved

DDWWMP shall be made only in consultation with the CPM, BLM, CDFG, and USFWS. Results of desert dry wash woodland monitoring will be submitted to the CPM in MCRs and ACRs throughout the project's construction period and for no fewer than three (3) additional years following the completion of construction. The reports will include all monitoring data required as part of the monitoring program requirements under **WATER SUPPLY-4** and as required under this condition including evaluation and any changes in plant health and vigor, and changes in groundwater levels in the production and monitoring wells. If the project owner elects to mitigate potential future impacts through acquisition of compensation habitat, then all terms and measures of Condition of Certification **BIO-3**, including schedule requirements, submittal and acceptance of a formal acquisition proposal, completion of the required transactions, and verification of completion for each term or condition, shall apply to the verification of this condition, except that transaction and management schedule requirements will be adjusted to begin on the date of the CPM's approval of the acreage impacts.

## STATE WATERS IMPACT MINIMIZATION AND COMPENSATION MEASURES

**BIO-9** The project owner shall implement the following measures to avoid, minimize and mitigate for direct and indirect impacts to waters of the state and to satisfy requirements of California Fish and Game Code sections 1600 and 1607.

1. Finalize Acreages of Impacts to State Waters: The applicant estimates that 817.37 acres of state-jurisdictional waters would be directly or indirectly impacted by the project, and staff's recommended compensation is based on that estimate. Upon completion of final engineering, the project owner shall review and quantify the project's permanent and long-term impacts to state-jurisdictional waters. The calculated acreage of permanent and long-term impacts shall include all ephemeral drainages within or adjacent to the fenced boundary of the solar generator site; the adjacent temporary construction area; and all impacts to streambeds or adjacent riparian vegetation resulting on the gen-tie alignment, including construction or widening of the access road; transmission line tower access; logistics, staging, and lay-down areas; road turnouts; pull sites; and any other project-related disturbance to state jurisdictional waters.

2. Acquire Off-Site State Waters: Permanent and long-term impacts to waters of the state shall be offset by compensation at a 3:1 ratio. The project owner shall acquire, in fee or in easement, a parcel or parcels of land that includes 2,452.11 acres of state jurisdictional waters, including ephemeral streambeds and adjacent riparian vegetation. The parcel or parcels comprising the off-site state waters shall include similar vegetation and habitat types as those found on the project site, including blue palo verde – ironwood woodland and bush seepweed – mesquite bosque scrub. Total acreage of these vegetation types shall be at the 3:1 ratio as described for special status plant community compensation in staff's recommended Condition of Certification **BIO-3**. The terms and conditions of this acquisition or easement shall be as described in Condition of Certification **BIO-3**. Compensation lands for offset of impacts to state

waters shall be located within the surrounding watersheds, as close to the project site as possible. State waters on other compensation lands, such as desert tortoise compensation lands (see Condition of Certification **BIO-11**) may fully or partially fulfill the requirements of this condition. Additional off-site state waters shall be acquired if those compensation lands do not include the necessary acreage of state waters as required for compliance with this condition of certification.

3. Prepare and Implement Habitat Management Plan for Off-site Compensation Land: The project owner shall prepare and implement a Long-Term Habitat Management Plan that describes site-specific enhancement measures for the acquired compensation lands, as described in Condition of Certification **BIO-3**. The Management Plan shall include site-specific enhancement measures for all state waters on the compensation lands that will be used to fulfill the requirements of this condition of certification. The management plan shall be submitted for the CPM'S review in consultation with BLM, CDFG, and UFWS, and implemented upon its finalization and approval.

4. Code of Regulations: The project owner shall provide a copy of the State Waters Impact Minimization and Compensation Measures condition as published in the Energy Commission Decision to all contractors, subcontractors, and the project owner's construction, operations, and closure supervisors. Copies shall be readily available at work sites at all times during periods of active work and must be presented to the CPM or BLM, CDFG, or USFWS upon request. The CPM reserves the right to issue a stop work order after giving notice to the project owner and the CPM, if the CPM in consultation with CDFG determines that the project owner has breached any of the terms or conditions or for other reasons, including but not limited to the following:

   a. The information provided by the project owner regarding streambed alteration is incomplete or inaccurate;

   b. A new discovery on the project site that was not known to the Energy Commission staff or to CDFG in preparing and reviewing the terms and conditions; or

   c. The project or project activities as described in future environmental documentation or in decision documents prepared by the Energy Commission have changed.

5. Best Management Practices: The project owner shall comply with the following conditions to protect state waters on and adjacent to the project site:

   a. The project owner shall not operate vehicles or equipment in ponded or flowing water except as described in this condition;

b. With the exception of the drainage control system, the installation of bridges, culverts, or other structures shall be such that water flow (velocity and low flow channel width) is not impaired. Bottoms of temporary culverts shall be placed at or below stream channel grade;

c. When any activity requires moving of equipment across a flowing drainage, such operations shall be conducted without substantially increasing stream turbidity;

d. Vehicles driven across ephemeral drainages when water is present shall be completely clean of petroleum residue and water levels shall be below the vehicles' axles;

e. The project owner shall minimize road building, construction activities, and vegetation clearing within ephemeral drainages to the extent feasible for all project components both within and outside the perimeter fence;

f. The project owner shall not allow water containing mud, silt, or other pollutants from grading, aggregate washing, or other activities to enter off-site state waters or be placed in locations that may be subject to high storm flows;

g. The project owner shall comply with all litter and pollution laws and shall be responsible for compliance of all contractors, subcontractors, and employees with these laws;

h. Spoil sites shall be located and protected as necessary to prevent spoils from eroding into any off-site state-jurisdictional waters; no spoils shall be placed in locations that may be subjected to high storm flows, where spoils might be washed back into drainageways;

i. Raw cement or concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to vegetation or wildlife resources, resulting from project-related activities, shall be prevented from contaminating the soil or entering off-site state-jurisdictional waters; these materials, if placed within or where they may enter state waters by the project owner or any party working under contract or with the permission of the project owner, shall be removed immediately;

j. No broken concrete, debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products or other organic or earthen material from any construction or associated activity of any nature shall be allowed to enter into, or be placed where it may be washed by rainfall or runoff into, off-site state waters;

k. When construction is completed, any excess materials or debris shall be removed from the work area; no rubbish shall be deposited within

150 feet of the high water mark of any category 3, 4, or 5 streambed or any streambed greater than 10 feet wide;

l. No equipment maintenance shall occur within 150 feet of any category 3, 4, or 5 streambed or any streambed greater than 10 feet wide and no petroleum products or other pollutants from the equipment shall be allowed to enter these areas or enter any off-site state waters;

m. Stationary equipment such as motors, pumps, generators, and welders located within or adjacent to a drainage, shall be positioned over drip pans; stationary heavy equipment shall have suitable containment to handle a catastrophic spill or leak; clean up equipment such as booms, absorbent pads, and skimmers shall be on the site prior to the start of construction; and

n. The cleanup of all spills shall begin immediately; the CPM, BLM CDFG, and USFWS shall be notified immediately by the project owner of any spills and shall be consulted regarding clean-up procedures.

6. Non-Native Vegetation Removal: The project owner shall remove any non-native vegetation (consistent with the IWMP, Condition of Certification **BIO-7**) from any drainageway on the project site that requires the placement of a bridge, culvert, or other structure. Removal shall be done at least twice annually throughout the life of the project.

7. Reporting of Special-Status Species: Consistent with Conditions of Certification **BIO-1, BIO-5**, and **BIO-10**, if any special-status species are observed on or in proximity to the project site, or during project-related field surveys, the project owner shall submit California Natural Diversity Data Base (CNDDB) forms and maps to the CNDDB within five working days of the sightings and provide the regional CDFG office with copies of the CNDDB forms and survey maps. The CNDDB form is available online at: www.dfg.ca.gov/whdab/pdfs/natspec.pdf. This information shall be mailed within five days to: California Department of Fish and Game, Natural Diversity Data Base, 1807 13th Street, Suite 202, Sacramento, CA 95814, (916) 324-3812. A copy of this information shall also be mailed within five days to the CPM, BLM, CDFG, and USFWS.

8. Notification: The project owner shall notify the CPM, BLM, CDFG, and USFWS in writing at least five days prior to initiation of project activities in jurisdictional areas and at least five days prior to completion of project activities in jurisdictional areas. The project owner shall notify the CPM, BLM, CDFG, and USFWS of any change of conditions to the project, the jurisdictional impacts, or the mitigation efforts, if the conditions at the site of the project change in a manner which changes risk to biological resources that may be substantially adversely affected by the proposed project. The notifying report shall be provided to the CPM, BLM, CDFG, and USFWS no later than 7 days after the change of conditions is identified. As used here, change of condition refers to the process,

procedures, and methods of operation of a project; the biological and physical characteristics of a project area; or the laws or regulations pertinent to the project, as described below. A copy of the notifying change of conditions report shall be included in the annual reports.

a. Biological Conditions: a change in biological conditions includes, but is not limited to, the following: 1) the presence of biological resources within or adjacent to the project area, whether native or non-native, not previously known to occur in the area; or 2) the presence of biological resources within or adjacent to the project area, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.

b. Physical Conditions: a change in physical conditions includes, but is not limited to, the following: 1) a change in the morphology of a river, stream, or lake, such as the lowering of a bed or scouring of a bank, or changes in stream form and configuration caused by high flows; 2) the movement of a river or stream channel to a different location; 3) a reduction of or other change in vegetation on the bed, channel, or bank of a drainage, or 4) changes to the hydrologic regime such as fluctuations in the timing or volume of water flows in a river or stream.

c. Legal Conditions: a change in legal conditions includes, but is not limited to, a change in Regulations, Statutory Law, a Judicial or Court decision, or the listing of a species, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.

**<u>Verification:</u>** Within 30 days of the completion of final engineering, the project owner shall notify the CPM, BLM, CDFG, and USFWS of the total acreage of impacts to jurisdictional waters. No fewer than 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall implement the construction-related mitigation measures described above. All terms and measures of Condition of Certification **BIO-3**, including schedule requirements, submittal and acceptance of a formal acquisition proposal, completion of the required transactions, and verification of completion for each term or condition, shall apply to the verification of the portion of this condition requiring compensation lands. No fewer than 30 days prior to the start of work potentially affecting waters of the state, the project owner shall provide written verification (i.e., through incorporation into the BRMIMP) to the CPM, BLM, CDFG, and USFWS that the above best management practices will be implemented and shall provide a discussion of ongoing, completed, or future planned work in waters of the state in MCRs and ACRs for the duration of the project.

Verification of non-native vegetation removal from drainages on the site, and reporting of special-status species shall be included in MCRs and ACRs (see Condition of Certification **BIO-1**). Verification of implementation and completion of the compensation land Habitat Management Plan shall be as specified in that Plan.

## SPECIAL-STATUS PLANT IMPACT AVOIDANCE, MINIMIZATION AND HABITAT COMPENSATION

**BIO-10** The project owner shall implement the following measures to mitigate the project's direct and indirect impacts to special-status plants.

1. **Special Status Plant Impact Avoidance and Minimization.** To protect Harwood's milk-vetch or other CRPR 1 or 2 plants located within the project area or within 250 feet of its boundaries (including access roads, staging areas, laydown areas, parking and storage areas) from accidental and indirect impacts during construction, operation, and closure, the project owner shall avoid special-status plant locations to the extent feasible. Any CRPR 1 or 2 plant locations and a surrounding 250-foot buffer area shall be designated as "environmentally sensitive areas" and avoided during all project activities. Project design or grading plan modifications to avoid special-status plant locations shall be clearly depicted on the grading and construction plans, and on report-sized maps in the BRMIMP, with notations indicating avoidance requirements. These special-status plant locations shall be marked and monitored as environmentally sensitive areas as described in Condition of Certification **BIO-5**. Erosion and sediment control measures shall be taken to avoid adverse impacts to the sites.

2. **Seed Salvage.** For all direct impacts to CRPR 1 or 2 plants, mitigation shall include seed collection from the affected special-status plants on-site prior to construction to conserve the germplasm and provide a seed source for potential future restoration efforts. Where construction schedules or seed availability prevents seed collection, seed must be collected from another portion of the project site or from public or applicant-owned lands off-site. Seed collection on public land must only be done under permit from the BLM; the project owner shall be responsible for obtaining and complying with applicable permit(s). The seed shall be collected under the supervision or guidance of a reputable seed storage facility such as the Rancho Santa Ana Botanical Garden (RSABG) Seed Conservation Program, San Diego Natural History Museum, or the Missouri Botanical Garden. The costs associated with the long-term storage of the seed shall be the responsibility of the project owner. Any efforts to propagate and reintroduce special-status plants from seeds in the wild shall be carried out under the direct supervision of specialists such as those listed above.

3. **Mitigation of Unavoidable Impacts to Special-status Plants.** The project owner shall mitigate impacts to any CRPR 1 or 2 ranked plants, including plants that may be discovered during summer 2012 field surveys, through one or a combination of the following strategies.

   a. Off-site compensation. The project owner may provide compensation lands consisting of occupied habitat of the affected CRPR 1 or 2 ranked plants, at a 1:1 ratio for any occupied habitat affected by the project. Compensation lands shall be secured according to all terms described in Condition of Certification **BIO-3**. Selection criteria and acreage for special-status plant compensation lands shall be as follows.

i. Compensation lands shall be occupied by the special-status plant species impacted by the project.

ii. Occupied habitat shall be calculated for impacted lands and for compensation lands as including each special status plant occurrence and a surrounding 250 foot buffer area.

b. Salvage. It is not known whether salvage is a feasible mitigation strategy for most special-status plants. The project owner may contract with RSABG or another entity with comparable experience and qualifications, to develop an appropriate experimental salvage and relocation strategy, based on the life history of the species affected.

c. Horticultural propagation and off-site introduction. If salvage and relocation is not believed to be feasible, then the project owner may consult with RSABG or another qualified entity, to develop an appropriate experimental propagation and relocation strategy, based on the life history of the species affected. The strategy will include at minimum:

d. Enhancement or Restoration. The project owner may undertake habitat enhancement or restoration for the target special-status plant species. Habitat enhancement or restoration must achieve protection at a 3:1 ratio, Examples of suitable enhancement projects include but are not limited to the following: i) control unauthorized vehicle use into an occurrence (or pedestrian use if clearly damaging to the species); ii) control weeds that infest or pose an immediate threat to an occurrence; iii) exclude grazing by wild burros or livestock from an occurrence; or iv) restore lost or degraded hydrologic or geomorphic functions such as restoring previously diverted flows, removing obstructions to the wind sand transport corridor above an occurrence, or increasing groundwater availability for dependent species.

   Habitat enhancement must meet the following performance standards: The enhancement project shall achieve “rescue” of an off-site occurrence meeting one of the following threat ranks (Master et al. 2009; Morse et al. 2004): long-term decline greater than 30 percent; an immediate threat affecting greater than 30 percent of the population; or having an overall threat impact that is High to Very High. “Rescue” would be considered successful if it achieves an improvement in the occurrence trend to “stable” or “increasing” status, or downgrading of the overall threat rank to Slight or Low.

e. If the project owner chooses to mitigate special-status plant impacts through plant salvage, horticultural propagation, or habitat enhancement (b., c., or d. above), then the project owner shall prepare an appropriate plan, to include all applicable components from the following list:

i. Collection/salvage measures for plants or seed banks, to retain intact soil conditions and maximize likelihood of success;

ii. Details regarding storage of plants or seed; location of any proposed propagation facility, and proposed methods;

iii. Relevant ecological factors for enhancement or introductions, to include feasibility for long-term protection;

iv. Location and description of proposed recipient or enhancement site, including pre-impact or historical conditions (before the enhancement site was degraded), current conditions, and the planned enhancement conditions;

v. Detailed implementation measures, including weed control, site preparation, soil handling, site protection, seedling protection, irrigation, long-term maintenance;

vi. Season and methods of the proposed salvage, planting, seeding or enhancement activities;

vii. Success criteria;

viii. A detailed monitoring program, commensurate with the Plan's goals;

ix. Budget and time-line; and

x. Contingency measures.

4. **Conformance with BLM Plant Protection Policies**. It is BLM policy to salvage yucca and cactus plants (excluding cholla species, genus *Cylindropuntia*) and transplant them to undisturbed sites within project Rights of Way. Staff recommends conformance with policy, as follows:

   a. The project owner shall inventory all plants subject to BLM policies on BLM lands on the gen-tie line alignment that would be removed or damaged by proposed project construction.

   b. The project owner shall prepare a Protected Plant Salvage Plan in conformance with BLM standards for review and approval by the CPM in consultation with BLM. The plan shall include detailed descriptions of proposed methods to salvage plants; transport them; store them temporarily (as needed); maintain them in temporary storage (i.e., irrigation, shade protection, etc.); proposed transplantation locations and methods for permanent relocation; proposed irrigation and maintenance methods at transplantation sites; and a monitoring plan to verify survivorship and establishment of translocated plants for a minimum of five years.

c. Prior to initiating any ground-disturbing activities on the project site, the project owner shall implement the Protected Plant Replacement measures as approved by the CPM, in consultation with BLM's State Botanist.

**Verification:** The Special-Status Plant Impact Avoidance and Minimization Measures shall be incorporated into the BRMIMP as required under Condition of Certification **BIO-2**. The Project owner shall immediately provide written notification to the CPM, CDFG, USFWS, and BLM if it detects a state- or federally listed species, or BLM Sensitive species at any time during its late summer/fall botanical surveys or at any time thereafter through the life of the project, including conclusion of project decommissioning.

No less than 30 days prior to the start of ground-disturbing activities the project owner shall submit grading plans and construction drawings depicting the location of Environmentally Sensitive Areas and the Avoidance and Minimization Measures contained in **Part 1** of this condition. The project owner shall coordinate with the CPM, BLM, CDFG, and USFWS to revise and finalize boundaries of the ESAs. The Designated Biologist shall provide a summary of all implementation and compliance activities for special-status plant avoidance in the MCRs and ACRs during all applicable reporting periods (generally expected to be throughout the construction phase).

Prior to construction, the project owner shall provide written verification that seed of any special-status plants have been collected and conveyed to a facility (as described in **Part 2** this measure) and that suitable long-term funding has been provided by the project owner.

Off-site compensation for special-status plants, if any (according to **Part 3. a.** of this condition), will be incorporated into the project's Habitat Compensation Plan, for review and approval by the CPM, in consultation with BLM, CDFG, and USFWS. The project owner shall provide suitable compensation lands or financial security as appropriate, to address acreage, habitat, conservation provisions, long-term management, and all other applicable requirements, as described in Condition of Certification **BIO-3**. All terms and measures of Condition of Certification **BIO-3**, including schedule requirements, submittal and acceptance of a formal acquisition proposal, completion of the required transactions, and verification of completion for each term or condition, shall apply to the verification of the compensation lands portion of this condition, if implemented.

Plant salvage, horticultural propagation and reintroduction, or off-site habitat enhancement (according to parts **3.b, 3.c.,** or **3.d.** of this condition) will necessitate approval of an appropriate action plan. For any of these mitigation strategies, the project owner shall provide the CPM, BLM, CDFG, and USFWS with the a final draft of the appropriate plan as reviewed and approved by the CPM in consultation with the other agencies, at least 30 days prior to the start of any project-related ground disturbance activities. Any further modifications to the approved plan shall be made only in consultation with the CPM, BLM, CDFG, and USFWS. A summary report on plan implementation and success shall be submitted in each ACR throughout the implementation and follow-up monitoring period.

At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, CDFG, and USFWS with the a final draft of the Protected Plant Salvage Plan, described in **Part 4** of this condition, as reviewed and approved by the BLM's State Botanist. A summary report on implementation and compliance with the Protected Plant Salvage Plan shall be submitted in the MCRs and ACRs during all applicable reporting periods (generally expected to be throughout construction of the gen-tie line and a follow-up monitoring period to be identified in the Plan).

If any state or federally listed rare, threatened, or endangered plant species is located by the project's biology staff at any time within the project area, the Designated Biologist shall notify the CPM, BLM, CDFG, and USFWS within five (5) working days of the discovery.

## PRE-CONSTRUCTION NEST SURVEYS AND IMPACT AVOIDANCE

**BIO-11** The project owner shall implement the measures described in this condition to avoid impacts to nesting birds throughout the construction, operations, and closure phases of the project.

1. The project owner shall prepare and implement a Nesting Bird Management Plan (NBMP), describing measures to detect native birds that may nest on the project site or facilities, and avoid impacts or take of those birds or their nests, during all project phases. The NBMP shall describe avoidance measures, such as buffer distances from active nests, based on the specific nature of project activities, noise or other disturbance of those activities, the bird species and conservation status, and other pertinent factors. The NBMP may be incorporated into the Bird and Bat Conservation Strategy (Condition of Certification **BIO-12**) as a separate chapter. The plan shall include, at minimum, the following measures and components:

    a. Define the start and end dates of the local bird nesting season (tentatively defined as January 15 through August 31);

    b. Specify nest survey timing and areas in relation to construction activity and survey area (tentatively no more than 7 days prior to construction and throughout all disturbance areas and surrounding 500 foot buffer);

    c. Specify 330 feet as a general buffer distance, and 500 feet for raptor species, to be adjusted according to bird species (or groups of species) that are relatively tolerant or intolerant of human activities and nature of construction activity or disturbance;

    d. List all project construction activities and rank them in terms of noise and other disturbance to nesting birds, and specify any modifications to buffer areas as appropriate to each activity; for example, vehicle travel along an access route would likely warrant reduced buffers whereas pile driving may necessitate increased distances;

e. Specific project activities and bird species (or groups of species) that may warrant temporary buffer reductions or nest relocation with on-site nest monitoring by a qualified field ornithologist during any such activities;

f. Specific monitoring measures to track any active bird nest within or adjacent to the project site, bird nesting activity, project-related disturbance, and fate of each nest;

g. Specific data management and reporting procedures, to include annual evaluation of buffer distance efficacy and other plan components, and recommendations for revisions for the upcoming nesting season;

h. Specific measures to prevent or reduce bird nesting activity on project facilities, construction equipment, or operation and maintenance equipment throughout the life of the project; and

i. Specific actions to be taken if a bird nest is located on project facilities, construction equipment, or operation and maintenance equipment throughout the life of the project.

2. Pre-construction nest surveys for all bird species including burrowing owls shall be conducted prior to any construction activities scheduled during the breeding period (from January 15 through August 31). Burrowing owl surveys are addressed in **BIO-17**. Biology staff or contractors conducting the surveys shall be experienced field ornithologists and familiar with standard nest-locating techniques such as those described by Martin and Guepel (1993). Surveys shall be in accordance with the following guidelines. Nothing in this condition requires the project owner to conduct nesting bird surveys by entering non-federal lands adjacent to the project site when the project owner has made reasonable attempts to obtain permission to enter the property for survey work but was unable to obtain such permission. In this situation only, the project owner may substitute binocular surveys for protocol field surveys.

   a. Surveys shall cover all potential nesting habitat in the project site and within 500 feet of the boundaries of the solar generator site, gen-tie alignment, and any other work sites, except as specified in the approved NBMP;

   b. Except as specified in the approved NBMP, at least two pre-construction surveys shall be conducted, separated by a minimum 10-day interval; the second survey shall be no more than 7 days prior to the start of clearing or construction activity; follow-up surveys shall be required if construction inactivity in any given area exceeds one week, an interval during which birds may build and occupy a nest;

c. If active nests are found during the survey, buffer zones and other measures as specified in the approved NBMP shall be implemented; and

d. Project biology staff shall monitor the nest until nestlings have fledged and dispersed or until nest failure is documented; monitoring and reporting shall be as specified in the NBMP.

**Verification:** At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, BLM, CDFG, and USFWS with the a final draft of the NBMP, as reviewed and approved by the CPM in coordination with the other agencies. Any further modifications to the approved NBMP shall be made only in consultation with the CPM, BLM, CDFG, and USFWS. Results of nest monitoring will be submitted to the CPM in MCRs and ACRs throughout the project's construction, operations, and closure. The Reports will include all monitoring data required as part of the monitoring program. Prior to the start of project-related ground disturbance activities at any work site or project phase, the project owner shall provide the CPM with written or verbal description of survey methods and results, including the time, date, and duration of the survey; identity and qualifications of the surveyor(s); and a list of species observed. If active nests are detected during the survey, the report shall include a map or aerial photo identifying the location of the nest(s) and shall depict the boundaries of the no-disturbance buffer zone around the nest(s).

## MITIGATION AND MONITORING OPERATIONAL IMPACTS TO BIRDS AND BATS

**BIO-12** The project owner shall implement the following measures to monitor, mitigate and adaptively manage operational impacts to birds and bats.

1. Monitoring Study: The project owner shall prepare and implement a monitoring study to monitor the death and injury of birds and bats caused by collisions with project facilities including heliostats and solar receiver tower, burning or other injury caused by flying through concentrated solar energy within the solar field, or other project-related causes including the gen-tie line and evaporation ponds. The study design shall be based on the USFWS's *Monitoring Migratory Bird Take at Solar Power Facilities: An Experimental Approach* (USFWS 2011d) or more current guidelines if available. It shall be subject to review and approval by the CPM in consultation with CDFG and USFWS, shall be incorporated into the project's BBCS and BRMIMP, and implemented by the Designated Biologist in coordination with the project owner, CPM, CDFG, and USFWS. The study shall be implemented, for a period of not less than 5 years (60 months) total, including the entire construction phase and not less than 2 years during the operational phase and shall continue until the CPM concludes, in consultation with the other agencies, that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project.

2. Bird and Bat Conservation Strategy (BBCS): The project owner shall prepare and implement a Bird and Bat Conservation Strategy adopting

**BIO-16**, and all applicable guidelines recommended by the USFWS (2010c) or more current guidelines that may be released. The BBCS will describe all proposed measures to minimize death and injury of birds or bats from (1) collisions with facility features including the heliostats, power towers, and gen-tie line towers or transmission lines and (2) concentrated solar energy (flux) present between the heliostats and each solar receiver tower.

3. Eagle Conservation Plan (ECP): The project owner shall prepare and implement an Eagle Protection Plan adopting all applicable guidelines recommended by the USFWS (2011b) or more current guidelines that may be released. The ECP may be prepared as a stand-alone document or it may be included as a chapter within the BBCS. The ECP shall describe all available baseline data on golden eagle occurrence, seasonality, activity, and behavior throughout the project area and vicinity. The ECP shall outline a study protocol to include pedestrian and/or helicopter surveys of golden eagle breeding sites within a 10 mile radius of the project site, to be reviewed and approved by the CPM, in consultation with the USFWS.

   The ECP shall describe all proposed measures to minimize death or injury to eagles from (1) collisions with facility features including the heliostats, power towers, and gen-tie line towers or transmission lines, electrocutions on transmission lines or other project components, and (3) concentrated solar energy (radiant flux) over the solar field. The ECP shall specify the project owner's anticipated take of bald or golden eagles (if any).
   The ECP shall provide an inventory of existing electrical distribution lines within a 20-mile radius of the project site that do not conform to APLIC (2006) design standards to prevent golden eagle electrocution. The inventory shall identify the owner or operator and estimate the number of non-conforming poles for each distribution line. The ECP shall specify that for each anticipated project-related take of a bald eagle, golden eagle, Swainson's hawk, or other large special-status raptor (including but not limited to osprey, ferruginous hawk, Harris' hawk, norther harrier, prairie falcon, and peregrine falcon, 11 utility poles per year will be retrofitted to APLIC standards for the life of the project. In addition, the ECP shall specify that 11 utility poles per year will be retrofitted to APLIC standards for the life of the project for each take of a bald eagle, golden eagle, Swainson's hawk, or any other large special-status raptor that may exceed the estimated take (even if estimated take is zero).

   The ECP shall include any feasible modifications to proposed plant operation to avoid or minimize focusing heliostats at standby points and, instead, move heliostats into a stowed position or another alternative configuration when the power plant is in standby mode. The ECP also shall identify any additional feasible adaptive management measures to minimize collisions and exposure to solar flux. The ECP shall provide a reporting schedule for all monitoring or other activities related to bird or bat conservation or protection to be taken during project construction or operation. The ECP shall be subject to review and approval by the CPM in consultation with CDFG and USFWS, and shall be incorporated into the project's BRMIMP, and implemented.

**<u>Verification:</u>** The draft Monitoring Study, BBCS and ECP shall be submitted to the CPM for review in consultation with CDFG, and USFWS, and shall be finalized by the project owner and submitted to the CPM and other agencies no less than 30 days prior to construction At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, CDFG, and USFWS with the a final draft of all three documents, as reviewed and approved by the CPM in coordination with the other agencies. The project owner shall obtain the CPM's written approval of the Monitoring Study, BBCS and ECP prior to the start of any project-related ground disturbance activities.

The project owner shall provide the CPM with copies of any written or electronic transmittal from the USFWS indicating the status of Monitoring Study, BBCS and ECP review and any permit that may be required, and any follow-up actions required by the applicant, within 30 days of receiving such transmittal from USFWS.

Methods and results of the Monitoring Study shall be submitted to the CPM in MCRs and ACRs throughout the course of the study and until the CPM, in consultation with the other agencies, concludes that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project. The Reports will include all monitoring data required as part of the monitoring program.

Each year throughout the minimum 5 year monitoring period, the Designated Biologist shall submit an Annual Report to the CPM, CDFG, and USFWS by January 31 of each calendar year, summarizing all available bird and bat mortality data (species, date and location collected, evidence of injury and cause of death) collected over the course of the year. The report shall provide any recommendations for future monitoring and adaptive management actions. The report also shall summarize any additional wildlife mortality or injury documented on the project site during the year, regardless of cause. The Annual Report shall be subject to review and approval by the CPM in consultation with CDFG and USFWS. The project owner shall submit revisions within 30 days of receiving written comments from the CPM. At the direction of the CPM, in consultation with the other agencies, the study period will be extended based on data quality and sufficiency for analysis or if needed to document efficacy of any adaptive management measures undertaken by the project owner. If a carcass of a golden eagle or any state or federally listed threatened or endangered species is found at any time, the project owner or Designated Biologist shall contact CDFG and USFWS within one working day of receipt of the carcass to report the mortality and for guidance on disposal or storage of the carcass.

## DESERT TORTOISE CLEARANCE SURVEYS, EXCLUSION FENCING, AND TRANSLOCATION

**BIO-13** The project owner shall avoid and minimize impacts to desert tortoises on the project site by (1) fencing the solar generator site to prevent tortoises from entering it during construction, operation, or decommissioning; (2) removing all tortoises from the site prior to initiating construction; and (3) translocating tortoises to an appropriate off-site location to be identified in a Translocation Plan. Methods for clearance surveys, fence specification and installation, tortoise handling, artificial burrow construction, egg handling, and other procedures shall be consistent with those described in the USFWS (2009a) *Desert Tortoise Field Manual* (http://www.fws.gov/ventura/species_information/protocols_guidelines) or more current guidance provided by CDFG and USFWS. The project owner shall also implement all terms and conditions described in the Biological Opinion for the project, to be prepared by USFWS. Applicable conditions and requirements include, but are not limited to, the following:

1. Desert Tortoise Translocation Plan. The project owner shall prepare and implement a Desert Tortoise Translocation Plan in conformance with standards and guidelines described in Translocation of Desert Tortoises (Mojave Population) From Project Sites: Plan Development Guidance (USFWS 2010d) or more current guidance or recommendations as available from CDFG or USFWS, and meets the approval of the CPM in consultation with BLM, CDFG, and USFWS. The goals of the plan shall be to safely exclude desert tortoises from within the project area, translocate them to appropriate locations off site, and minimize stress and potential for disease transmission. For tortoises that may be found along the gen-tie line, the plan's goal will be to avoid impacts through construction monitoring, allowing the tortoise to leave the work area, moving it out of harm's way if necessary, and avoiding disturbance to tortoise burrows through re-siting work sites and structures. The plan shall include all protocols for handling desert tortoises, evaluating tortoise health, translocation locations and procedures, monitoring methods for translocated tortoises, reporting, and contingency planning (e.g., handling an injured or diseased tortoise).

2. Handling of Desert Tortoises. Any desert tortoise located during any phase of the project shall be handled only by the Authorized Desert Tortoise Biologist in accordance with the USFWS (2009a) *Desert Tortoise Field Manual* and the project's Desert Tortoise Translocation Plan. Any time a tortoise is handled, the Authorized Desert Tortoise Biologist shall record and report pertinent data, in accordance with the final Desert Tortoise Translocation Plan. Monitoring of translocated desert tortoise shall be in accordance with the Desert Tortoise Translocation Plan and USFWS (2010d) guidance.

3. Desert Tortoise Exclusion Fence Installation. Permanent desert tortoise exclusion fencing shall be installed around the project site. The alignments for all desert tortoise exclusion fencing shall be prominently flagged or staked and shall be surveyed for desert tortoise by project biology staff no more than 24 hours prior to the initiation of fence construction. The fence alignment surveys shall be conducted using techniques approved by the USFWS and CDFG and may be conducted in any season according to specification in the Desert Tortoise Translocation Plan. The fence alignment clearance surveys shall provide 100 percent coverage of all

areas to be disturbed and an additional buffer approximately 90 feet wide centered on the fence alignment (i.e., 45 feet along each side of the fence line). Survey transects shall be no greater than 15 feet apart. All potential desert tortoise burrows shall be examined to assess occupancy by desert tortoises.

a. Timing of Fence Installation. The exclusion fencing shall be installed prior to the pre-construction clearance surveys. No ground-disturbing activity will be permitted within the fenced area until completion of the pre-construction clearance surveys.

b. Fence Material and Installation. The exclusion fencing shall be constructed in accordance with the USFWS (2009a) *Desert Tortoise Field Manual* (Chapter 8 – Desert Tortoise Exclusion Fence).

c. Security Gates. Security gates shall be designed with minimal ground clearance to prevent entry by tortoises. The gates should be electronically activated to open and close immediately after the vehicle(s) have entered or exited to prevent the gates from being kept open for long periods of time. Cattle grating designed to safely exclude desert tortoise may be installed at the gated entries to discourage tortoises from gaining entry (to be determined by the CPM in consultation with BLM, CDFG and USFWS).

d. Fence Inspections. The exclusion fencing shall be regularly inspected daily during project construction. If tortoises were moved out of harm's way during fence construction, fencing in that area shall be inspected at least twice daily for a minimum of 7 days after moving the animal to ensure that the recently moved tortoise is not walking the fenceline. During operations, fencing shall be inspected monthly and within 24 hours following all major rains. Major rains are defined as a storm(s) for which surface flow is detectable within the fenced drainages. Any damage to the fencing shall be temporarily repaired immediately to keep tortoises from entering the site, and permanently repaired within 48 hours of observing damage. Monthly and post-rainfall inspections of permanent site fencing shall continue throughout the life of the project. Carcasses of animals entrapped in the fence shall be handled as described above in **BIO-5.**

e. Temporary Exclusion Fencing. Any project activities during the life of the project within desert tortoise habitat but outside of the permanently fenced site, and have the potential to disturb native soils or vegetation, shall be subject to fencing and pre-construction clearing survey requirements, or shall take place only while project Biology Staff is on-site. Temporary tortoise exclusion fencing may be placed on access roads or other work sites, including gen-tie line construction sites, in accordance with direction from the CPM in consultation with BLM, CDFG, and USFWS. The fence installation shall be supervised by the Authorized Desert Tortoise Biologist and monitored by project biology staff to ensure the safety of any tortoise present. Temporary fencing shall be inspected weekly and, where drainages intersect the fencing, during and within 24 hours following major rains. All temporary fencing shall be repaired immediately upon discovery of damage, and project biology staff shall inspect the area to determine whether the damage may have permitted tortoise entry.

4. Desert Tortoise Clearance Surveys. Following construction of the tortoise exclusion fencing, the fenced area (including permanent and temporarily fenced areas) shall be cleared of tortoises by the Authorized Desert Tortoise Biologist and project biology staff. Clearance surveys shall be conducted in accordance with the USFWS 2009a *Desert Tortoise Field Manual* (Chapter 6 – Clearance Survey Protocol for the Desert Tortoise – Mojave Population) and shall consist of at least two surveys covering 100 percent of the enclosed area by walking transects no more than 15 feet apart. Surveys shall be repeated until two consecutive 100 percent coverage surveys are completed without finding live tortoises. Any tortoise located during clearance surveys shall be relocated and monitored in accordance with the Desert Tortoise Translocation Plan.

5. Burrow Searches. During clearance surveys all desert tortoise burrows and burrows constructed by other species that might be used by desert tortoises, shall be examined by the Authorized Desert Tortoise Biologist to assess occupancy by desert tortoises and handled in accordance with the USFWS' 2009a *Desert Tortoise Field Manual*. To prevent reentry by a tortoise or other wildlife, all burrows shall be collapsed once absence has been determined. Tortoises taken from burrows shall be translocated as described in the Desert Tortoise Translocation Plan.

6. Monitoring Following Clearing. Following the desert tortoise clearance surveys, the Authorized Desert Tortoise Biologist and project biology staff shall monitor initial clearing and grading activities to find and translocate any tortoises which may have been missed during the clearance survey. Should a tortoise be discovered, it shall be translocated as described in the Desert Tortoise Translocation Plan to an area approved by the Authorized Desert Tortoise Biologist in consultation with the CPM and wildlife agencies. Any time over the life of the project that a desert tortoise is found within the exclusion fencing, the Authorized Desert Tortoise Biologist shall immediately contact the CPM, BLM, CDFG, and USFWS; monitor the tortoise's location and activities; and implement translocation of the animal in accordance with and the approved Desert Tortoise Translocation Plan and in consultation with the CPM and other agencies.

7. Relocation of Other Special-Status Species. Wherever feasible and safe, any special-status mammal or reptile incidentally encountered during desert tortoise clearance surveys or monitoring shall be actively or passively relocated outside the exclusion fencing.

**Verification:** The draft Desert Tortoise Translocation Plan shall be submitted to the CPM for review in consultation with BLM, CDFG, and USFWS, and shall be finalized by the project owner and submitted to the CPM and other agencies no less than 30 days prior to construction.  At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, BLM, CDFG, and USFWS with the a final draft of the plan, as reviewed and approved by the CPM in coordination with the other agencies. The project owner shall obtain the CPM's written approval of the plan prior to the start of any project-related ground disturbance activities. All measures and their implementation methods in the Desert Tortoise Translocation Plan shall be included in the BRMIMP and implemented by the project owner.

All implementation of the Desert Tortoise Translocation Plan shall be reported in the MCRs and ACRs submitted by the project owner to the CPM. Within 30 days after completion of desert tortoise clearance surveys and translocation, the Designated Biologist shall submit a Desert Tortoise Clearance Survey, Exclusion Fencing, and Translocation Report to the CPM, BLM, CDFG, and USFWS, describing methods and results of the fencing, clearance surveys, and translocation (if any).  The report will also document any other animals relocated during the clearance surveys.

## DESERT TORTOISE HABITAT COMPENSATION

**BIO- 14** The project owner shall acquire and protect no fewer than 3,834 acres of suitable desert tortoise habitat in perpetuity. All terms and measures of Condition of Certification **BIO-3** shall apply to the transaction, management, security deposit and all other actions related to the acquisition and protection of these lands. Selection criteria for desert tortoise compensation lands shall be as listed below. In general, the compensation lands shall provide habitat conditions, quality and function that are equal to or better than those present on the habitat to be impacted. The project owner shall submit a formal acquisition proposal to the CPM describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands for desert tortoise in relation to the criteria listed above and must be approved by the CPM in consultation with BLM, CDFG and USFWS. Compensation lands shall:

a. be within the Colorado Desert Recovery Unit, with potential to contribute to wildlife habitat connectivity and build linkages between desert tortoise designated critical habitat, known populations of desert tortoise, and/or other preserve lands;

b. provide habitat for desert tortoise with capacity to regenerate naturally when disturbances are removed;

c. be near larger blocks of lands that are either already protected or planned for protection, or which could feasibly be protected long-term by a public resource agency or a non-governmental organization dedicated to habitat preservation;

d. be contiguous and biologically connected to lands currently occupied by desert tortoise, ideally with populations that are stable, recovering, or likely to recover;

e. not have a history of intensive recreational use or other disturbance that might cause future erosional damage or other habitat damage, and make habitat recovery and restoration infeasible;

f. not be characterized by high densities of invasive species, either on or immediately adjacent to the parcels under consideration, that might jeopardize habitat recovery and restoration; and

g. not contain hazardous wastes that cannot be removed to the extent that the site could not provide suitable habitat; and

h. have water and mineral rights included as part of the acquisition, unless the CPM, in consultation with CDFG, BLM and USFWS, agrees in writing to the acceptability of land without these rights.

**Verification:** All terms and measures of Condition of Certification **BIO-3**, including schedule requirements, submittal and acceptance of a formal acquisition proposal, completion of the required transactions, and verification of completion for each term or condition, shall apply to the verification of this condition.

## RAVEN MONITORING, MANAGEMENT, AND CONTROL PLAN

**BIO-15** The project owner shall prepare and implement a Raven Monitoring, Management, and Control Plan (Raven Plan) that shall be consistent with the most current USFWS-approved raven management guidelines and that meets the approval of the CPM in consultation with BLM, CDFG, and USFWS. The purpose of the plan shall be to avoid raven "subsidies" and any project-related increases in raven numbers or activity during the life of the project. The plan shall address all project components and their potential effects on raven numbers and activity. The threshold for implementation of raven control measures shall be any increases in raven numbers or nesting activities from baseline conditions, as detected by monitoring to be implemented pursuant to the plan. Regardless of raven monitoring results, the project owner shall be responsible for all project effects or subsidies that could contribute to increased raven numbers, including food or trash, water sources, or perch or roost sites, throughout the life of the project. In addition, to offset the cumulative contributions of the project to desert tortoise from increased raven numbers, the project owner shall contribute to the USFWS Regional Raven Management Program. The Project owner shall do all of the following:

1. Prepare and Implement a Raven Monitoring, Management, and Control Plan. The Raven Plan shall include, but shall not be limited to the following components:

   a. Identify any potential project facilities or activities that might provide raven subsidies or attractants;

   b. Describe management practices to be implemented to avoid or minimize raven subsidies, nesting, overall numbers, and predation;

   c. Specify a program to monitor raven nesting and presence in the project vicinity and detect any increase in numbers or activity;

d. Specify monitoring methods to detect evidence of predation on desert tortoises and reporting schedule or protocol to inform CDFG and USFWS of predation so that follow-up control measures may be taken;

e. Provide for nest monitoring and nest removal throughout the life of the project; and

f. Describe report contents requirements to be provided in MCRs and ACRs.

2. Contribute to the USFWS Regional Raven Management Program. The project owner shall submit payment to the project sub-account of the REAT Account held by the NFWF to support the USFWS Regional Raven Management Program. The amount shall be a one-time payment of $105 per acre of long-term or permanent disturbance (totaling $402,570 for disturbance area of 3,834 acres, to be adjusted according to final project footprint).

**Verification:** No later than 30 days prior to the start of construction, the project owner shall provide written verification to the CPM that NFWF has received and accepted payment into the project's sub-account of the REAT Account to support the USFWS Regional Raven Management Program.

No later than 30 days prior to any construction-related ground disturbance activities, the project owner shall provide the CPM, USFWS, and CDFG with the final version of a Raven Monitoring, Management, and Control Plan as reviewed and approved by the CPM in coordination with the other agencies. All modifications to the approved Raven Plan shall be made only with approval of the CPM in consultation with BLM, CDFG, and USFWS. The project owner shall include all descriptions of all activities related to plan implementation (as specified in the approved plan according to 1f above) in MCRs and ACRs submitted to the CPM.

## CONSTRUCTION PHASE GOLDEN EAGLE NESTING SURVEYS

**BIO-16** The Project owner shall implement the following measures to avoid or minimize project-related construction impacts to golden eagles.

1. Annual Construction Phase Golden Eagle Nesting Survey. Each year throughout the project construction period, the project owner will submit golden eagle nesting survey results for potential golden eagle nesting habitat within ten miles of the solar generator site and gen-tie alignment. Survey methods shall be as described in the *Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations* (Pagel et al. 2010) or more current guidance from the USFWS.

2. Survey Data: The report shall provide at least the following data for each historic or potential golden eagle nesting territory within the survey area: territory status (unknown, vacant, occupied, breeding successful, breeding unsuccessful); active and inactive nest locations, photographs, substrates, and elevations; any observed territorial or nesting activity; age class of any

golden eagles observed; and chronology and number of eggs or young at any active nest.

3. <u>Territory Status</u>: A nesting territory or inventoried habitat shall be considered unoccupied by golden eagles only after completing at least two surveys in a single breeding season (Pagel et al. 2010). The observation periods shall be at least 30 days apart. Specific scheduling of the survey dates shall be based on golden eagle nesting season in the Colorado Desert region of California.

4. <u>Monitoring and Management Plan:</u> If an occupied nest (as defined by Pagel et al. 2010) is detected within 10 miles of the project area, including the gen-tie line, the project owner shall prepare and implement a Golden Eagle Monitoring and Management Plan for the duration of the construction phase to ensure that construction activities do not cause disturbance to golden eagles. The monitoring methods shall be consistent with those described by Pagel et al. (2010) or more current guidance from the USFWS. The Plan shall be prepared in consultation with the USFWS. Triggers for adaptive management shall include any evidence of project-related disturbance to nesting golden eagles, including but not limited to: agitation behavior (displacement, avoidance, and defense); increased vigilance behavior at nest sites; changes in foraging and feeding behavior, or nest site abandonment. The plan shall include a description of adaptive management actions, which shall include, but not be limited to, cessation of construction activities that are deemed by the Designated Biologist to be the source of golden eagle disturbance.

<u>**Verification:**</u> No fewer than 10 days following completion of each annual golden eagle nesting survey, the project owner shall provide a written or verbal report of survey results to the CPM, BLM, CDFG, and USFWS. No later than 30 days following the survey, the project owner shall provide the CPM, BLM, USFWS, and CDFG with a complete survey report.

If an active or occupied golden eagle nest is detected within 10 miles of the project site, then the project owner shall provide the CPM, BLM, CDFG, and USFWS with a draft Golden Eagle Monitoring and Management Plan within 14 days of observing the active nest, and shall implement the draft plan upon the CPM’s verbal approval, based on consultation with BLM, CDFG, and USFWS. The project owner shall provide revisions within 30 days of receiving written comments from the CPM, based on consultation with BLM, CDFG, and USFWS. Once final, the plan shall be implemented in each subsequent year of project construction if an active golden eagle nest is located within the survey area. All modifications to the approved plan shall be made only with approval of the CPM in consultation with BLM, CDFG, and USFWS. The project owner shall include all descriptions of all activities related to plan implementation in MCRs and ACRs submitted to the CPM.

## BURROWING OWL IMPACT AVOIDANCE, MINIMIZATION, AND COMPENSATION MEASURES

**BIO-17** The project owner shall implement the following measures to avoid and offset impacts to burrowing owls:

1. Pre-Construction Surveys. The project biology staff shall conduct pre-construction surveys for burrowing owls within the project site and along all linear facilities in accordance with CDFG guidelines (CDFG 2012c). The surveys shall be no more than 30 days prior to initiation of ground disturbance or site mobilization activities. The survey area shall include the project disturbance area (i.e., all lands disturbed in the construction and operation of the Rio Mesa SEGF Project) and surrounding 500-foot survey buffer where access is legally available. The surveys may be conducted concurrently with desert tortoise clearance surveys if field crews are suitably qualified and survey dates are compatible.

2. Implement Avoidance Measures. If an active burrowing owl burrow is located within 500 feet from the any project work area or disturbance are the following avoidance and minimization measures shall be implemented:

   a. Designate Non-Disturbance Buffer. Fencing shall be installed at a 250-foot radius from the occupied burrow to create buffer area where no work activities may be conducted. The non-disturbance buffer and fence line may be reduced to 160 feet if all project-related activities that might disturb burrowing owls would be conducted during the non-breeding season (i.e., conducted September 1st through January 31st). Signs shall be posted in English and Spanish at the fence line indicating no entry or disturbance is permitted within the fenced buffer.

   b. Monitoring: If construction activities would occur within 500 feet of the occupied burrow during the nesting season (February 1 – August 31st) the project biology staff shall monitor to determine if these activities have potential to adversely affect nesting efforts, and shall implement measures to minimize or avoid such disturbance.

3. Prepare and Implement a Burrowing Owl Relocation and Mitigation Plan. The project owner shall prepare and implement a Burrowing Owl Relocation and Mitigation Plan, in addition to the avoidance measures described above. The final Burrowing Owl Relocation and Mitigation Plan shall be approved by the CPM, in consultation with BLM, CDFG, and USFWS and shall:

   a. Provide a quantitative evaluation of unoccupied suitable burrows available on surrounding lands within 1 mile of the project boundary (e.g., by inventorying burrow numbers in selected representative sample areas);

   b. Ensure that a minimum of two suitable, unoccupied burrows are available off-site for every burrowing owl or pair of burrowing owls to be passively relocated, including a discussion of timing of burrow improvements, specific location of burrow installation, and burrow design; design of the artificial burrows shall be consistent with CDFG guidelines (CDFG 2012c) and shall be approved by the CPM in consultation with CDFG and USFWS;

c. If artificial burrows will be constructed, identify and describe suitable burrow replacement sites within one (1) mile of the project site and describe measures to ensure that burrow installation or improvements would not affect sensitive species habitat or any burrowing owls already present in the relocation area; burrow replacement sites shall be in areas of suitable habitat for burrowing owl nesting, and be characterized by minimal human disturbance and access; relative cover of non-native plants within the proposed relocation sites shall not exceed the relative cover of non-native plants in the adjacent habitats;

d. Provide detailed methods and guidance for passive relocation of burrowing owls occurring during the non-breeding season within the project disturbance area; occupied burrows may not be disturbed during the nesting season (February 1 to August 31) to avoid take under the MBTA and Fish and Game codes;

e. Describe monitoring and management of the replacement burrow site(s), and provide a reporting plan; the objective shall be to manage the sites for the benefit of burrowing owls, with the specific goals of:

   i. Maintaining the functionality of the burrows for a minimum of two years; and

   ii. Minimizing weed cover.

4. <u>Acquire Compensatory Mitigation Lands for Burrowing Owls.</u> The project owner shall acquire, in fee or easement, 900 acres of compensatory mitigation lands, based on staff's estimate that three territories are present on the project site and that each territory comprises 300 acres. If more than three active burrowing owl burrows are located on the site during pre-construction surveys, then the project owner shall compensate 300 additional habitat acres for each additional active burrow.

   The project owner shall provide funding for the enhancement and long-term management of these compensation lands, as described in Condition of Certification **BIO-3**. Compensatory mitigation lands for burrowing owl must satisfy the criteria below, and may be nested within habitat compensation lands acquired for desert tortoise or native vegetation (see Condition of Certification **BIO-3**), provided those lands also meet the criteria for burrowing owl mitigation lands.

5. <u>Selection Criteria for Burrowing Owl Mitigation Lands.</u> The terms and conditions of this acquisition or easement shall be as described in **BIO-3** [Compensatory Mitigation], with the addition of the following criteria: 1) the compensation land must provide suitable habitat for burrowing owls (as

described in the CDFG guidelines for burrowing owl mitigation [CDFG 2012c or more current guidance], and 2) the compensation land must either support burrowing owls or be within dispersal distance from an active burrowing owl nesting territory (generally approximately 5 miles). The burrowing owl compensation lands may be included with the desert tortoise or native vegetation mitigation lands only if these two burrowing owl criteria are met.

**Verification:** If pre-construction surveys detect burrowing owls within 500 feet of proposed construction activities, the Designated Biologist shall provide to the CPM, BLM, CDFG and USFWS documentation indicating that non-disturbance buffer fencing has been installed at least 10 days prior to the start of any construction-related ground disturbance activities. The project owner shall report monthly to the CPM, CDFG, and USFWS for the duration of construction on the implementation of burrowing owl avoidance and minimization measures. Within 30 days after completion of construction, the project owner shall provide to the CPM, BLM, CDFG, and USFWS a written construction termination report identifying how mitigation measures described in the plan have been completed.

If pre-construction surveys detect burrowing owls within the project disturbance area, the project owner shall notify the CPM, CDFG, and USFWS within 10 days of completing the surveys that a relocation of owls is necessary. The project owner shall do all of the following if relocation of one or more burrowing owls is required:

1. Within 30 days of completion of the burrowing owl pre-construction surveys, submit to the CPM, BLM, CDFG, and USFWS a Burrowing Owl Relocation and Mitigation Plan.

2. By January 31st of each year following construction for a period of five years, the Designated Biologist shall provide in the ACR a report to the CPM, BLM, USFWS, and CDFG that describes the results of monitoring and management of the burrowing owl relocation area, if applicable. The annual report shall provide an assessment of the status of the relocation area with respect to burrow function and weed infestation, and shall include recommendations for actions the following year for maintaining the burrows as functional burrowing owl nesting sites and minimizing the occurrence of weeds.

All terms and measures of Condition of Certification BIO-3, including schedule requirements, submittal and acceptance of a formal acquisition proposal, completion of the required transactions, and verification of completion for each term or condition, shall apply to the verification of the portion of this condition requiring habitat compensation.

## DESERT KIT FOX AND AMERICAN BADGER MANAGEMENT PLAN

**BIO-18** The project owner shall prepare and implement a Desert Kit Fox and American Badger Management Plan (plan). The objective of the plan shall be to avoid direct impacts to the desert kit fox and American badger as a result of construction of the power plant and linear facilities, as well as during project operation and decommissioning. The draft plan submitted by the project owner shall provide the basis for the final plan, subject to review and comment by the Bureau of Land Management (BLM) and revision and approval by the Compliance Project Manager (CPM), in consultation with California Department of Fish and Game (CDFG).

Prior to ground disturbance at any work site, the project owner shall survey the area and passively exclude any desert kit foxes or American badgers according to the plan. These surveys may be conducted concurrently with the desert tortoise pre-construction surveys (Condition of Certification **BIO-13**, above).

The final plan shall include, but is not limited to, the following procedures and impact avoidance measures:

1. Describe pre-construction survey and clearance field protocol, to determine the number and locations of single or paired kit foxes or badgers on the project site that would need to be passively relocated and the number and locations of desert kit fox or badger burrows or burrow complexes that would need to be collapsed to prevent re-occupancy by the animals. Qualified biologists shall perform pre-construction surveys for badger and kit fox dens throughout the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads. If dens are detected, each den shall be classified as inactive non-natal, inactive natal, potentially active, definitely active non-natal, or active natal den.

    a. <u>Inactive non-natal and inactive natal dens.</u> Inactive non-natal and inactive natal dens that would be directly impacted by construction activities shall be excavated by hand and backfilled to prevent reuse by badgers or kit fox.

    b. <u>Potentially active and definitely active non-natal dens.</u> Potentially and definitely active non-natal dens that would be directly impacted by construction activities shall be monitored by the Biological Monitor for three consecutive nights using a tracking medium (such as diatomaceous earth or fire clay) and/or infrared camera stations at the entrance. If no tracks are observed in the tracking medium or no photos of the target species are captured after three nights, the den shall be excavated and backfilled by hand. If tracks are observed, and especially if high or low ambient temperatures could potentially result in harm to kit fox or badger from burrow exclusion, various passive hazing methods may be used to discourage occupants from continued use. A detailed description of the types and methods of passive hazing to be used must be included in the plan; however, approval must be granted by the CPM, in consultation with CDFG prior to implementation. After verification that the den is unoccupied, it shall then be excavated by hand and backfilled to ensure that, no badgers or kit fox are trapped in the den.

    c. <u>Active natal dens.</u> During denning season (American badger – March to August, and desert kit fox – February to June), any active natal dens that are detected in the preconstruction surveys shall have a buffer zone of 300 feet to 500 feet surrounding the den, pending approval from the CPM in consultation with CDFG, and monitoring measures shall be implemented. Discovery of an active natal den that could be impacted by the project shall be reported to the CPM and CDFG within 24-hours of the discovery. A detailed description outlining the types and methods of monitoring must be included in the plan. The den location shall be mapped and submitted along with a report stating the survey results to the CPM and CDFG. The Designated Biologist shall monitor the natal den until he or she determines that the pups have dispersed. No disturbance will be allowed for any animal associated with a natal den and any activities that might disturb denning activities shall be prohibited within the buffer zone. Once the pups have dispersed, various passive hazing methods may be used to discourage den reuse. A detailed description of the types of passive hazing to be used must be included in the plan; however, approval must be granted by the CPM, in consultation with CDFG prior to implementation. After verification that the den is unoccupied, it shall then be excavated by hand and backfilled to ensure that, no badgers or kit fox are trapped in the den.

d. Exception for American badger. In the even that passive relocation techniques fail for badgers, the project owner will contact the CPM and CDFG to explore other relocation options.

2. Qualitative discussion of availability of suitable habitat on off-site surrounding lands within 10 miles of the project boundary, and quantitative evaluation of unoccupied desert kit fox burrows available on surrounding lands within 1 mile of the project boundary (e.g., by inventorying burrow numbers in selected representative sample areas);

3. Estimates of the distances kit foxes would need to travel across the project site and across adjacent lands to safely access suitable habitat (including burrows) off-site;

4. Proposed scheduling of the passive relocation effort;

5. Methods to minimize likelihood that the animals will return to the project site;

6. Descriptions of any proposed or potential ground disturbing activities related to kit fox relocation, and locations of those activities (e.g., artificial burrow construction);

7. A monitoring and reporting plan to evaluate success of the relocation efforts and any subsequent re-occupation of the project site; and

8. A plan to subsequently relocate any animals that may return to the site (e.g., by digging beneath fences).

9. Notify the CPM and CDFG if injured, sick, or dead American badger and desert kit fox are found. If an injured, sick, or dead animal is detected on

any area associated with the solar project site or associated linear facilities, the CPM and the Ontario CDFG Office shall be notified immediately by phone. Written follow-up notification via FAX or electronic communication shall be submitted to the CPM and CDFG within 24 hours of the incident and shall include the following information as appropriate:

a. Injured animals. If an American badger or desert kit fox is injured because of any project-related activities, the Designated Biologist or approved Biological Monitor shall immediately notify the CPM and CDFG personnel regarding the capture and transport of the animal to CDFG-approved wildlife rehabilitation and/or veterinarian clinic. Following the phone notification, the CPM and CDFG shall determine the final disposition of the injured animal, if it recovers. A written notification of the incident shall be sent to the CPM and CDFG containing, at a minimum, the date, time, location, and circumstances of the incident.

b. Sick animals. If an American badger or desert kit fox is found sick and incapacitated on any area associated with the solar project site or associated linear facilities, the Designated Biologist or approved Biological Monitor shall immediately notify the CPM and CDFG personnel for immediate capture and transport of the animal to a CDFG-approved wildlife rehabilitation and/or veterinarian clinic. Following the phone notification, the CPM and CDFG shall determine the final disposition of the sick animal, if it recovers. If the animal dies, a necropsy shall be performed by a CDFG-approved facility to determine the cause of death. The project owner shall pay to have the animal transported and a necropsy performed. A written notification of the incident shall be sent to the CPM and CDFG and contain, at a minimum, the date, time, location, and circumstances of the incident.

c. Fatalities. If an American badger or desert kit fox is killed because of any project-related activities during construction, operation, and decommissioning, or is found dead on the project site or along associated linear facilities, the Designated Biologist or approved Biological Monitor shall immediately refrigerate the carcass and notify the CPM and CDFG personnel within 24 hours of the discovery to receive further instructions on the handling of the animal. If the animal is suspected of dying of unknown causes, a necropsy shall be performed by a CDFG-approved facility to determine the cause of death. The project owner shall pay to have the animal transported and a necropsy performed.

10. Additional protection measures to be included in the plan and implemented:

a. All pipes within the project disturbance area must be capped and/or covered every evening or when not in use to prevent desert kit foxes or other animals from accessing the pipes.

b. All water sources shall be covered and secured when not in use to prevent drowning.

c. Project perimeter fencing shall be designed to exclude kit foxes from the solar field site during all project phases (construction, operation, decommissioning). The desert tortoise exclusion fencing shall be secured directly to the security fence to minimize the chance that kit foxes can dig under or climb over the fence. The project owner shall coordinate with CDFG to identify any additional fence design features to maximize the effectiveness of the fence to exclude kit foxes during each phase of the project.

d. Incorporate and implement the CDFG Veterinarian's guidance regarding impact avoidance measures including measures to prevent disease spread among desert kit foxes. Measures to reduce traffic impacts to wildlife if the project owner anticipates night-time construction. The plan must also include a discussion of what information will be provided to all night-time workers, including truck drivers, to educate them about the threats to kit fox, what they need to do to avoid impacts to kit fox, and what to report if they see a live, injured, or dead kit fox.

**Verification**: No fewer than 30 days prior to the start of any construction-related ground disturbance activities associated with the new project related facilities, the project owner shall provide the CPM, BLM, and CDFG with a draft American Badger and Desert Kit Fox Mitigation and Monitoring Plan for review and comment.

No fewer than 10 days prior to start of any ground disturbance activities associated with the new project-related facilities, the project owner shall provide an electronic copy of the CPM-approved final plan to the CPM and CDFG and implement the plan.

The project owner shall submit a report to the CPM and CDFG within 30 days of completion of any badger and kit fox surveys. The report shall describe survey methods, results, impact avoidance and minimization measures implemented, and the results of those measures.

No later than 2 days following a phone notification of an injured, sick, or dead American badger or desert kit fox, the project owner shall provide to the CPM and CDFG, via FAX or electronic communication, a written report from the Designated Biologist describing the incident of sickness, injury, or death of an American badger or desert kit fox, when the incident occurred, and who else was notified.

Beginning with the first month after start of construction and continuing every month until construction is completed, the Designated Biologist shall include a summary of events regarding the American badger and desert kit fox in each MCR.

No later than 45 days after initiation of project operation, the Designated Biologist shall provide the CPM a final American Badger and Desert Kit Fox Mitigation and Monitoring Plan that includes: 1) a discussion of all mitigation measures that were and currently are being implemented; 2) all information about project-related kit fox and badger injuries and/or deaths; 3) all information regarding sick kit fox and badger found within the project site and along related linear facilities; and 4) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the American badger and desert kit fox.

## ADVANCE MITIGATION OPTION

**BIO-19** The project owner may choose to satisfy its compensatory mitigation obligations identified in this section of the Commission Decision by participating in the advance mitigation program established under SB X8 34 instead of acquiring compensation lands. If the project owner chooses to satisfy its mitigation obligations through this program, the advance mitigation lands shall meet the criteria as stated in all applicable compensation conditions of certification in the Commission Decision. In addition, the project owner shall provide proof of participation in the advance mitigation program to the CPM.

**Verification:** If electing to use this provision, the project owner shall provide proof to the CPM that the advance mitigation lands meet the criteria as stated in all applicable compensation conditions of certification in the Commission Decision. If the project owner elects to use this provision prior to posting security required by the conditions of certification, the project owner shall provide proof of participation to the CPM, to be verified by CDFG, prior to any ground disturbance. If the project owner elects to use this provision after posting such security, the project owner shall provide proof of participation in the advance mitigation program prior to the time required for habitat compensation lands to be surrendered in accordance with all applicable compensation conditions of certification in the Decision. No later than 18 months after the start of project ground-disturbing activities, the project owner shall demonstrate completion of the advanced mitigation process and that its compensatory mitigation obligations have been satisfied.

## FACILITY CLOSURE, REVEGETATION, AND RECLAMATION PLAN AND FINANCIAL SECURITY

**BIO-20** The project owner shall prepare and implement a Closure, Revegetation, and Reclamation Plan (plan) and shall provide financial security to ensure implementation of the plan. The plan shall describe activities and schedule for the reclamation/revegetation of the project site and other facilities including the gen-tie line at the time that the facility is decommissioned, or otherwise ceases to be operational. The plan shall specify site-specific criteria for evaluating and monitoring compliance with the approved reclamation plan. The plan will guide site and closure activities, including all methods proposed for revegetation or reclamation of disturbed areas upon closure of the facility. The plan must address all revegetation, reclamation, and other required facility closure activities. In addition to specifying closure, revegetation, and reclamation activities upon planned closure, the plan also shall specify closure, revegetation, and reclamation activities and schedule in the event of unanticipated facility closure prior to the anticipated lifespan of the plant. The plan shall specify estimated cost for implementation and the project owner shall provide a financial security to ensure availability of funds to fully implement the plan. The plan and amount of financial security shall be reviewed and updated on five-year intervals throughout the life of the project. The plan shall include, but not be limited to, the following elements:

1. Plan Purpose: The plan shall explicitly identify the objective of the revegetation plan to be control and minimization of weed invasion or spread, dust, and erosion.

2. Standards/Monitoring: Performance standards for success thresholds, weed cover, performance monitoring methods and schedule, and maintenance monitoring.

3. Baseline Surveys – Methods to perform baseline surveys for planning reclamation or revegetation efforts, with a level sufficient to collect data necessary to prepare the plan.

4. Seed Handling: Methods for seed collection, testing, and application.

5. Soil Preparation: If determined necessary by baseline surveys conducted pursuant to part 3 (above). Soil descriptions, compaction measurements, mulch application, soil storage, seed farming, mycorrhizal inoculation, biological crust collection, or other soil preparations may be included as part of the plan.

6. Weed Management. Discussion of scope, duration, success criteria, and monitoring of weed management activities shall be included in the plan, plan to be consistent with recommended Condition of Certification BIO-7.

7. Financial Security. The Plan shall estimate costs of closure, revegetation, and reclamation, to be based on current rates for personnel, equipment, and materials to implement each component of the plan, accounting for anticipated inflation over the life of the project. The project owner shall specify the source of its cost basis and inflation factors, for staff's review and approval.

**Verification**: The revised Closure, Revegetation, and Reclamation Plan and proof of financial security shall be submitted to the CPM for review and approval no more than six months following initiation of ground-disturbing project activities. The project owner shall review the plan and financial security every five years thereafter and shall submit proposed plan revisions and verification that the financial security is adequate, based on time, equipment, and materials costs at each five-year review interval to the CPM for review and approval. Modifications to the approved Closure, Revegetation, and Reclamation Plan shall be made only through consultation with and authorization of the CPM.

Financial assurance may be in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("Security") only as approved the CPM and CDFG. Prior to submitting the Security verification, the project owner shall obtain the CPM's approval of the form of the Security, in consultation with BLM, CDFG, and USFWS.

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# APPENDIX BIO1 - BIOLOGICAL RESOURCES RISK ASSESSMENT OF AVIAN EXPOSURE TO CONCENTRATED SOLAR RADIATION

Rick Tyler, Geoff Lesh, PE, Alvin Greenberg, Ph.D.

## SUMMARY OF CONCLUSIONS

The risk assessment examined the potential effect of avian exposure to concentrated solar radiation. Staff examines the nature and probability of adverse effects to birds, when exposed to concentrated solar electromagnetic radiation, including infrared, visible and ultraviolet light.

Staff's analysis of avian exposure to concentrated solar radiation indicates that a threshold of safe exposure does not exist above a solar flux density of 4 kW/m$^2$. The analysis also indicates that both the Hidden Hills and Rio Mesa facilities pose significant risk to avian populations that may encounter the air space in the facilities where concentrated flux density is above the safe levels. The available data regarding avian impacts is very limited; however, such data does provide at least some perspective regarding potential for impact.

There are significant questions regarding extrapolation from the available information regarding avian impacts. The most vexing is the complete absence of data that would allow estimation of avian morbidity. Staff's assessment provides estimates of exposure and dose that can lead to injury and late fatality. In addition, there are major unknowns in estimation of differences in avian populations from one site to the next. These limitations in the available data require exercise of considerable judgment in extrapolation of data from one site to another. However, the errors introduced by the lack of site specific data are likely to be small in comparison to the absence of morbidity estimates and effects of dramatically increased potential exposure duration resulting from the increase volume of the air space affected by concentrated solar flux.

## SETTING

Concentrating solar thermal power plants, like Hidden Hills and Rio Mesa, collect ambient solar radiation and concentrated it onto a solar receiver to generate steam for the steam turbine generator. The concentration of the solar radiation creates a range of solar radiation flux densities between the solar receiver steam generator located atop the power tower and the reflecting mirrors arrayed on the ground. At ground level, nominal solar radiation, or solar energy per unit area, is about 1 kilowatt per square meter (kW/m$^2$). At the solar receiver steam generator, the reflected concentrated solar radiation is about 600 kW/m2.

However, because the heliostat mirror arrays do not form a continuous reflective surface across the solar field due to gaps from roads or non-uniform spacing due to terrain or maintenance spacing, the solar flux density does not increase linearly with increasing elevation up to the maximum at the receiver. Gaps in the mirrors arrays result in discontinuities in flux overlaps at elevations closer to the mirrors. The applicant provided modeling results of the solar flux fields in response to Staff Data Request 159.

As expected, values are low near the surface of the mirrors and increase in a non-linear manner in close proximity to receiver. When the mirrors are concentrating sunlight onto to the receiver, the shape of the higher flux regions between the receiver and mirror is an inverted cone, with a small section at the receiver that broadens as you descend to the solar field. When the mirrors are directed off the receiver, or in standby mode, the shape of the higher flux regions are like two cones, one facing downward towards the mirrors and one upward away from the focal point (BS 2012u, Fig. 5).

Note that our sun emits a broad spectrum of radiation, including radio waves, visible light, and x-rays. The earth's atmospheric layers filter much of the radiation, diminishing and/or eliminating certain wavelengths particularly in the ultraviolet (UV) spectrum. And the solar field heliostat mirrors further diminish the reflected solar radiation of the shorter wavelength (e.g., UV) wave lengths.

## HIDDEN HILLS

The Hidden Hills Solar Electric Generating System (HHSEGS) would be located on Old Spanish Highway, near the community of Charleston View on approximately 3,277 acres (5.12 square miles) of privately owned land in Inyo County, California, adjacent to the Nevada border. The project site is approximately 8 miles south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada.

HHSEGS would consist of two 250 MW solar plants. Each solar plant would use heliostats which are elevated mirrors mounted on a pylon to focus the sun's rays on one solar receiver steam generator (SRSG) or receiver atop a 750-foot tall solar power tower near the center of each solar field. In each solar plant, one Rankine-cycle steam turbine would receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment would start each morning after sunrise and would shut down when insolation[1] drops below the level required keeping the turbine online, or during upsets and emergencies.

Each of the heliostat assemblies would be composed of two mirrors, each approximately 12 feet high by 8.5 feet wide with a total reflecting surface of approximately 204 square feet (19 square meter – $m^2$). Each heliostat assembly would be mounted on a single pylon, along with a computer-programmed aiming control system that directs the motion of the heliostat to track the movement of the sun. The 85,000 heliostats have an effective total reflective area of approximately 1.7 million $m^2$. These heliostats concentrate solar radiation on the solar receiver boiler and superheater sections (the SRSG is four -sided, with boiler tube walls on the outside to be heated by the concentrated solar radiation).

The receiver absorbs the concentrated radiation from the heliostats and transfers the resultant heat into water and steam in steel tubes at the receiver surface. The efficiency of the Rankine-cycle (steam cycle) is about 43 percent under optimum conditions (summer mid-day). This equates to a solar energy transfer of about 610 million watts

[1] **Insolation** is a measure of solar radiation energy received on a given surface area and recorded during a given time. It is also called solar irradiation and expressed as hourly irradiation if recorded during an hour, daily irradiation if recorded during a day.

(610 MW) between the heliostats and the receiver. While the concentration to an energy density of 600 kW/$m^2$ is roughly analogous to focusing a 3 inch magnifying glass down to a 1/8 inch point, the power tower does not focus the reflected sun to a point, but rather overlays thousand of heliostat reflections onto the boiler tube walls of the receiver. The total concentrated solar energy of 610 MWhr is approximately equal to burning 17,000 gallons of gasoline per hour. The solar flux density is intense enough that if the water and steam in the boiler were to stop flowing and the heliostats remained focused on the receiver, it would be destroyed in a short period of time. In spite of careful design and material selection, and emergency defocusing protocols for the mirrors, the SRSG would need to be replaced about every 4 years.

### RIO MESA

The Rio Mesa Solar Electric Generating Facility (RMSEGF) is very similar to the Hidden Hills facility and consists of two 250-megawatt (MW) (nominal) solar concentration thermal power plants situated on the Palo Verde Mesa in Riverside County, California, 13 miles southwest of Blythe, and is located partially on private land and partially on public land administered by BLM. Design aspects of the RMSEGF are essentially the same for the HHSEGS.

## ANALYTICAL APPROACH

Staff's analysis includes the following analytical steps in estimating the avian mortality and morbidly from exposure to concentrated solar radiation:

a. Hazard Assessment -- the determination of whether a particular environmental exposure is or is not causally linked to particular health effects on the receptors

b. Dose-Response Assessment -- the determination of the relation between the magnitude of exposure and the probability of occurrence of the health effects in question

c. Exposure Assessment -- the determination of the extent of receptor exposure before or after application of regulatory controls

d. Risk Characterization -- the description of the nature and often the magnitude of receptor risk.

e. Analysis of Uncertainty -- Uncertainty represents a discussion of the gaps in knowledge about factors such as adverse effects or exposure levels which may be reduced with additional study. Generally, risk assessments carry several categories of uncertainty, and each merits consideration. Measurement uncertainty refers to the usual error that accompanies scientific measurements -- standard statistical techniques can often be used to express measurement uncertainty. An amount of uncertainty is often inherent in environmental sampling. There are likewise uncertainties associated with the use of scientific models, e.g.,dose-response models, models of the physical environment, probability of occurrence of particular circumstances, etc.

Birds are exposed to this concentrated solar radiation when they enter the flux field and receive the incident radiant energy that is reflected from the array of heliostats on the ground. The radiant energy that exists in the flux field is converted to heat when it is absorbed on any solid opaque surface that receives the transmission of the radiant energy through an otherwise transparent medium (air).

The absorption efficiency of radiant flux is governed by the emissivity of the surface of the object that receives it. Emissivity can range from 0 to 1 with 0 representing perfect reflection of all the incident radiation and 1 representing complete absorption and conversion to heat. It is also governed by the angle of incidence between the radiant flux and the surface that receives it. A mirror is an example of a surface with a low emissivity (typically below 0.05) absorbing and converting to heat less than 5 percent of the incident light. Black pavement is an example of a surface with high emissivity (about 0.95) absorbing 95 percent of the incident light. This is the reason that blacktop becomes so hot when exposed to sunlight.

In actual circumstances the rise in temperature of a surface exposed to radiant flux is often reduced by the transfer of heat to the surrounding air which absorbs heat from the surface. This is typically referred to as convective heat transfer. The amount of heat removed by convection is governed by the speed and turbulence of the air passing over the surface and the temperature difference between the air and the heated surface. In the case of birds, the speed of flight through the air is equivalent to a velocity of air over the surface.

The convective heat transfer between bird feathers and the ambient air is analogous to the convective heat transfer between the heated boiler tubes in the receiver and the water and steam flowing in the receivers at the Hidden Hills and Rio Mesa power plants. In the absence of this continuous convective heat removal the temperature of the boiler tubes would rise rapidly to a new higher equilibrium temperature much higher than the normal 540 $^{o}$C operating temperature on the surface of the receiver resulting in subsequent damage to the receiver unless the incident radiation is removed by putting the heliostats in a standby mode whereby radiant flux is no longer directed at the receiver.

The potential for injury to birds that fly through a concentrated solar flux field results from heating of the outer surface feathers and subsequent conduction of heat into the exposed feathers causing break down of their molecular structure. Conduction is the transfer of heat into a solid object due to the temperature difference between the object and its surroundings. While exposure could also cause a rise in body temperature it is likely that severe damage to the outer feathers would occur much more quickly as a result of the insulating effect of the plumage covering the bird’s body.

In this analysis, staff has attempted to estimate levels of exposure to concentrated radiant flux that are safe and would result in little or no damage to exposed birds. It can then be concluded that exposures above such safe levels would result in irreversible and potentially significant impact to exposed birds that enter the flux field.

Safe exposure criteria are typically estimated by establishing a No Observed Adverse Affect Level (NOAEL) or Lowest Observed Adverse Effect Level (LOAEL) and dividing that level of exposure by an appropriate safety factor to reflect the seriousness of the adverse effect considered and/or the uncertainties in estimating the NOAEL or LOAEL. Typically, acute (short-term) exposure criteria – including those for the non-ionizing radiation addressed in this assessment (electromagnetic radiation including infrared, visible, and ultraviolet light) - are based on a NOAEL for at least a period of 30 or 60 minutes divided by a safety factor that is based on the uncertainty associated with extrapolating from the experimental data to the exposed population (human or ecological). However, avian exposure to concentrated solar flux will be in the range from about 20 seconds to 4 minutes during each pass through the field.

## HAZARD ASSESSMENT

While the highest flux density occurs at the surface of the receiver, high concentration solar flux densities also occur in other parts of the air space above the heliostats, ranging continuously from 1 up to 600 times the background solar radiation of about 1 kW per square meter (1.0 $kW/m^2$). The applicant's response to Data Request 159 (BS 2012u) provides maps of flux densities throughout the air space above the Rio Mesa Solar fields. Similar flux density fields will exist at the proposed Hidden Hills facility.

When high solar flux densities impinge on a bird's flight feathers (primaries, secondaries, and tail feathers), the solar radiant flux is converted to heat, which can cause injury or death depending on the exposure level and duration of exposure (i.e. dose). For example, for exposed (bare) human skin, at an exposure level of 5 $kW/m^2$, first-degree burns would occur within 20 seconds of continuous exposure, second-degree burns would occur within 30 seconds, and third-degree burns would occur within 50 seconds with a 1 percent fatality rate. Because feathers are effectively dead structural protein similar to hair without nerves and other physiological activity, bare human skin is more sensitive than avian feathers to the effects of thermal radiation but does serve as a useful comparison.

Exposures of birds to concentrated solar flux did actually occur at the Solar One facility near Daggett California (McCrary et. al. 1986). Birds were found dead on the site that had clear evidence of thermally induced damage to flight feathers caused by exposure to concentrated solar flux. The birds had near complete removal of both barbules and barbs of flight feathers leaving only the rachis (the main central shaft of the flight feather) remaining. This suggests that the flight feathers had reached temperatures in excess of 300 $^{o}$C and demonstrates the potential for damage to flight feathers resulting from exposure to concentrated solar flux. The barbules, which comprise the major resistance to air flow are essential to creating lift caused from wing flapping. The barbules are very small (less than 1/1000 of an inch thick) and have very low mass. Thus, damage to barbules from exposure to concentrated flux will be virtually instantaneous.

This assessment provides an analysis of the potential damage to flight feathers of the bird associated with exposure to concentrated solar flux. Staff has determined that damage of surface feathers is one of the most sensitive types of adverse effects that can result in avian species from such exposure. Staff's dose response assessment provides analysis of the relationship of potential feather damage associated with increasing levels of concentrated radiant flux exposure. Staff's analysis identifies levels of concentrated solar flux exposure that are just below the levels that could cause irreversible damage to flight feathers as the criteria to establish safe avian exposure levels.

## DOSE RESPONSE ASSESSMENT

Bird feathers are composed predominantly of keratin which is a naturally occurring polymeric protein chain. These polymer chains of keratins also form secondary structures creating hard natural fibers (for example hair and wool) and hard fibrous sheets (for example feathers, claws, nails, and hooves) (Conn et al 1987) (Mazur and Harrow 1968) (Van Holde and Mathews 1996).

Feathers are composed of the beta form of keratin. β-keratin is a macromolecular secondary form resulting from folding and cross linking at the edges of the poly peptide polymer primary chains. The β-keratin in feathers also typically contains small amounts of both loosely bound water and more tightly bound water that exists in the molecular structures of the secondary proteins. Alpha and Beta keratin from wool, hair, and feathers have remarkably similar thermal decomposition characteristics (Brebu et. al. 2011).

The structural properties (strength, stiffness, elasticity etc.) of the keratin that make up feathers is central to the feathers function in flight (Bachmann et. al. 2011). Intact keratin structure is also essential to maintenance of the feather's aerodynamic shape and surface smoothness. Both structural and molecular changes occur when keratin is exposed to temperatures above about 160 $^{o}$C (Takahashi et. al. 2004) (Senoz.et.al. 2011) (Istrate et. al. 2011).

At ambient pressure and feather surface temperature up to 100 $^{o}$C, the feather loses unbound water. However, unbound water can also be lost at a slower rate through accelerated evaporation at lower temperatures and relative humidity. Heating above 100 $^{o}$C in the absence of water is often referred to as heating in the dry state. Keratin is more resistant to thermal degradation when heated in a dry state than in a wet state (Takahashi et. a.l 2004). Because unbound water cannot exist in the keratin at temperatures above 100 $^{o}$C at ambient atmospheric pressure, staff concludes that exposure to concentrated radiant solar flux at ambient conditions will result in dry heating.

Loss of water that is not molecularly bound is reversible. Typically the presence of unbound water would result in a transient period before temperatures inside the feather would rise upon heating above 100 $^{o}$C due to latent heat required to vaporize the unbound water. However, in the environment of the project site in summer the elevated ambient temperatures and low humidity would suggest very low moisture content in the feathers of indigenous birds, particularly for the flight feathers.

At about 160 $^{o}$C, bonds in the molecular structure of secondary proteins are broken leading to loss of structural integrity of the β-keratin molecular structure and a permanently weakened feather. The keratin begins to melt at about 250 $^{o}$C. At temperatures of 250 to 450 $^{o}$C, bonds in the primary polymer protein chains are broken into smaller molecular compounds through pyrolysis ( Senoz et. al. 2010) (Miller et. al.

2005) (Senoz et. al. 2011) (Brebu et. al. 2011). When temperatures reach 450 to 500 $^{o}$C, keratin will almost completely break down and carbon will be the primary constituent of what remains.

Once bonds on the ends of the protein chains are broken, damage to the keratin is not reversible and thus the structural properties of the secondary proteins and ultimately the exposed feathers are adversely affected. This breaking of the chemical bonds that secure the secondary molecular structure of keratin, which leads to structural changes without affecting the primary protein chains is referred to as denaturing (Istrate 2011) (Takahashi et. al. 2004). This is very similar to the boiling of an egg where the protein structures in the albumin (egg whites) are permanently changed but the basic protein chains are not disrupted.

Based on the results of staff's thermodynamic equilibrium analysis, exposure to solar flux greater than 4kW/m$^2$ could result in temperatures above 160 $^{o}$C, thus compromising the keratin molecular structure of a bird in flight and, therefore potentially causing irreversibly weakening of feathers leading to an irreversible adverse impact on the feathers. While molting may ultimately replace some damaged feather it will in most cases not occur for some time after the damage occurs.

## EXPOSURE ASSESSMENT

To estimate exposure staff modeled the change in surface temperature of wing feathers of a bird during flight when the bird's feathers are exposed on its underside to a concentrated reflection of sunlight in a solar heliostat field. The intensity of exposure depends on the path the bird traverses from the point where it enters a space with concentrated flux until it exits that space. The figures in the applicant's response to Data Request 159 (BS 2012u) are contour plot depictions of concentrated flux density isopleths indicating the locations of flux density levels of 5, 10, 25, 50, 100, and 500 kW/m$^2$. Because the ambient (background) solar flux incident on the heliostats is about 1 kW/m$^2$, the concentration ratio is also equal to the concentrated flux density in kW/m$^2$.

Because temperatures above 160 $^{o}$C have been demonstrated to cause structural damage to feathers, to evaluate the potential for damage, it is necessary to convert the radiant flux to a resultant increase in the temperature at the surface of the exposed feathers. During flight, concentrated solar radiation is reflected from the heliostats on to the bottom surface of the feather, causing heating of the surface. The rate of heating depends upon the intensity, or flux density, and how fast the surface is simultaneously being cooled. By equating the flux density to the heat losses occurring through convection and radiation, the resulting feather surface temperature that allows heat-transfer equilibrium (steady-state) to occur can be determined.

Potential cooling of the exposed feather surface results from the ongoing heat loss from the bottom surface of the wing feather by multiple mechanisms. The most important of these is convection of heat to the air stream passing under the wing surface (at the bird's air speed). Additional losses include re-radiation of heat (energy) from the hot surface, and by conduction of heat through the feather to its backside, where it can be lost through convection to the air stream passing over the top side of the feather. These loss mechanisms depend upon the difference between the surface temperature of the feather and the temperature of the ambient air, increasing in effectiveness as the temperature difference increases. Thus, as the feather surface temperature heats from solar radiation, the heat losses increase until they collectively match in their heat loss rate, the heat gain rate caused by the concentrated solar radiation. At that point the surface temperature stabilizes, and becomes what is called “steady-state.” At realistic bird flight speeds in the gradually changing solar flux densities of a solar field, surface temperatures reach to within a few degrees of this steady-state temperature virtually instantaneously. During realistic flight conditions in the power plant’s solar field, flux densities change continuously with location, so any sudden change is an unrealistic simplification of actual conditions experienced in flying through the air space having concentrated flux densities.

Thus, in the solar field, because changes in flux density occur gradually during flight, there are no large “step changes”, so temperature rise-times can be ignored. After conducting dynamic analyses and examination of several plausible flight paths and comparing those results to the simple assumption of instantaneous equilibrium, staff used the assumption of instantaneous equilibrium to establish safe exposure criteria as this assumption created little error in the result. Assuming instantaneous equilibrium eliminates the dependence on flight path in analyzing potential avian exposures to concentrated solar radiation. Tables 1 and 2 below provide estimates of equilibrium temperatures for a range of plausible exposure intensities and exposure conditions, a flight speed of 18 miles-per-hour, an ambient temperature of 49 $^{o}$C, and at incidence angles of 0 degrees and 71 degrees off-perpendicular to the feather surfaces. Figures 1 through 4 below show the results of dynamic modeling of a range of plausible flight paths. The simplification of using instantaneous equilibrium, allows staff to reduce multiple variables (flux level, emissivity, angle of incidence, flight speed, path through solar field) down to a simpler set of only two variables (flux level and exposure time).

Dynamic modeling was conducted by choosing several plausible straight-line flight paths through the solar field, utilizing the isopleth solar field diagrams provided by the applicant, This was be done by calculating the feather surface temperature at half-second intervals along a presumed flight path by adjusting for the incoming radiant flux and convective and radiative loses that would be occurring at each interval step using the assumed ambient air temperature, flight speed, and incidence angle, etc. Staff used linear interpolation to estimate flux intensities between isopleths, then plotted temperature on a continuous basis during the flight path through the field. Points where exposure resulted in estimated surface temperatures above 160 $^{o}$C, and 300 $^{o}$C were noted. Tables 1 and 2 provide estimates of equilibrium surface temperatures based on varying flux densities, and flight paths, and for assumed steady exposure to flux levels.

Staff determined that conduction of heat through the feather is not an important heat loss factor as it constitutes less than 2 percent of the heat losses from radiation and convection. Therefore, it would have no appreciable effect on the equilibrium surface temperature. While conduction through the feather is a small fraction of the heat loss from the surface, shallow diffusion of heat and flux into the material at and just beneath the surface of the feather is the primary cause of temperature rise in the feather and of the subsequent damage to the structure of the keratin molecules that provide the structural integrity of feathers.

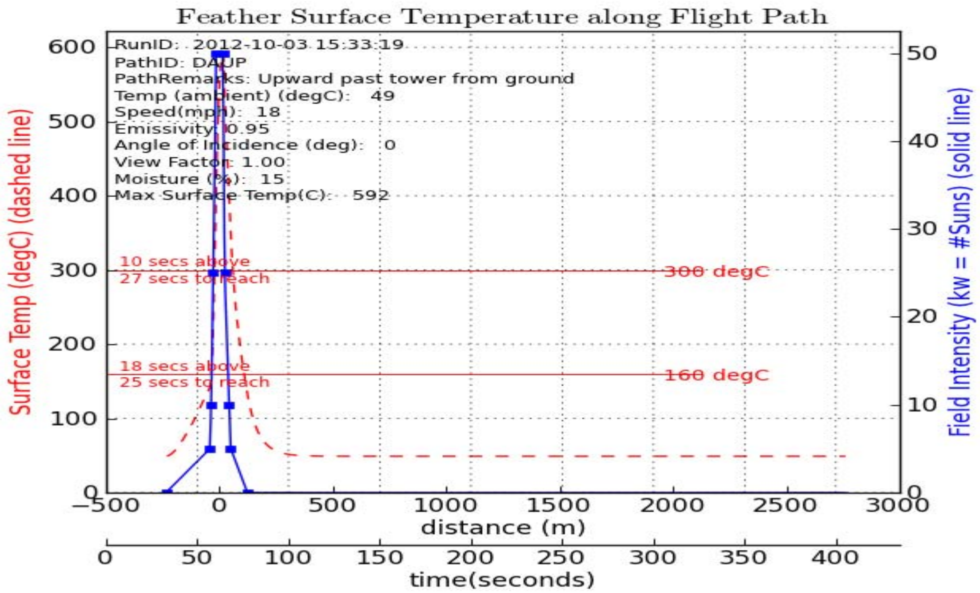


**Figure 1 – Path is from ground up past tower receiver while operating at full load**

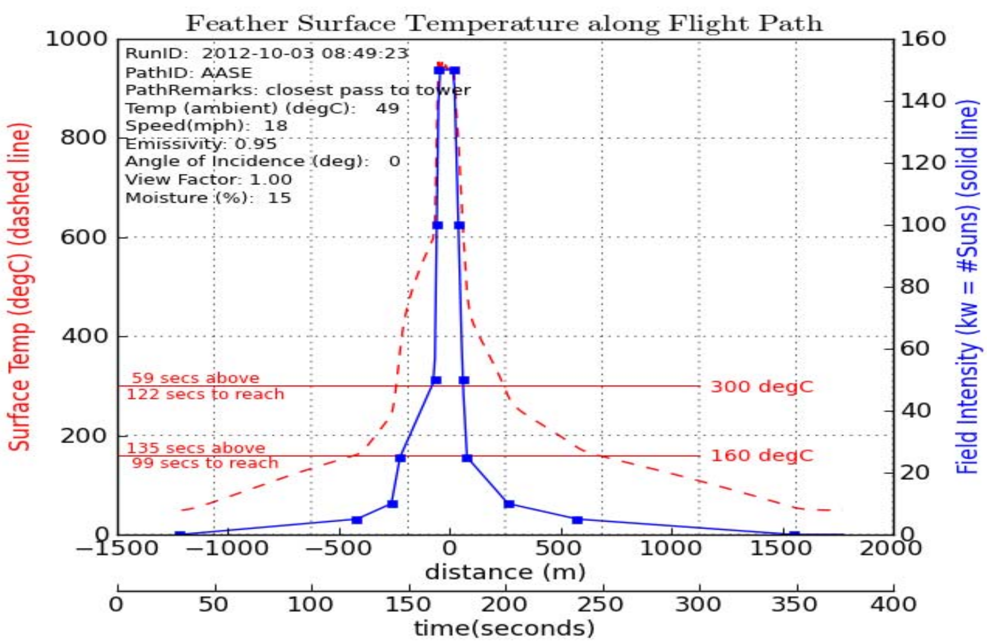


**Figure 2 – Path is straight line from edge of solar field going close by tower to opposite edge of field**

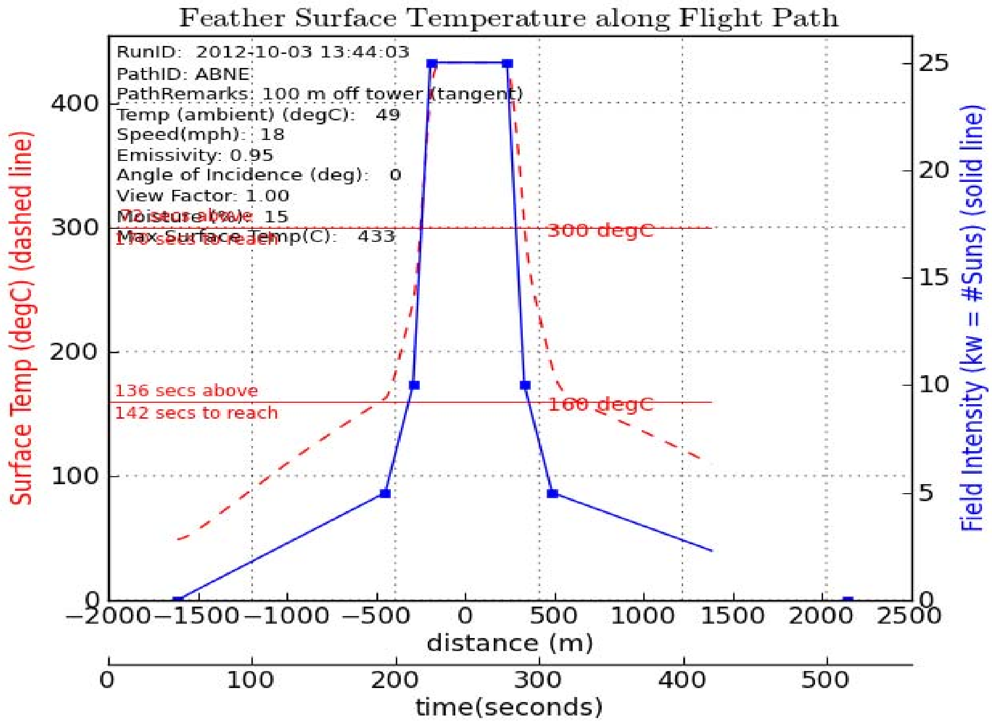


**Figure 3 -- Flight path is straight line tangent to circle with radius of 100 meters around tower**

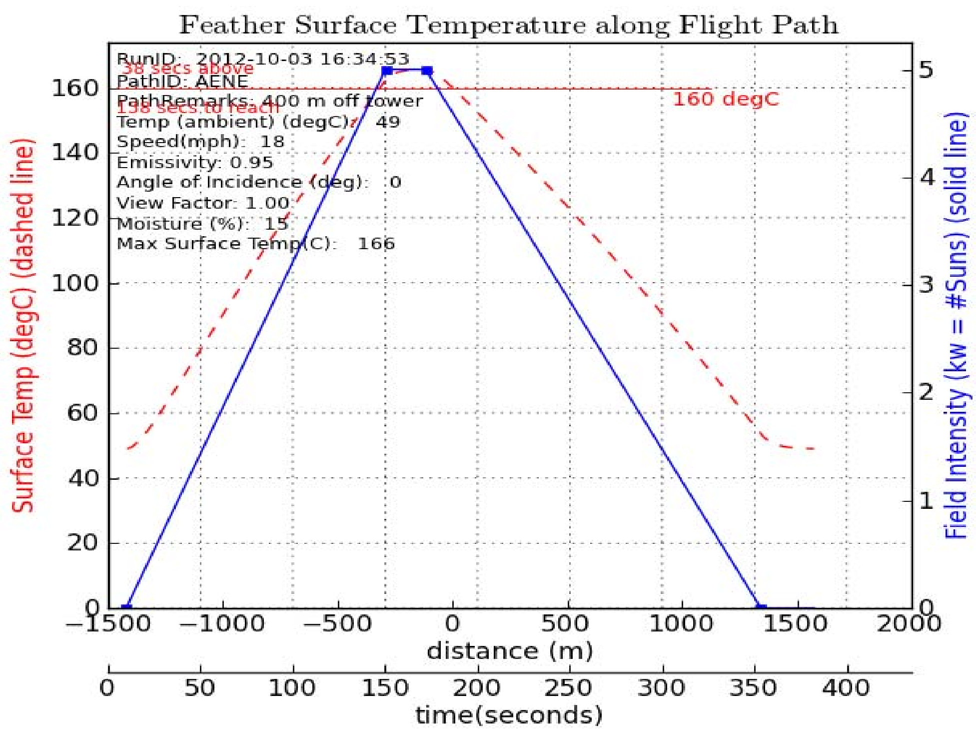


**Figure 4 -- Flight path is tangent to circle with radius of 400 meters around tower**

**Table** 1

Feather Surface Temperatures vs Flux Intensity

| | | Flight Condition | | |
|---|---|---|---|---|
| Flux Intensity (kW/m^2) | Steady State Temp (deg C) | Directly at Tower Temp (deg C) | Tangent to 100yds off Tower (deg C) | Flying upward near tower (deg C) |
| 1 | 75 | 66 | 68 | 57 |
| 5 | 166 | 160 | 161 | 141 |
| 10 | 255 | 238 | 238 | 156 |
| 25 | 433 | 360 | 408 | 224 |
| 50 | 606 | 600 | na | 408 |
| 100 | 811 | 740 | na | na |
| 150 | 947 | 930 | na | na |

All at 18mph, View factor = 1 (Angle of incidence = 0 deg)

**Table 2**

Feather Surface Temperatures vs Flux Intensity

| | | Flight Condition | |
|---|---|---|---|
| Flux Intensity (kW/m^2) | Steady State Temp (deg C) | Directly at Tower Temp (deg C) | Tangent to 100yds off Tower (deg C) |
| 1 | 58 | 54 | 55 |
| 5 | 90 | 87 | 88 |
| 10 | 128 | 118 | 118 |
| 25 | 224 | 164 | 194 |
| 50 | 342 | 325 | na |
| 100 | 495 | 380 | na |
| 150 | 600 | 499 | na |

All at 18mph, View factor = 0.33 (Angle of incidence = 71 deg)

## CHARACTERIZATION OF RISK

In flying completely across areas of the facility with flux densities above 5kW/m$^2$, maximum distances would be between 900 to 1000 meters. At a flight speed of 4.5 meters per second (about 10 miles per hour), the flight would take about 200 seconds and at 18 meters per second (about 40 miles per hour) it would take about 50 seconds to traverse 900 meters. During such flight, the bird would receive exposures ranging from 5 kW/m$^2$ up to possibly 500 kW/m$^2$ of varying duration depending on the flight path taken. This exposure including heat loss mechanisms and duration must be integrated over the flight path to obtain a time – temperature profile to obtain a dose.

As stated previously, when the exposure and duration are sufficient to cause the feather to reach temperatures above 160 $^{o}$C, the bird would suffer some level of irreversible damage to feathers that are critical to its ability to fly. This damage can lead to secondary effects such as collision with the ground if damage is sufficient to impair normal flight, or even the ability to become and remain air-borne.

Feather damage could also decrease the bird's overall probability of survival and life expectancy. For birds of prey, the ability to carry small animals that are caught could be severely compromised leading to potential malnutrition or even starvation of the bird or its young. The carrying of prey significantly increases load-carrying demands placed on the wings and critical flight feathers.

Thus, the potential damage caused by avian exposure to concentrated solar flux can range from minor impairment to near immediate fatality depending on the dose received. Low doses of 5 kW/m$^2$ to 15 kW/m$^2$ for short exposure periods may not cause effects that are observable to the naked eye but could result in significant flight impairment. For example if a significant portion of the feather barbules (the micro structure between barbs) were lost or the feather's structural integrity is impaired, it could reduce the bird's level and climbing flight speeds. Larger short term exposures in the 10 to 25 kW/m$^2$ range could cause nearly complete loss of barbules and result in loss of flight capability and inability to remain airborne. Staff has identified 4kW/m$^2$ as a safe level for short exposures

Using the only available data on avian mortality, provided by (McCrary et. al. 1986) staff estimates that the proposed Hidden Hills and Rio Mesa facilities could each result in avian mortality in excess of 22 times that of the Solar One facility previously studied. This extrapolation is based on mirror area as collision with mirrors played a major role in the avian fatalities documented at the Solar One facility. It should be noted that the McCrary study provides no data to assess avian morbidity. It should be recognized that estimates of avian mortality that ignore excess morbidity will necessarily underestimate ultimate fatality that will be associated with that excess morbidity (i.e. latent fatality). It should also be noted that damage to flight feathers could be cumulative if flights through concentrated flux are repeated. Such factors would be expected to contribute to underestimation of avian impacts.

In risk assessments of other hazards, the morbidity to mortality ratio can range from less than 5 to one to over 100 to one.  For example, for every death from an explosion, you expect 5 injuries.  For automobile accidents, we see about 100 injuries for every death. Since McCrary did not survey the region surrounding the project or account for scavenging of injured birds on or offsite, we cannot define morbidity due to collisions and exposure to concentrated solar radiation.

In addition to these concerns extrapolation from a 10 MW pilot plant to a 250 MW facility with many thousands of heliostats and a much taller receiver tower "may produce non-linear increases in the rate of avian mortality when compared to Solar One…" according to McCrary.  Also, while the volume of the air space with solar flux densities greater than 4 kW/$m^2$ would likely increase proportionally to MW or solar field size, the effect of a larger volume of the proposed projects may have a greater effect on bird mortality and morbidity given that exposure times become much greater. This is why elephants and whales retain body heat better than smaller animals – for a doubling of a volume's surface area, the enclosed volume increases by threefold. An increase in the surface area would result in a proportional increase in birds enter the volume, but the disproportional increase in the volume would result in greater risk to birds from increased exposure durations.

## ANALYSIS OF UNCERTAINTY

There are significant uncertainties associated with staff's analysis of risk to avian plumage potentially resulting from exposure to concentrated solar flux. Evaluation of the relative sensitivity to various inputs to the thermodynamic equilibrium calculation indicates that the orientation of the bird in the flux field causes the greatest effect on the resultant radiant exposure. This is the result of the strong effect of the angle of incidence on effective flux density. This is reflected in the view factor of the incident rays on the surface. The view factor used in staff's model can vary from about 0.25 to 1 depending on the bird's orientation in the radiant field. This can result in a fourfold change in effective exposure level between level flight and flight that causes the feathers to be perpendicular to the incident solar radiation.

The flight speed of the bird is the next most important variable in estimation of the resultant surface temperature reached. A decrease in flight speed from 40 miles per hour to 20 miles per hour would increase resultant relative surface temperature rise by about 50 percent. This is the result of decreased convective heat transfer from the feather surface to the ambient air at lower flight speeds.

The emissivity (the fraction of the incident radiation absorbed) of the feather would also affect the resultant temperature. However, staff used an emissivity of 0.95 as a plausible worst case eliminating the potential variability associated with differences in emissivity of different feathers. It should also be noted that the micro structure of the feathers may allow radiant energy to penetrate deeply into the feather below the boundary of the outer surface. For example the radiant energy could first contact the barbules that are well within the feather. This could substantially reduce the effect of convection and substantially increase the rate of temperature rise on these surfaces. If this does in fact occur, staff's analysis could substantially underestimate the effect of flight feather damage associated with exposure to concentrated flux.

It is also conceivable that conduction of heat down the quill of the feather could result in damage to the follicle resulting in complete loss of the feather and loss of ability to re-grow a new feather during subsequent molting cycles.

Another uncertainty is the potential exposure to UV radiation with concurrent exposure to high temperatures. Staff was not able to include the potential effect of increased bond scission that could be associated with concurrent exposures. Such exposure could result in adverse effects on keratin integrity at lower surface temperatures.

Exposure to summer ambient conditions mid-day results in exposure to solar flux of 1 $kW/m^2$, and is thus the base line beyond which excess damage can occur. Preexisting exposure of 1 $kW/m^2$ with or without the existence of the proposed facilities places a lower limit on exposure. An exposure to 5 $kW/m^2$ is the lowest exposure that results in a surface temperature of $160^o$ C. Use of an uncertainty factor greater than 5 and a LOAEL of 5 $kW/m^2$ would render the exposure criteria moot as it would require exposure to remain below the preexisting background of $1kW/m^2$. Exposures below 4 $kW/m^2$ did not result in surface temperatures of above $160^o$ C and can be considered a NOAEL. Use of an uncertainty factor of 2 and a LOAEL of 5 $kW/m^2$ results in an estimated safe exposure level of 2.5 $kW/m^2$. Based on this analysis staff estimates that one time exposure to solar flux densities between 2.5 $kW/m^2$ and 4 $kW/m^2$, for a period duration not exceeding 1 minute, would cause little if any damage to flight feathers and could be considered safe.

## SUMMARY OF CONCLUSIONS

Staff's analysis of avian exposure to concentrated solar radiation indicates that a threshold of safe exposure does not exist above a solar flux density of 4 $kW/m^2$. The analysis also indicates that both the Hidden Hills and Rio Mesa facilities pose significant risk to avian populations that may encounter the air space in the facilities where concentrated flux density is above safe levels. The available data regarding avian impacts is very limited; however, such data does provide at least some perspective regarding potential for impact.

There are significant questions regarding extrapolation from the available information regarding avian impacts. The most vexing is the complete absence of data that would allow estimation of avian morbidity. Staff's assessment provides estimates of exposure and dose that can lead to injury and late fatality. In addition, there are major unknowns in estimation of differences in avian populations from one site to the next. These limitations in the available data require exercise of considerable judgment in extrapolation of data from one site to another. However, the errors introduced by the lack of site specific data are likely to be small in comparison to the absence of morbidity estimates and effects of dramatically increased potential exposure duration resulting from the increase volume of the air space affected by concentrated solar flux.

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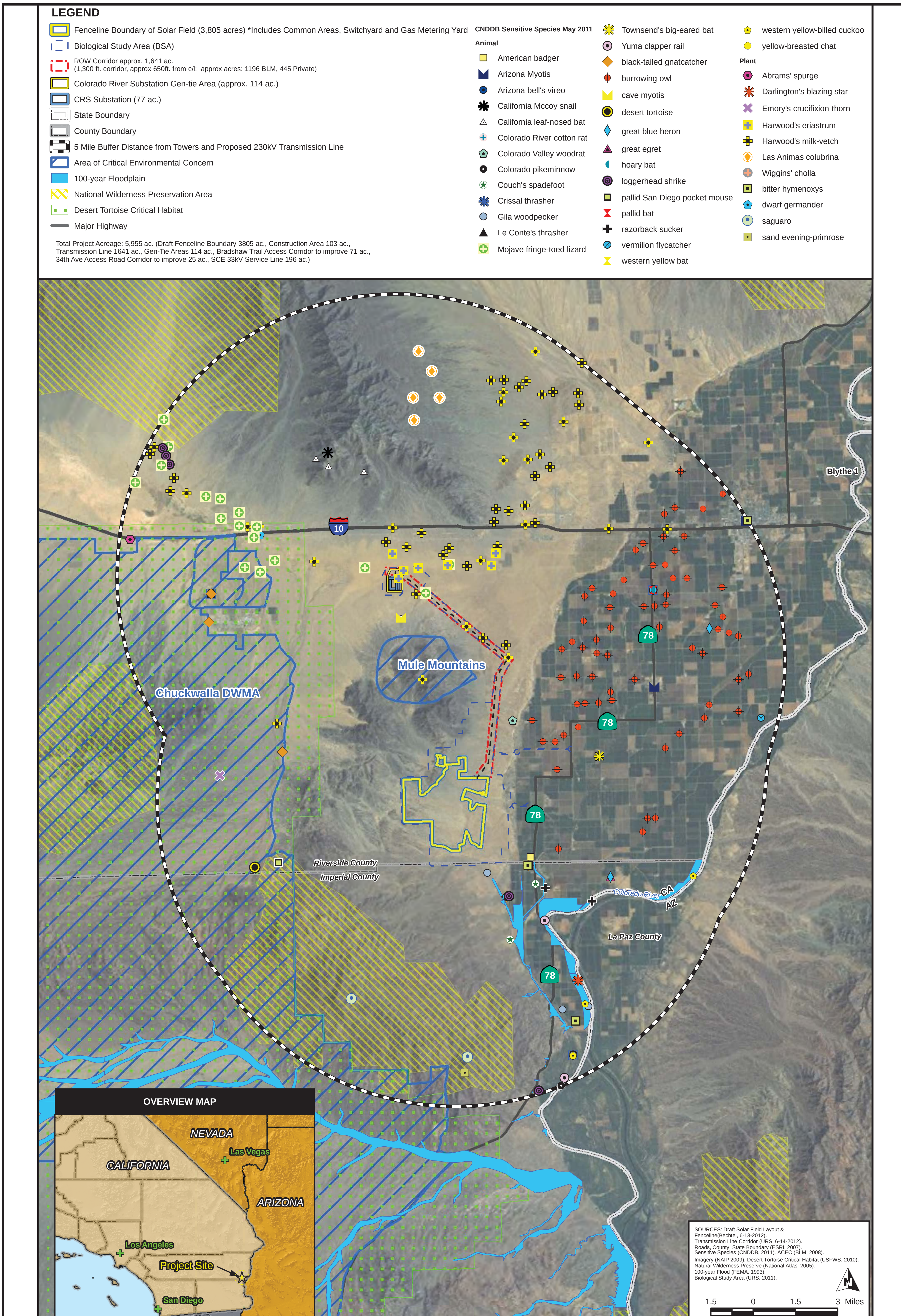
**BIOLOGICAL RESOURCES - FIGURE 1**
Rio Mesa Solar Electric Generating Facility - CNDDB Data and Land Conservation Designations in the Project Vicinity

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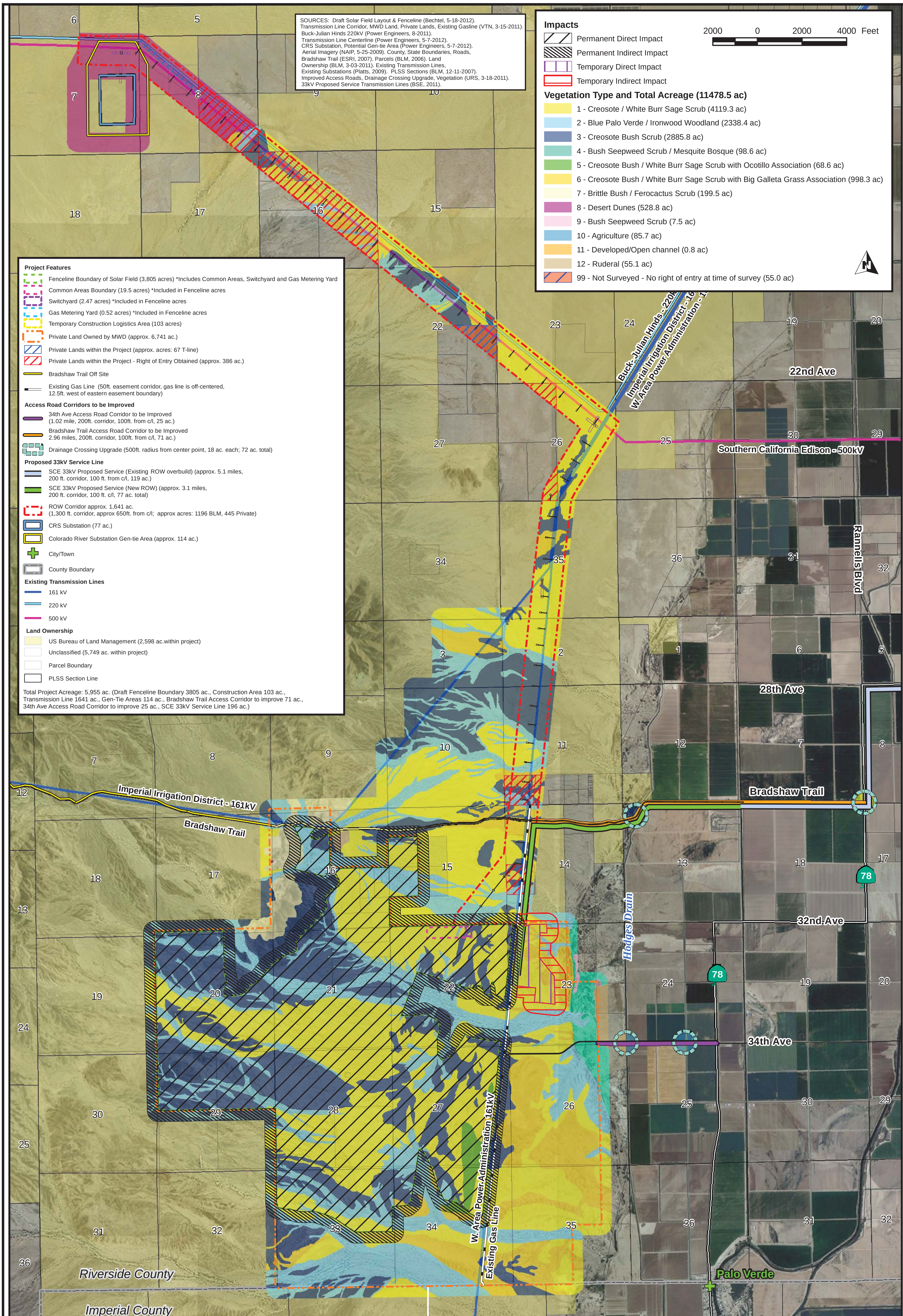
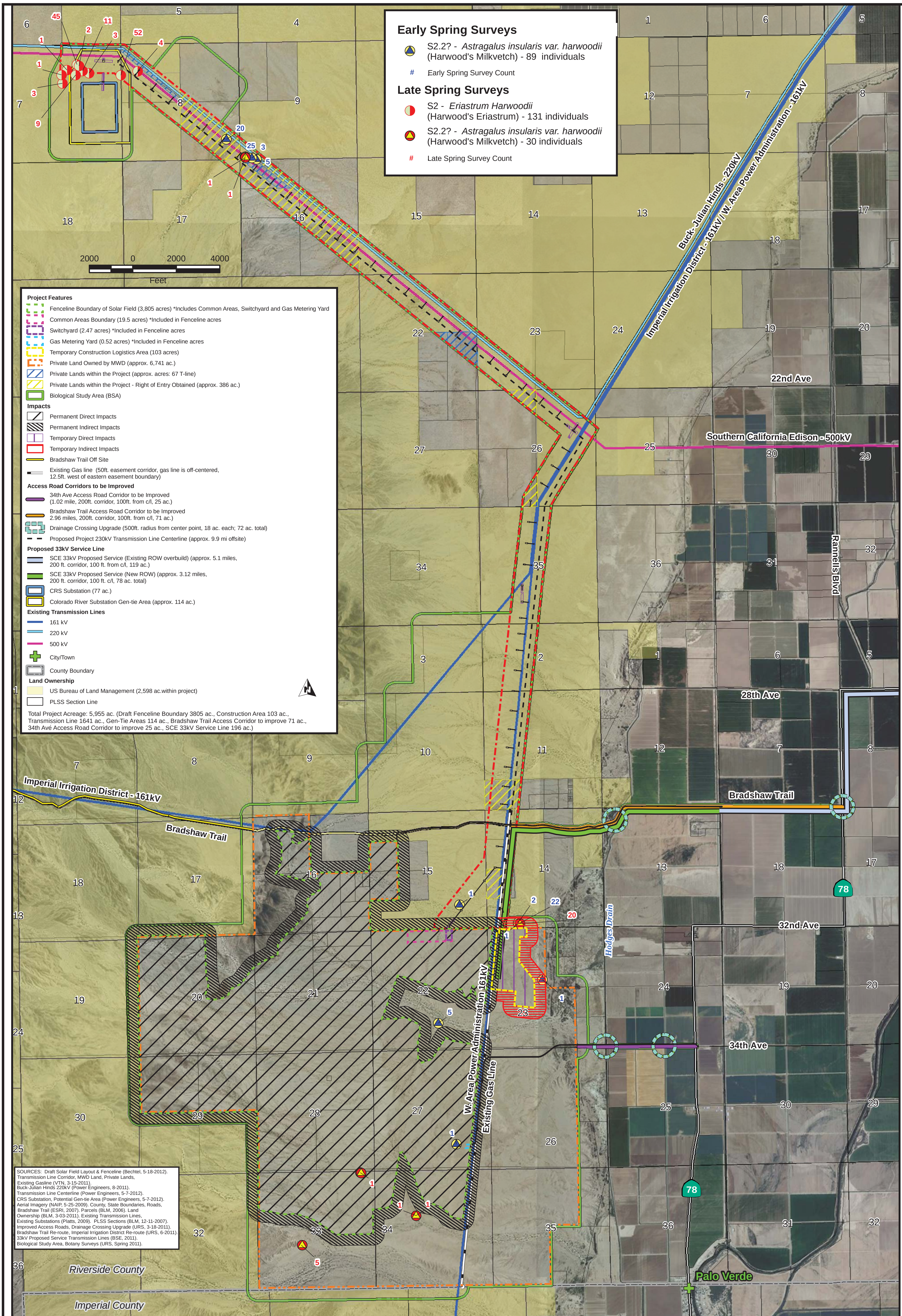
SOURCE: AFC Figure 5.2-1 (REV)

## BIOLOGICAL RESOURCES - FIGURE 2
Rio Mesa Solar Electric Generating Facility - Vegetation in the Biological Study Area



**BIOLOGICAL RESOURCES - FIGURE 3a**

Rio Mesa Solar Electric Generating Facility - Special-Status Plants

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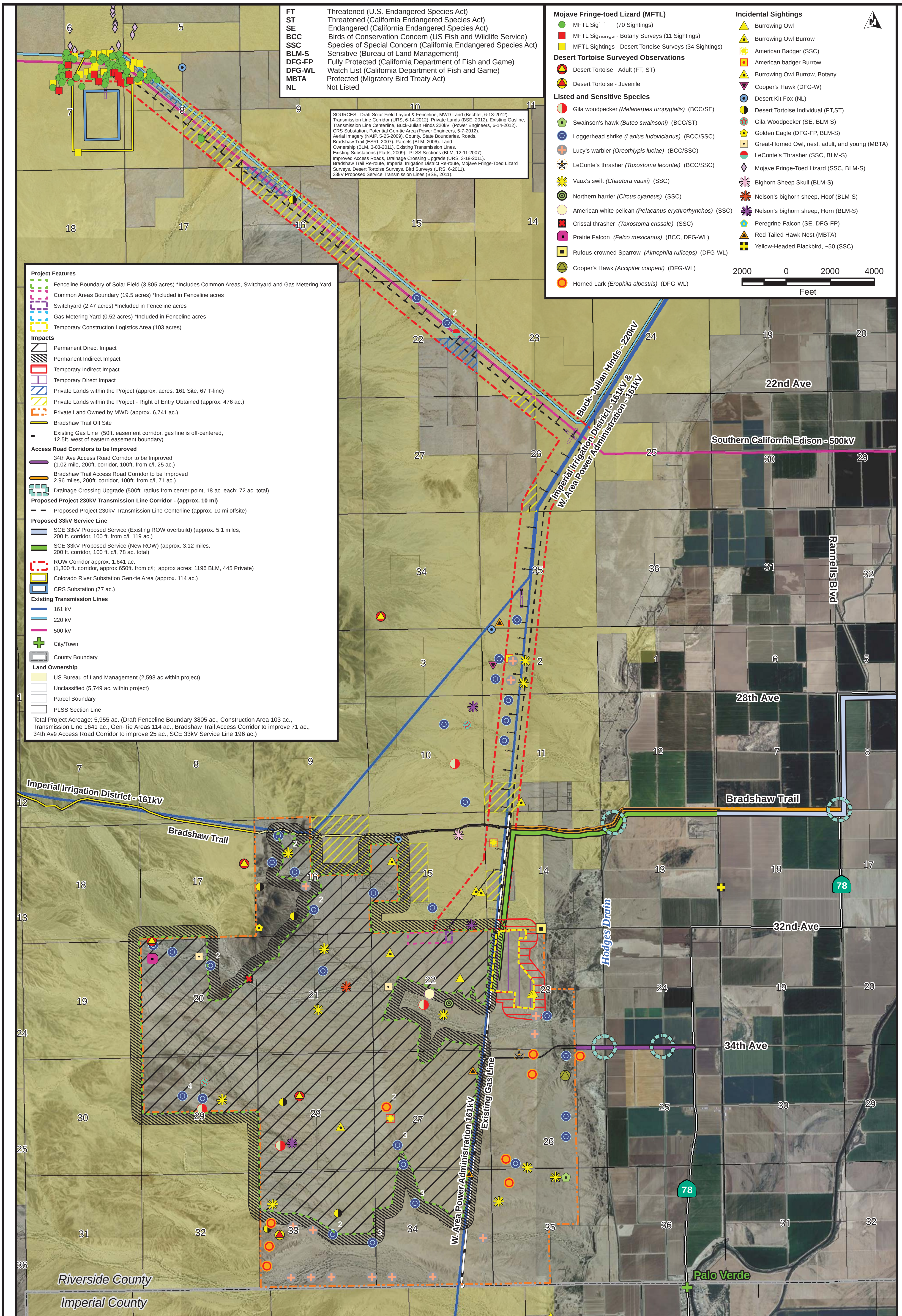
SOURCE: AFC Figure 5.2-3 (REV)

## BIOLOGICAL RESOURCES - FIGURE 3b

Rio Mesa Solar Electric Generating Facility - Special-Status Wildlife

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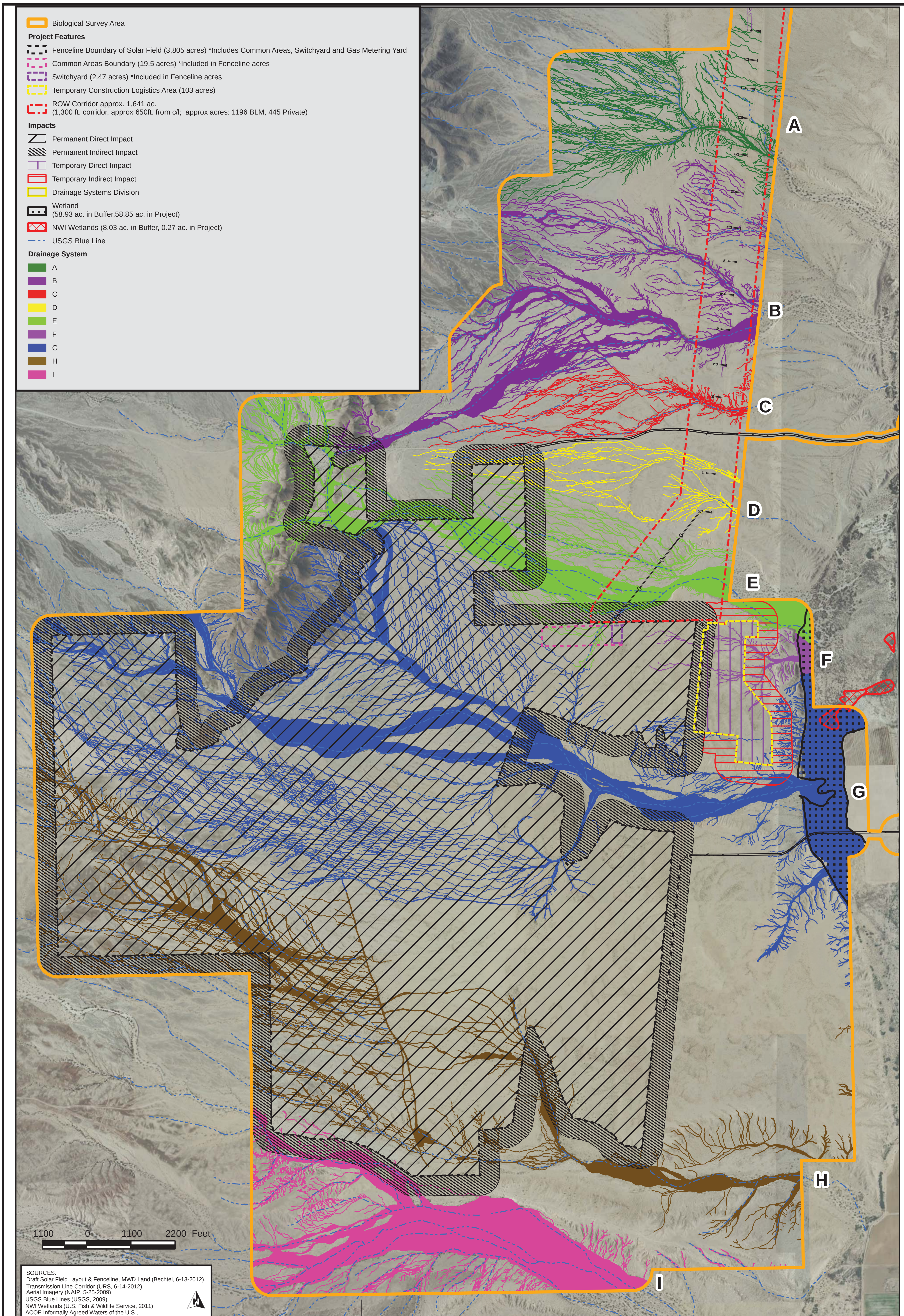
SOURCE: AFC Figure 5.2-4 (REV)

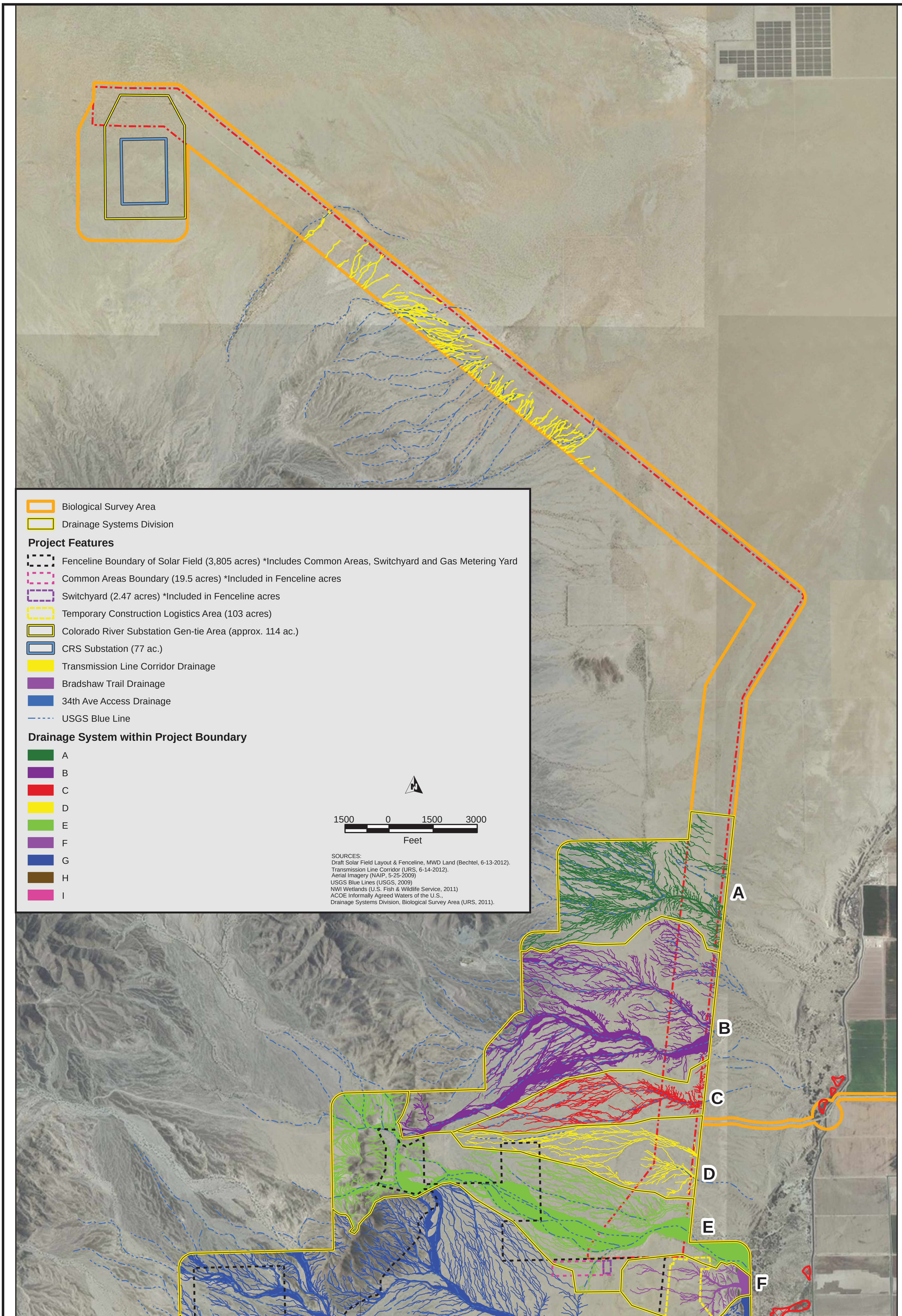
**BIOLOGICAL RESOURCES - FIGURE 4a**

Rio Mesa Solar Electric Generating Facility - Identified Waters of the US – Project Site

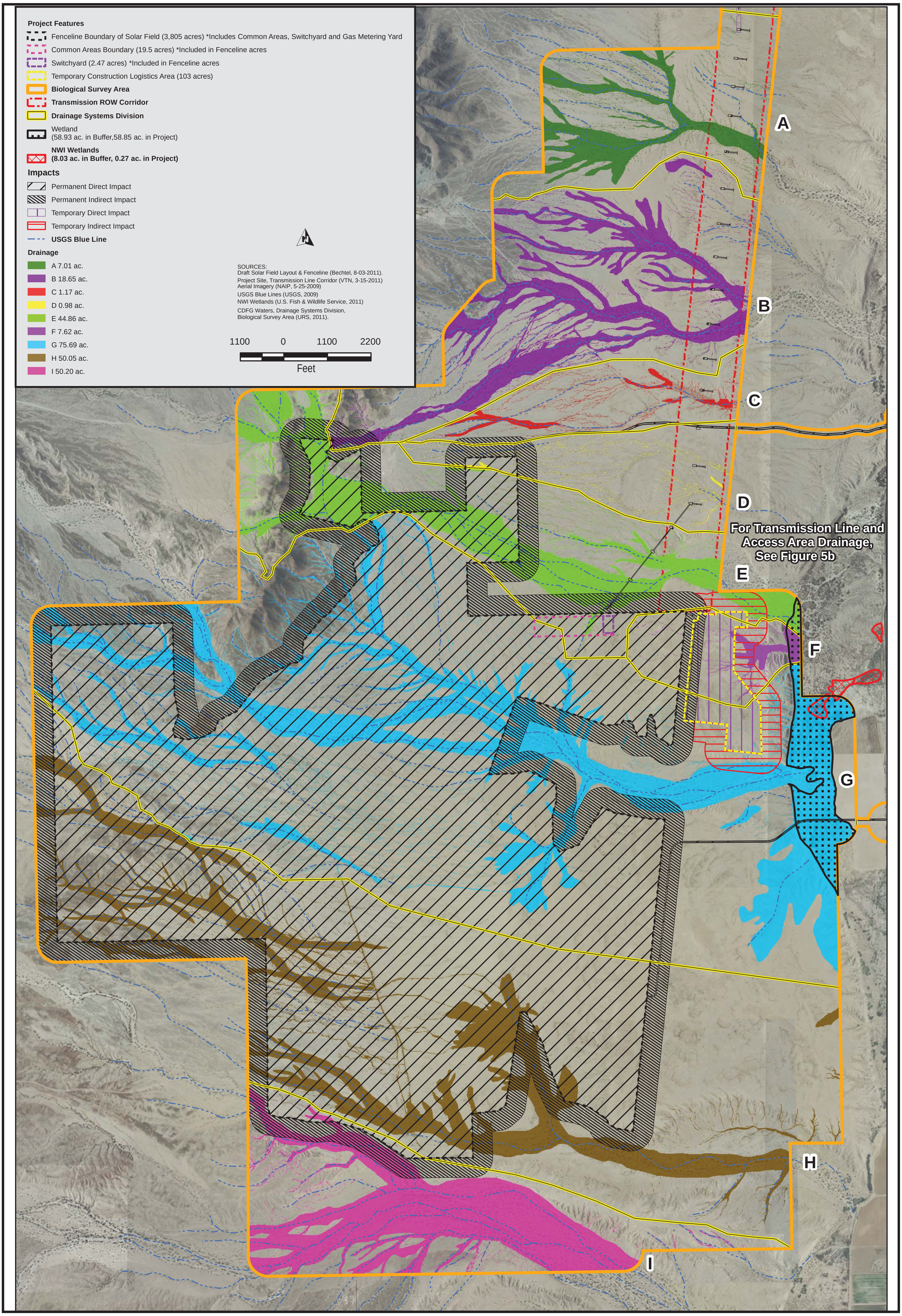


**BIOLOGICAL RESOURCES - FIGURE 4b**

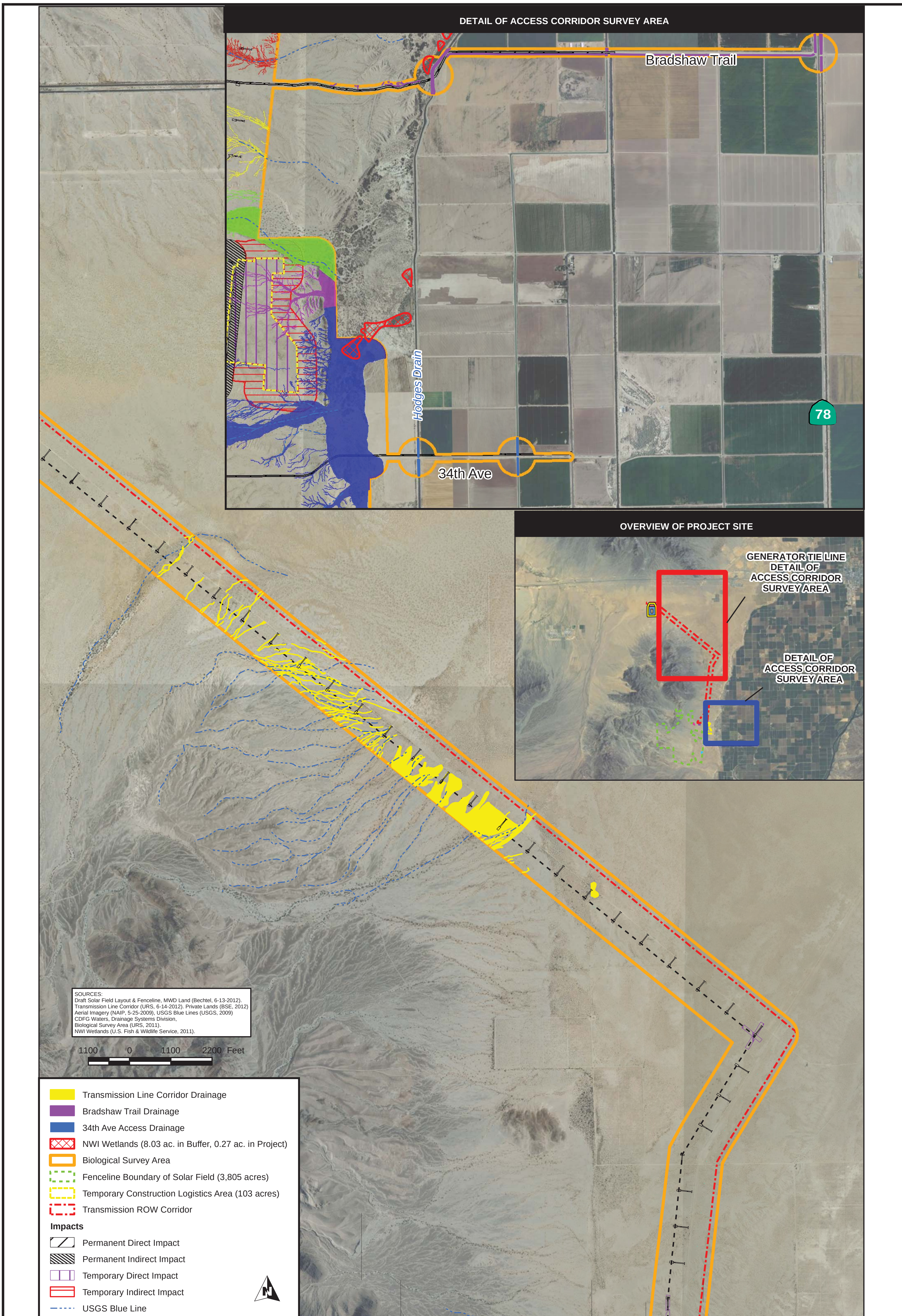
Rio Mesa Solar Electric Generating Facility - Identified Waters of the US – Gen-Tie



**BIOLOGICAL RESOURCES - FIGURE 5a**
Rio Mesa Solar Electric Generating Facility - Potential Waters of the State – Project Site

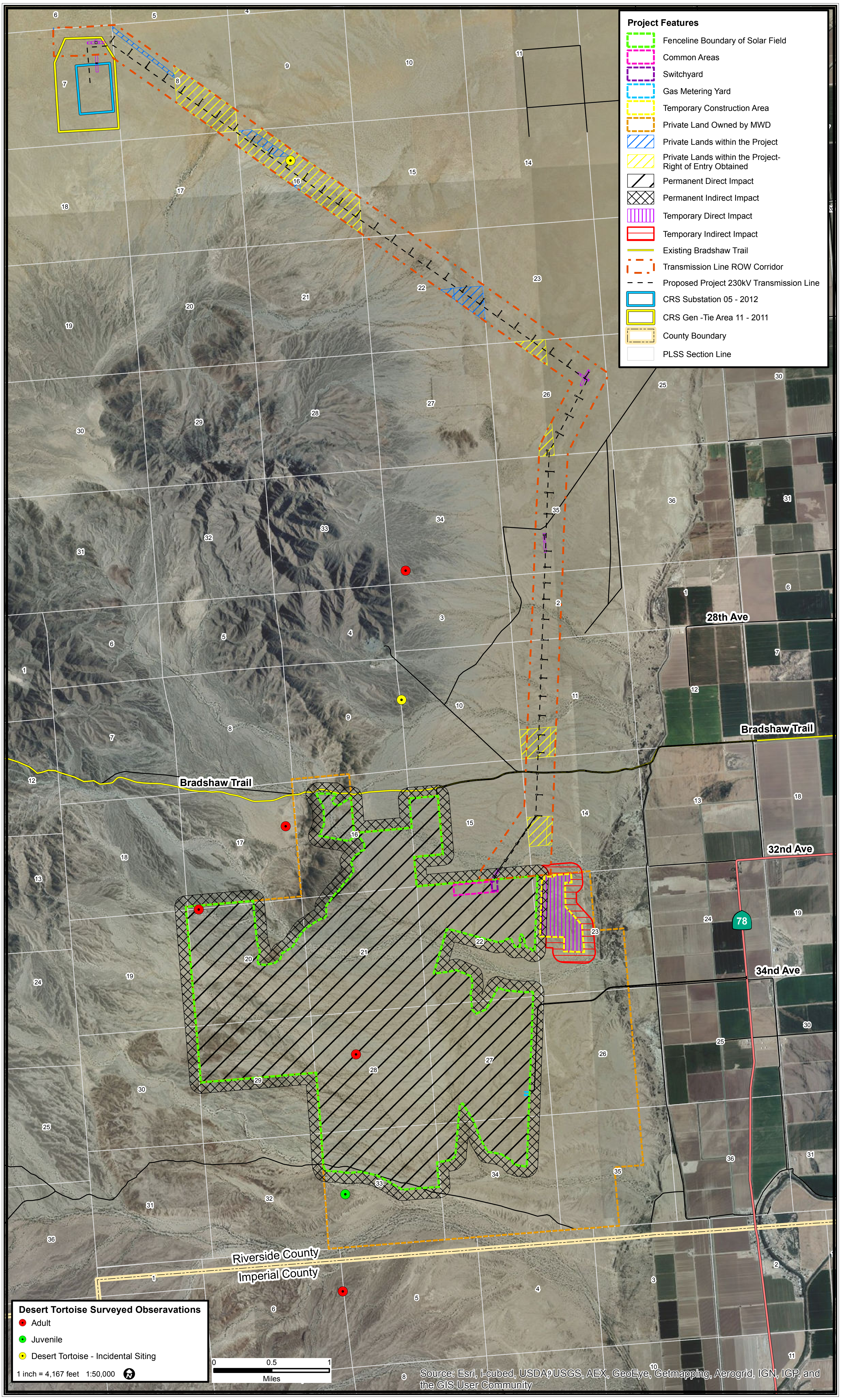


## BIOLOGICAL RESOURCES - FIGURE 5b
Rio Mesa Solar Electric Generating Facility - Potential Waters of the State – Gen-Tie



## BIOLOGICAL RESOURCES - FIGURE 6a

Rio Mesa Solar Electric Generating Facility - Desert Tortoises Observed in the Biological Study Area

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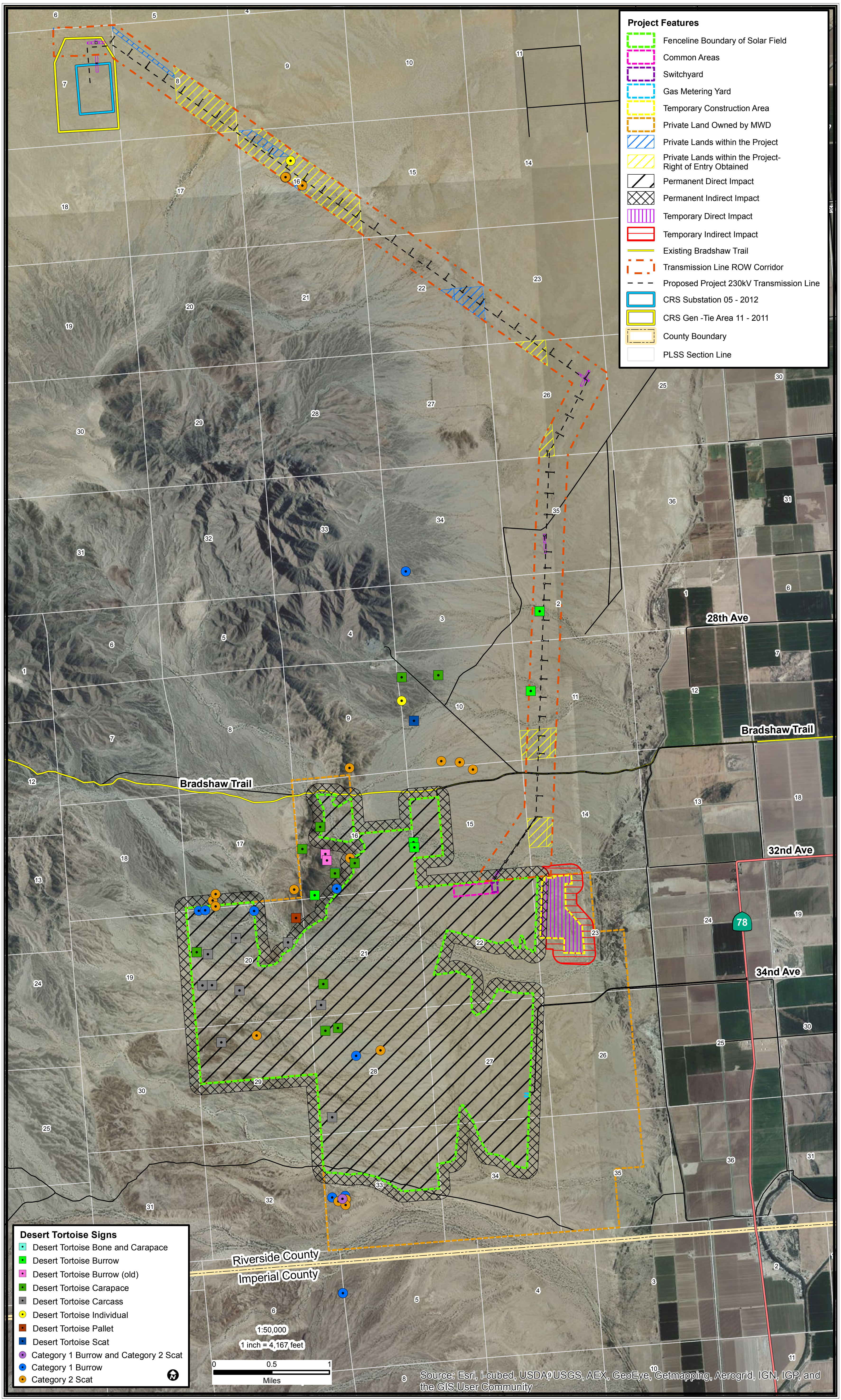
SOURCE:URS - ESRI

**BIOLOGICAL RESOURCES - FIGURE 6b**

Rio Mesa Solar Electric Generating Facility - Desert Tortoise Sign in the Biological Study Area

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SOURCE:URS - ESRI

# CULTURAL RESOURCES

Elizabeth A. Bagwell, Glenn J. Farris, Thomas Gates, Amber Grady,
Michael D. McGuirt, and Melissa E. Mourkas[1]

## INTRODUCTION

This environmental assessment identifies the potential impacts of the Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF) project on cultural resources. The term “cultural resource” means any tangible or observable evidence of past human activity, regardless of significance, found in direct association with a geographic location, including tangible properties possessing intangible traditional cultural values. Historical resources are defined under California state law as including, but not necessarily limited to, any object, building, structure, site, area, place, record, or manuscript that is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California. Classified by their origins, three kinds of cultural resources are considered in this assessment: prehistoric, ethnographic, and historic. Under federal and state historic preservation law, cultural resources generally must be at least 50 years old to have sufficient historical importance to merit consideration of eligibility for listing in the California Register of Historical Resources (CRHR). A resource less than 50 years of age must be of exceptional historical importance to be considered for listing.

Prehistoric archaeological resources are associated with the human occupation and use of California prior to prolonged European contact, for which very few written records exist. These resources may include sites and deposits, structures, artifacts, rock art, trails, and other traces of Native American human behavior. In California, the prehistoric period began over 12,000 years ago and extended through the eighteenth century until 1769, when the first Europeans settled in California.

Historical archaeology is the study of the material remains of past societies that also left behind a written record and oral histories. Therefore, historical archaeology deals with historic-period, or post-prehistoric period, resources. These resources may include sites and deposits, structures, artifacts, roads, and other traces of human behavior. Historical archaeology utilizes archaeological excavation techniques combined with the review of historical records to reconstruct events at sites of this period.

Ethnographic resources represent the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, Latino, or Asian immigrants. They may include traditional resource-collecting areas, ceremonial sites, value-imbued landscapes and related features, cemeteries, shrines, or ethnic neighborhoods and structures. Ethnographic resources are variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users. The decision to call resources "ethnographic" depends on whether associated

[1] Elizabeth A. Bagwell: Prehistoric Archaeology; Glenn J. Farris: Historical Archaeology; Thomas Gates: Ethnography; Amber Grady and Melissa E. Mourkas: Built Environment; Michael D. McGuirt: Geoarchaeology.

peoples perceive them as traditionally meaningful to their identity as a group and the survival of their lifeways.[2]

Historic-period resources, both archaeological and architectural, are associated with Euro-American exploration and settlement of an area and the beginning of a written historical record. They may include archaeological deposits, sites, structures, traveled ways, artifacts, or other evidence of human activity. Groupings of historic-period resources are also recognized as historic districts and as historic vernacular landscapes.

For the Rio Mesa SEGF project, staff provides an overview of the environmental setting and history of the project vicinity from a cultural resources perspective, an inventory of the cultural resources identified in the project vicinity, and an analysis of the project's potential impacts to significant cultural resources, using criteria from the California Environmental Quality Act (CEQA) and Guidelines.

If cultural resources are present, staff identifies which are historically significant (defined as eligible for the CRHR or by other significance criteria) and whether the Rio Mesa SEGF would have a substantial adverse impact on those that are determined to be historically significant. Staff's primary concern is to ensure that all potentially significant cultural resources are identified, all potential project-related impacts to those resources are identified and assessed, and conditions are proposed that ensure that all significant impacts that cannot be avoided are mitigated to a less-than-significant level, or to the extent feasible.

## SUMMARY OF CONCLUSIONS

Energy Commission staff concludes, pending the receipt and consideration of outstanding information and the completion of ongoing analyses, that the proposed Rio Mesa SEGF project would have significant and unavoidable impacts to one combined archaeological district/ethnographic landscape, two archaeological districts, three ethnographic landscapes, and as many as 108 individual archaeological resources. Feasible mitigation is being considered and is reflected in the proposed cultural resources Conditions of Certification **CUL-1** through **CUL-15**. However, no mitigation measures, individually or cumulatively, for the project's impacts to the landscapes and districts would reduce the impacts of the proposed project to a less-than-significant level.

## ARCHAEOLOGICAL RESOURCES

Energy Commission staff has identified 166 archaeological sites, including 36 components of multi-component archaeological sites, that are prehistoric-to-historic-period Native American archaeological resources located within staff's prehistoric archaeological Project Area of Analysis for the proposed Rio Mesa SEGF. Staff has analyzed the currently available data for these resources; however due to the lack of complete information needed to evaluate their CRHR eligibility, staff is unable to finalize

[2] A "lifeway," as used herein, refers to any unique body of behavioral norms, customs, and traditions that structure the way a particular people carry out their daily lives.

conclusions on the project's potential impacts on prehistoric archaeological resources. At this time, staff tentatively recognizes that 41 prehistoric archaeological resources may be contributors to a region-wide cultural landscape/district (the Prehistoric Trails Network Cultural Landscape, or PTNCL) that staff previously identified in the project areas of the Genesis Solar Energy Project (GSEP), the Blythe Solar Power Project (BSPP), and the Palen Solar Power Project (PSPP) during staff's CEQA review of these projects and that staff assumed eligible for the CRHR. Additionally, some prehistoric archaeological resources may be contributors to an archaeological district (the Prehistoric Quarries Archaeological District, or PQAD) that staff previously identified near the BSPP and that staff assumed eligible for the CRHR. Consequently, after staff has analyzed the additional data requested from the applicant, staff may conclude that some prehistoric archaeological resources (but not isolated artifacts) located on and near the Rio Mesa SEGF project site may be contributors to the PTNCL and/or the PQAD and may therefore also be assumed eligible for the CRHR. Staff has also concluded that the Rio Mesa SEGF project's direct and cumulative impacts to PTNCL resources and PQAD resources would be significant. Staff therefore proposes conditions of certification to mitigate these impacts to the extent feasible. Proposed **CUL-1** would have the project owner contribute to an existing fund dedicated to the documentation and nomination of the PTNCL. Proposed **CUL-6**, when staff receives the additional required information from the applicant, would provide for data recovery from prehistoric archaeological resources that staff concludes are eligible for the CRHR. One or more additional conditions of certification may include, but would not be limited to, a condition requiring the collection and analysis of diagnostic artifacts and a condition requiring a GIS map and associated spatial analysis of trails and features commonly associated with them.

Staff has also analyzed currently available data on historical archaeological resources located within staff's historical archaeological Project Area of Analysis for the proposed Rio Mesa SEGF. Resources representing the World War II U.S. Army training exercises known as the Desert Training Center (DTC) predominate, with 32 DTC Maneuver sites, 50 DTC Food-Related sites, and at least 436 recorded isolated artifacts that could be clearly related to the DTC operations in the Project Area of Analysis. Desert Training Center resources were previously also identified in the project areas of the BSPP, the GSEP, the PSPP, and the RSEP, during staff's CEQA review of these projects, with the result that staff identified a region-wide cultural landscape/district, the Desert Training Center Cultural Landscape, that staff assumed to be eligible for the CRHR. Consequently, staff has concluded that the DTC historical archaeological sites (but not the isolated artifacts) located on and near the Rio Mesa SEGF project site are contributors to the Desert Training Center Cultural Landscape and therefore are also assumed to be eligible for the CRHR. Staff has also concluded that the Rio Mesa SEGF project's direct and cumulative impacts to the Desert Training Center Cultural Landscape resources would be significant. Staff proposes conditions of certification to mitigate these impacts to the extent feasible. To mitigate the project's direct impacts, proposed **CUL-8** provides for data recovery at 32 DTC Maneuver sites. To mitigate the project's cumulative impacts to the DTCCL, proposed **CUL-2** would have the project owner contribute to an existing fund dedicated to the scholarly documentation and nomination of the Desert Training Center Cultural Landscape to the National Register of Historic Places. To further mitigate the project's cumulative impacts to the DTCCL, proposed **CUL-9** provides for the preparation of a film documentary focused on the

Infantry, Engineers, and Armor in the DTC to capture this special history in a publically accessible way.

There were 24 other historical archaeological sites, consisting of non-military artifacts that staff deemed ineligible for the CRHR. No mitigation of project impacts to these resources would be needed.

Additionally, staff has proposed Conditions of Certification **CUL-3** through **CUL-5** and **CUL-11** through **CUL-15**, intended to ensure that all significant impacts to archaeological historical resources discovered during Rio Mesa SEGF project construction (including the potential project use of soil borrow and disposal sites) and operation are mitigated below the level of significance.

## ETHNOGRAPHIC RESOURCES

Staff has identified three ethnographic resources in the Rio Mesa SEGF ethnographic Project Area of Analysis: the Salt Song Trail Landscape, the Keruk/Xam Kwatcan Trail/Earth Figures Landscape, and the Palo Verde Mesa Ethnographic Landscape. Staff has concluded that the impacts of the proposed Rio Mesa SEGF project to all three ethnographic landscapes would be significant. Proposed **CUL-1** would have the project owner contribute to an existing fund dedicated to the documentation and nomination of the Prehistoric Trails Network Cultural Landscape. **CUL-7**, when finalized, would monetarily endow several tribal cultural centers or preserves for the purpose of interpreting Chemehuevi and Yuman-affiliated understanding and practice of subsistence patterns that combine agriculture and hunting and gathering activities. But the full implementation of **CUL-1** and **CUL-7** would only mitigate the impacts to the Palo Verde Mesa Ethnographic Landscape to a less-than-significant level. The project would still have significant and unmitigable impacts on the Salt Song Trail and Keruk Trail/Xam Kwatcan/Earth Figures Landscapes and on Native American spiritual practices dependent on these resources.

## HISTORIC-PERIOD BUILT-ENVIRONMENT RESOURCES

Staff identified seven historic-period built-environment resources in the Rio Mesa SEGF built-environment Project Area of Analysis, of which three have been either previously listed or found to be eligible by staff or by previous researchers for the CRHR and/or the National Register of Historic Places: Pilot Knob-to-Blythe 161-kV Transmission Line (RMS-ML-001/P-33-011110), Niland-to-Blythe 161-kV Transmission Line (RMS-ML-002/CA-RIV-7127H/P33-012532), and the Bradshaw Trail (RMS-ML-003/CA-RIV-5191/P-33-5119). Staff has concluded that one additional resource, the Palo Verde Irrigation District, is potentially eligible. Elements of the Palo Verde Irrigation District are in the built-environment Project Area of Analysis, and analysis is ongoing as to eligibility and potential impacts.

Staff has concluded that the impacts to the Pilot Knob-to-Blythe 161-kV Transmission Line and the Niland-to-Blythe 161-kV Transmission Line are less than significant, and no mitigation measures are proposed. The full impacts of the proposed Rio Mesa SEGF project on the Bradshaw Trail and on the PVID are unknown due to an incomplete project description for the Rio Mesa SEGF access road. Staff has submitted to the applicant a set of Data Requests seeking specific information about proposed project access road improvements. When received, this information will assist staff in assessing project impacts on the PVID and the Bradshaw Trail and in recommending mitigation in the FSA.

## SUMMARY OF RIO MESA SEGF IMPACTS AND PROPOSED MITIGATION

See **Cultural Resources Table 1**, below, for a summary of Rio Mesa SEGF impacts to cultural resources that staff identified as historical or potential historical resources for the purposes of CEQA, with staff's proposed mitigation of impacts and outcomes of proposed mitigation.

**Cultural Resources Table 1**
**Summary of Significant Rio Mesa SEGF Impacts to Historical Resources, Including Those Still Under Evaluation, and Proposed Mitigation**

| Resource Type | Resource Identifier | Rio Mesa SEGF Impact | Proposed Mitigation and Impact Reduction |
|---|---|---|---|
| Prehistoric Archaeological Resources | | | |
| | PTNCL/District (PTNCL) | Significant physical cumulative impacts; other impacts to be determined | **CUL-1**; impacts reduced to extent feasible |
| | PQAD (PQAD) | Impacts to be determined | **CUL-6** (under development; expectation for impacts to be reduced to extent feasible) |
| | Up to 108 individual archaeological sites, some of which may be contributors to the PTNCL and/or the PQAD | Impacts to be determined | **CUL-6** (under development) expectation for impacts to be reduced to extent feasible) |
| | Unknown number of buried prehistoric archaeological resources discovered during construction and determined by the Energy Commission to be eligible for the CRHR | Impacts to be determined when discovered | **CUL-3**–**CUL-5**, **CUL-11**–**CUL-15**; impact less than significant with staff's proposed mitigation |
| Historical Archaeological Resources | | | |
| | Desert Training Center Cultural Landscape/District (DTCCL) | Significant physical cumulative impacts | **CUL-2**, **CUL-9**; expectation for impacts to be reduced to extent feasible |

| Resource Type | Resource Identifier | Rio Mesa SEGF Impact | Proposed Mitigation and Impact Reduction |
|---|---|---|---|
| | Up to 32 DTC Maneuver sites, all of which are contributors to the DTCCL | Significant direct physical impacts | **CUL-8**; impacts less than significant with staff's proposed mitigation |
| | More than 50 DTC Food-Related Sites, all of which are contributors to the DTCCL | Significant direct physical impacts | None; extant recordation sufficient mitigation |
| Ethnographic Resources | | | |
| | Salt Song Trail Landscape | Significant direct physical impacts to contributing features; significant direct impacts to associative values; significant indirect impacts to Salt Song participants | Unmitigable |
| | Keruk Trail/Xam Kwatcan/Earth Figures Landscape | Significant direct physical impacts to contributing features; significant direct impacts to associative values; significant indirect impacts to Dream Trail participants | Unmitigable |
| | Palo Verde Mesa Ethnographic Landscape | Significant direct physical impacts to contributing features; significant indirect and disproportionate impact to Mesa Zone | **CUL-1, CUL-7** (under development); impacts less than significant with staff's proposed mitigation |
| Built-Environment Resources | | | |
| | The Bradshaw Trail (RMS-ML-003/CA-RIV-5191/P-33-5119), isted on the CRHR | Impacts to be determined | Mitigation to be determined |
| | Palo Verde Irrigation District (PVID) (possibly eligible for the CRHR) | Impacts to be determined | Mitigation to be determined |
| | Five contributors to the PVID: Hodges Drain, C-03 Canal, Palo Verde Drain, Estes Drain, and Private Drain No. 1 | Impacts to be determined; | Mitigation to be determined |

## LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Projects subject to the Energy Commission's licensing process are reviewed and conditions of certification are imposed, as needed, to ensure compliance with all laws, ordinances, regulations, and standards (LORS); plans; and policies that are applicable to the proposed project and related facilities, or would be applicable but for the Energy Commission's exclusive authority. The Rio Mesa SEGF project involves little federal land, with the majority of the project on leased land; therefore, most of the LORS subject to Energy Commission review are California state laws and local regulations, summarized in **Cultural Resources Table 2**.

**Cultural Resources Table 2**
**Laws, Ordinances, Regulations, Standards, and Executive Orders**

| Applicable LORS | Description |
|---|---|
| **Federal** | |
| Antiquities Act of 1906<br>16 United States Code (USC) 431–433 | Establishes criminal penalties for unauthorized destruction or appropriation of "any historic or prehistoric ruin or monument, or any object of antiquity" on federal land; empowers the President to establish historical monuments and landmarks. |
| Archaeological Resources Protection Act of 1979 (ARPA)<br>16 USC 470aa et seq. | Protects archaeological resources from vandalism and unauthorized collecting on public and Indian lands. |
| Use of Human Subjects<br>45 Code of Federal Regulations (CFR) 101 | Provides for non-disclosure of confidential information that may otherwise lead to harm of the human subject divulging confidential information. |
| Protection of Government Survey Markers<br>18 USC 1858 | Whoever willfully destroys, defaces, changes, or removes to another place any section corner, quarter-section corner, or meander post, on any government line of survey, or willfully cuts down any witness tree or any tree blazed to mark the line of a government survey, or willfully defaces, changes, or removes any monument or bench mark of any government survey, shall be fined under this title or imprisoned not more than six months, or both. |
| U.S. Department of Transportation (DOT) Federal Highway Administration (FHWA)<br>Intermodal Surface Transportation Efficiency Act of 1991<br>162 USC, Title 23 | Established to help recognize, preserve and enhance selected roads throughout the United States. The policy sets forth the procedures for the designation by the U.S. Secretary of Transportation of certain roads as National Scenic Byways or All-American Roads based on their archaeological, cultural, historic, natural, recreational, and scenic qualities. The Bureau of Land Management manages scenic byways as Back Country Byways. |
| **State** | |
| California Public Resources Code (PRC) §§ 5097.98(b) and (e) | Requires a landowner on whose property Native American human remains are found to limit further development activity in the vicinity until he/she confers with the Native American Heritage Commission-identified Most Likely Descendents (MLDs) to consider treatment options. In the absence of MLDs or of a treatment acceptable to all parties, the landowner is required to re-inter the remains elsewhere on the property in a location not subject to further disturbance. |

| Applicable LORS | Description |
|---|---|
| California PRC §§ 5097.99 and 5097.991 | 5097.99 establishes as a felony the acquisition, possession, sale, or dissection with malice or wantonness Native American remains or funerary artifacts.<br><br>5097.991 establishes as state policy the repatriation of Native American remains and funerary artifacts. |
| California Health and Safety Code § 7050.5 | Makes it a misdemeanor to mutilate, disinter, wantonly disturb, or willfully remove human remains found outside a cemetery;<br>Requires a project owner to halt construction if human remains are discovered and to contact the county coroner. |
| California Civil Code § 1798.24 | Provides for non-disclosure of confidential information that may otherwise lead to harm of the human subject divulging confidential information |
| California Public Records Act California Government Code § 6250.10 | Provides for non-disclosure of records that relate to archaeological site information and reports maintained by, or in the possession of, the Department of Parks and Recreation, the State Historical Resources Commission, the State Lands Commission, the Native American Heritage Commission, another state agency, or a local agency, including the records that the agency obtains through a consultation process between a California Native American tribe and a state or local agency. |
| **Local** | |
| Riverside County Planning Department, Cultural Resources Review | All professional-level archaeologists desiring to submit technical reports to the County of Riverside must be certified with the County. The County has published cultural resources (archaeological) investigations standard scopes of work. |
| Riverside County General Plan, Multipurpose Open Space Element (Chapter 5), Open Space Policies OS 19.2–19.4 | OS 19.2 requires the review of all proposed development for archaeological sensitivity;<br><br>OS 19.3 Employs procedures to protect the confidentiality and prevent inappropriate public exposure of sensitive archaeological resources when soliciting the assistance of public and volunteer organizations.<br><br>OS 19.4 Requires a Native American Statement as part of the environmental review process on development projects with identified cultural resources. |
| Riverside County General Plan, Multipurpose Open Space Element (Chapter 5), Open Space Policies OS 19.5–19.7 | OS 19.5 allows the History Division of the Riverside County Regional Park and Open-Space District to evaluate large project proposals for their potential preservation or destruction of historic sites; requires projects to provide feasible mitigation for impacts to historic sites prior to county approval.<br><br>OS 19.6 enforces the California State Historic Building Code so that historic buildings can be preserved and used without posing a hazard to public safety.<br><br>OS 19.7 endorses the allocation of resources and/or tax credits to prioritize retrofit of historic structures. |

| Applicable LORS | Description |
|---|---|
| Riverside County General Plan, Exhibit A, CEQA Findings of Fact and Statement of Overriding Considerations, Mitigation Monitoring Program, Measures 4.7.1A, 4.7.1B, and 4.7.1C | Outlines mitigation measures for cultural resources monitoring programs. |
| Imperial County General Plan,1993, Conservation and Open Space Element, § C: Cultural Resources | Imperial County has identified on a map (Figure 4) areas of high-to-low sensitivity for prehistoric resources. The portion of the County that is nearest to the project location is within one or more of staffs' Project Areas of Analysis is ranked as a high-sensitivity area. |
| Imperial County, Palo Verde Community Area Plan, 1998, IV. Goals and Policies, § G: Conservation, Objective 1.4. | Encourage the acquisition of scientific knowledge by encouraging the preservation of important ecological, archaeological, and other scientific sites. |
| Imperial County, Palo Verde Community Area Plan, 1998, IV. Goals and Policies, § G: Conservation, Objective 5.3. | Ensure the use and protection of the rivers and other waterways in the planning area. |
| Imperial County, Palo Verde Community Area Plan, 1998, V: Implementation Programs and Policies, § B-6, Other Requirements. | In the review of future development, e.g. if archaeological/paleontological resources are discovered or determined to be present, a qualified archaeologist shall be consulted prior to any archaeological material being removed or disturbed, and other conditions and/or limitations may be required as part of a discretionary action by the Planning Director, Planning Commission and/or Board of Supervisors. "Any development of property along Lagoon, Outfall Drain or other PVID [Palo Verde Irrigation District] facility needs to provide adequate access by PVID for maintenance purposes…PVID's canals and drains are not maintained for recreational purposes…" (PVID Chief Engineer). |

## SETTING

Information regarding the setting of the proposed project is used to place the project in its geographical, geological, ecological, and historical contexts. The contexts serve as the basis relative to which the historical significance of any cultural resources identified within staff's Project Areas of Analysis (PAAs) are evaluated.

## REGIONAL SETTING

The Rio Mesa SEGF project is in the southeastern Mojave Desert in the Sonoran section of the Basin and Range geomorphic province (California Geological Survey 2002, Fenneman and Johnson 1946). The region consists of broad, low-elevation, largely internally-draining basins, filled with alluvium, separated by isolated mountain ranges. The local sources of alluvium in these basins are typically the mountain ranges that bound them. The Colorado River slices through these basins in the area where the proposed project would be sited, and introduces characteristic features of riverine landscapes where it meanders among the local mountain ranges. Elevations in the region range from approximately 1,210–6,700 feet above sea level along mountain range ridges, from 610–830 feet above sea level on the bottoms of internally-draining basins, and from 230–540 feet above sea level along the Colorado River floodplain. The largely alluvial parent material of the region's alluvial fans, valley bottoms, and riverine terraces and floodplains, in conjunction with the desert climate of the region generally, support more weakly developed soil orders (Entisols and Aridisols) where a Colorado Desert Creosote Bush Scrub vegetation type often predominates (BS 2011a:5.2-44).

The proposed project site falls in a region where, on the basis of different technical perspectives, it can be said to lie both in the Mojave Desert and the Colorado Desert. From a physiographic or geomorphic perspective, the proposed project site is in the Mojave Desert, a subpart of the Basin and Range geomorphic province, where the desert boundary to the north is the Garlock fault and the boundary to the south is the San Andreas fault (California Geological Survey 2002, Fenneman and Johnson 1946). From a floristic perspective, the proposed project vicinity is in the Sonoran Desert region of the Desert floristic province, also known as the Colorado Desert, where the bases for the region's classification are the distributions of particular vegetation associations (Baldwin et al. 2002). The composition and distribution of Colorado Desert vegetation associations are dynamic and fluctuate through time, in and out of the geomorphic area that has been defined as the Mojave Desert. References, below, to the Mojave Desert, then, largely concern the geology and geomorphology of the region, while references to the Colorado Desert reflect more concern for the present climate and the present distribution of index vegetation associations.

## PROJECT SITE AND VICINITY DESCRIPTIONS

The proposed site for the Rio Mesa SEGF project is partly on a broad landform referred to as Palo Verde Mesa near the southeastern corner of Riverside County, California (see **Cultural Resources Figure 1**). The facility site, approximately 13 miles southwest of the City of Blythe, is primarily on land leased from the Metropolitan Water District of Southern California, but in the near vicinity is public land administered by the Palm Springs-South Coast Field Office of the Bureau of Land Management (BLM). The project, as proposed, includes the facility site, the construction logistics area, the transmission line corridor, two access road corridors, and four drainage crossing updates. Overall, the proposed area of disturbance includes approximately 5,993 acres (URS 2012j:fig. 1).

## ENVIRONMENTAL SETTING

### Climate

The project site is located in the Colorado Desert, a sub-region of the larger Sonoran Desert. The desert climate of southeastern California is marked by intensely hot summers and cold winters. Temperature extremes are the rule, both on an annual and a daily basis. The mostly arid climate is broken by storms that produce large amounts of water at once. The average rainfall is between 2 and 4 inches annually, mostly falling in a few events concentrated in the winter and summer months. The Colorado River is the only permanent surface water source in the valley. It is fed primarily with water from mountains to the north and east. Therefore, local precipitation is not strongly correlated with the amounts of river flow. Some drainages have temporary water after storms, but the majority of the precipitation in the area never reaches the major drainages. Natural springs and large depressions in bedrock that fill with rainwater (tanks or tinajas) provide the only reliable sources of water away from the river (Holmlund 1993:1).

During the time that humans have lived in the region in which the proposed Rio Mesa SEGF project is located, both climate and water availability have undergone several shifts. Periodically, earthquakes changed the course of the Colorado River. During these times water flowed west near Yuma, Arizona, forming a large lake (Ancient Lake Cahuilla) that provided important resources, an attractive place for Native American peoples to live, and an important travel destination. The entire flow of the Colorado River could fill the lake in about 20 years, and it would take about 60 years for the lake to dry. The last filling episode was around 1700 AD (Schaefer and Laylander 2007:250).

Several climatic shifts have also taken place. These shifts have resulted in variable availability of vital resources, and that variability has influenced the scope and scale of human use of the vicinity of the proposed project site. Consequently, it is important to consider the historical character of local climate change, or the paleoclimate, and the effects of the paleoclimate on the physical development of the area and its ecology.

The Pleistocene (1.8 million–10,000 years ago), and the Holocene (10,000 years ago to the present) environmental record from the Mojave Desert provides a model for the Colorado Desert. Summaries of the development and changes in vegetation in the Mojave Desert and surrounding region in these periods are provided by Grayson (1993:119–215), Spaulding (1990), Tausch et al. (2004), Thompson (1990), and Wigand and Rhode (2002: 332–342). All note the vegetation history of this region has been primarily studied by analysis of plant macrofossils contained in prehistoric packrat middens. Pollen studies from this region are largely lacking.

In general, Tausch et al. (2004:fig 2.3; see also Wigand and Rhode 2002:321–332) note the Early Holocene (8,500–5,500 BC) in the Mojave Desert was characterized by a post-glacial warming trend, accompanied by periods characterized by variable moisture. The subsequent Mid-Holocene (5,500–3,000 BC) was the warmest, driest part of the entire Holocene. During the post-Mid-Holocene transition (3,000–1,500 BC), relatively warm, dry conditions prevailed.

In the approximate period from 1,500 to 600 BC, a cool, wet interval has been termed the Neoglacial by climate scientists. It was followed by a much drier, and possibly relatively cooler, period, the Post-Neoglacial Drought (600 BC–400 AD). The next interval, the Medieval Climatic Anomaly (400–1350 AD) was characterized by intensified drought and relatively warm conditions (Meko et al. 2001; Stine 1994, 1996, 1998, 2000). A period called the Little Ice Age followed (1350–1850 AD) that was cold and somewhat dry (Fagan 2000; Grove 1988; Meko et al. 2001; Scuderi 1987a, 1987b, 1990, 1993). Our present climate conditions then commenced.

During the wetter periods (the Late Pleistocene, the Neoglacial, and the Little Ice Age), some of the basins in the Mojave Desert Region (and in the Colorado Desert region, as well) became shallow lakes, with extensive marshy shorelines. Being sources of food and materials, these lakes would have drawn Native Americans to them and perhaps would have encouraged settlement (Gallegos et al. 1980: 93). The elevation of the Palo Verde Mesa prevented a lake from forming where the Rio Mesa SEGF is to be located, but within a few miles to the west, two lakes, Ford Dry Lake and Palen Dry Lake, are known to have formerly existed.

## Geology

The proposed project is on the western flank of the lower Colorado River Valley. The Colorado River Valley is approximately 1,450 miles in length and its basin encompasses parts of Colorado, Wyoming, Utah, New Mexico, Arizona, Nevada, and California, and Baja California and Sinaloa in Mexico. The river slices its way from its headwaters on the western flank of the Rocky Mountains in Colorado, through the Colorado Plateau and different sections of the Basin and Range geomorphic province on its way through its delta into the Gulf of California. In the vicinity of the proposed project, the Colorado River has cut through a number of the internally-draining basins that typify the Sonoran section of the Basin and Range geomorphic province, and meandered about the isolated mountain ranges that bound those basins. Where the river has cut into the basins, the internal drainage pattern of some have been preserved, while other basins now drain out into the river and contribute to its watershed. The lower Colorado River Valley has, through time, carved out and built a typical suite of river valley landforms, such as alluvial terraces and a broad floodplain, in the midst of the broader basin and range landscape of the Mojave Desert. The origin of the stone and the sediments that make up the landforms along the river varies from place to place in the valley. Toward the margin of the watershed, landforms are derived from local materials, while landforms directly related to riverine deposition contain heavily weathered, exotic stone and sediment from distant regions.

The proposed Rio Mesa SEGF project site is on Palo Verde Mesa, a relatively large Colorado River riverine landform, to the east, and, to the west, a complex of coalescing alluvial fans that sweep down to the east from the Mule Mountains. The facility site is bounded to the south and west by the Mule Mountains, a faulted group of Triassic and Jurassic (251.0–199.6 and 199.6–145.5 mya,[3] respectively) igneous rocks (Stone 2006), and that range's associated fan complex; to the north by an extension of Chuckwalla Valley, a basin that trends roughly east to west and appears to have once drained into the Colorado River; and to the east by the broad floodplain of the Colorado River itself. Intermittent streams, large and small, that typically slope from west to east, variously dissect the facility site across the Mule Mountain fans and Palo Verde Mesa, primarily toward the northern and southern ends of the site.

## Geomorphology

The discussion of the geomorphology of the proposed project vicinity considers how and when the mosaic of landforms there may have developed, and helps provide the physical contexts to assess whether physical remains from the past human use of former landform surfaces may be present as surficial or buried archaeological deposits.

[3] "mya" = million years ago

### Processual Geomorphology

The proposed project vicinity for the Rio Mesa SEGF would traverse two principal groups of landforms. The western side of the proposed facility site would be on multiple aspects of the complicated system of coalescing alluvial fans that emanate from the Mule Mountains immediately to the west of the Rio Mesa SEGF project site. The more northerly reaches of the proposed route for the transmission line from the facility site to the future Colorado River Substation would cross this fan system as well. The eastern side of the proposed facility site, western elements of access road improvements, and western elements of proposed electric service lines would be on a major alluvial terrace of the Colorado River, Palo Verde Mesa, and on relatively recent alluvial fans along the base of Palo Verde Mesa that are the result of the ongoing erosion and dissection of both the terrace and the alluvial fan system above and to the west of that terrace. The more southerly reaches of the proposed transmission line route and the temporary construction logistics area for the facility would be other components of the proposed project that traverse or are on Palo Verde Mesa.

The construction of the proposed project would also traverse two other landforms. The eastern elements of the access road improvements and of the proposed electric service lines would cross the presently active floodplain of the Colorado River, which rests approximately 80 feet lower than the surface of Palo Verde Mesa. The most northerly reach of the proposed transmission line route would perhaps cross or come in close proximity to the suite of lake-derived, or lacustrine, sedimentary deposits associated with Ford Dry Lake, the local low spot in Chuckwalla Valley.

The system of coalescing alluvial fans that flanks the Mule Mountains is the oldest set of landforms in the proposed project vicinity. The different cycles of the range's erosion, to which the fans bear witness, date intermittently from the Pliocene through the Holocene epochs (*circa* 5.3 mya to the present). The proposed facility site is on the middle to lower reaches of this fan system, which are younger than the higher reaches closer to the mountains. This portion of the facility site drops in elevation approximately 160 feet, over a lateral distance of approximately 2 miles, toward the east, onto the surface of Palo Verde Mesa. Gravity and water have through time and continue to variously transport and deposit the weathered bedrock sediments from the Mule Mountains that make up the distinct lobes of the fan system on the facility site. Fan sediments are typically larger and more poorly sorted upslope toward the mountains and grade to finer, better sorted particles downslope where the fan deposits ultimately interfinger with the alluvial sediments that make up the river terrace that is Palo Verde Mesa. Over time, the shape of the individual lobes of this portion of the fan system appears to change in a relatively predictable manner. The lobes become progressively more dissected, remnant fan surfaces develop desert pavements[4] that exhibit increasingly darker rock varnish with age, and the original surface topography of the lobes, typified by intermittent stream channels, and lateral and mid-channel sediment bars, smoothes and becomes progressively less discernible (Stone 2006). This morphological progression is consistent both with observations of alluvial fans noted throughout the region (Peterson

[4] Desert pavements are single layers of clasts (rocks) borne upward over time by the slow, continual accretion of wind-borne silt. They progressively become more level and darker in contrast, and the surface clasts in the pavements become more tightly interlocked with age.

1981:16–18) and with the applicant's onsite reconnaissance of this particular fan system. The multiple present surfaces of the fan system lobes in the proposed project vicinity are typically mosaics of interconnected or anastomosing, intermittent stream channels of mostly coarse to very coarse sands, overflow and sheetwash deposits, and incipient desert pavements of variably very angular to well-rounded gravels.

The Mule Mountain alluvial fan system is a dynamic landform the development of which has undoubtedly been subject to alternating cycles of deposition and erosion that occur in response to regional fluctuations in climate. The presence on the surface of the proposed project vicinity, in overflow and sheetwash deposits and in incipient desert pavements, of mixtures of very angular gravels with relatively fresh faces or new cleavage planes and rounded, sand-blasted gravels with well-developed rock varnish indicate a relatively mobile bajada (fan) surface in the recent past where former desert pavements are being eroded as new ones are being formed. A firm understanding of whether the local net result of the dynamic processes at work on the surface of the system is or has been the thickening of fan deposits, or the erosion of them, is important to the interpretation of the history of the fan system's development, its potential as a resource base for human use, and its potential to preserve archaeological deposits related to any such use.

Palo Verde Mesa and the alluvial fans along the base of Palo Verde Mesa are the result, respectively, of the late Pleistocene (*circa* 1.8 million to 11,700 years ago) deposition of Colorado River alluvium, and the Holocene (*circa* 11,700 years ago to the present) erosion and redeposition of that alluvium and sediments from the alluvial fans to the west down on the active floodplain of the river (Stone 2006). Palo Verde Mesa is a relatively large, flat terrace that is the result of past sedimentary deposition from the Colorado River. The meandering incision of the Colorado River subsequent to the deposition of Palo Verde Mesa sediments created the alluvial terrace and others historically related to it up and down the river. The terrace appears to be made up of two primary sedimentary units. The light reddish brown lower unit is composed of alternating beds of fine-grained sand, silt, and clay, while the tan-to-light-gray upper unit, the unit that supports the present surface of the terrace, is made up of loose sand and loose pebbly sand. The relatively level to slightly sloped surface of the terrace sweeps up gently westward toward a slight break in the local slope that appears to mark the easternmost extent of the Mule Mountain alluvial fan system. Sedimentary deposits from some of the more recent lobes of that system appear to interfinger with the sedimentary deposits of the alluvial terrace. The western limit of surficial terrace deposits is presently understood to coincide with the western extent of the terrace's surficial exposure of pebbles.

### Historical Geomorphology

The historical geomorphology of the proposed project vicinity relates the order and the timing of landform development in that area. While it is necessary to understand the physical processes that create and alter landforms through time in order to assess whether a particular landform may harbor intact, buried archaeological deposits, it is also critical to understand landform age to discern whether a particular landform may be too old (>16,000 years ago) and predates the reasonably demonstrable presence of humans in the Western hemisphere. For the proposed Rio Mesa SEGF project vicinity, the chronological resolution presently available to date the local landforms and discern with reasonable precision the order of their creation is limited to a basic geologic time scale. The most present ascriptions of landform age come from a number of sources (Bull 1991; Malmon et al. 2011; Metzger et al. 1973; Stone 2006), none of which has yet been subject to hard verification in the proposed project vicinity. The acquisition of the primary data necessary to derive the reconstruction of the historical geomorphology of the proposed project vicinity relative to a time scale that is useful to the reconstruction of the local archaeological record, a time scale with increments of centuries rather than millennia, is one critical goal of the second phase of geoarchaeological research, the research design for which the applicant and staff are in the process of negotiating. The results of the second phase of research will be incorporated into this subsection in the FSA. The results will also shape the character of the final inventory of the archaeological deposits in the prehistoric archaeological PAA that qualify as historical resources, and shape the extent and the character of the proposed construction monitoring program and other proposed mitigation measures for the project.

### Ecology

On the project site and in the vicinity, three broad categories of Colorado Desert vegetation are present. On the river terraces vegetation is very meager and is characterized by creosote bush and white bursage. In and along the drainages palo verde, ironwood, and ocotillo can be found. In floodplain areas that are not under cultivation honey mesquite, screw bean mesquite, desert willow, smoke tree, cottonwood, bulrush, and cattail have also been noted. The density and types of animals found in and around the project vicinity have changed as a result of modern agricultural practices, damming of the river, over-hunting during the late nineteenth and early twentieth centuries, and the invasion of foreign plant species, particularly tamarisk. However, typical modern Sonoran Desert faunal types are present including mule deer, coyote, bobcat, badger, skunk, vulture, several raptors, small mammals, ducks, geese, quail, and fish (Nixon et al. 2011:2-1–2-2) (see **Biological Resources** section).

## IDENTIFYING SIGNIFICANT CULTURAL RESOURCES AND ASSESSING PROJECT IMPACTS ON THEM

Below staff first explains its data-gathering and analytic processes. Staff then compiles and presents the Rio Mesa SEGF cultural resources inventory by resource type, with the types addressed in the following order:

- Geoarchaeology
- Prehistoric Archaeological Resources
- Historical Archaeological Resources
- Ethnographic Resources
- Historic-Period Built-Environment Resources

Finally, staff presents its evaluation of the resources and its analysis of project impacts on them, by resource type, and proposes conditions of certifications to mitigate significant impacts.

## COMPILING THE CULTURAL RESOURCES INVENTORY

A project-specific cultural resources inventory is a necessary step in staff's effort to determine whether the proposed project may cause significant impacts to historically significant cultural resources (i.e., historical resources) and would therefore, under the CEQA, have a significant adverse effect on the environment.

The development of a cultural resources inventory entails working through a sequence of investigatory phases. Generally, the research process proceeds from the known to the unknown. These phases typically involve doing background research to identify known cultural resources, conducting fieldwork to collect requisite primary data on not-yet-identified cultural resources in the vicinity of the proposed project, assessing the results of any geotechnical studies or environmental assessments completed for the proposed project site, and compiling recommendations or determinations of historical significance for any cultural resources that are identified (see "Determining the Historical Significance of Cultural Resources," below).

## STAFF'S DEFINITIONS OF PROJECT AREAS OF ANALYSIS

The Project Area of Analysis (PAA) is a concept that staff uses to bound the geographic area in which the proposed project has the potential to affect cultural resources. The impacts that a project may have on cultural resources may be immediate (direct), further removed in time and agency (indirect), or cumulative. They may be physical, visual, auditory, or olfactory in character. The geographic area that would encompass consideration of all such impacts may or may not be one uninterrupted expanse, and it may differ by cultural resource type. It may include the project site, which would be the site of the proposed plant, the routes of requisite transmission lines and water and natural gas pipelines, other offsite ancillary facilities, and, in addition, one or several discontiguous areas where the project could be argued to potentially affect cultural resources.

When considering the historical road known as the Bradshaw Trail or the immense entity of the Desert Training Center Cultural Landscape (District), the relationship of the archaeological features and finds associated with these entities naturally extend beyond the formal boundaries of the Rio Mesa SEGF. The boundaries of the PAAs go well beyond the project site boundaries in order to sufficiently evaluate potential impacts. Each of the four subdisciplines of Cultural Resources has defined a PAA based on their resources and potential impacts.

### Prehistoric Archaeological Project Area of Analysis

For prehistoric archaeological resources, the PAA is defined as:

- The proposed project site footprint, as defined in the applicant's Environmental Enhancement Proposal (BS 2012v), plus a buffer of 200 feet;
- The transmission line corridor with a 50-foot buffer on either side of the center line;
- The access roads with a buffer of 50 feet to either side of the construction Right of Way (ROW);
- The four drainage crossing updates with a 500-foot radius from the center point; and

- The maximum depth that would be reached by all foundation excavations and by all pipeline installation trenches.

This definition serves to address both direct and indirect impacts on resources whose dimensions may well extend below the surface and beyond the project site (see **Cultural Resources Figure 2**).

## Historical Archaeological Project Area of Analysis

For historical archaeological resources, the PAA is defined as:

- The proposed project site footprint, as defined in the applicant's Environmental Enhancement Proposal (BS 2012v), plus a buffer of 200 feet;
- The transmission line corridor with a 50-foot buffer on either side of the center line;
- The access roads with a buffer of 50 feet to either side of the construction Right of Way (ROW);
- The four drainage crossing updates with a 500-foot radius from the center point; and
- The maximum depth that would be reached by all foundation excavations and by all pipeline installation trenches.

This definition serves to address both direct and indirect impacts on resources whose dimensions may well extend below the surface and beyond the project site (see **Cultural Resources Figure 2**).

## Ethnographic Project Area of Analysis

For ethnographic resources, the PAA is defined as two linear trail corridors that cover both sides of the river from generally Yuma to Laughlin and one large circle that generally encircles a length of the Colorado River, the Palo Verde Mountains, the Mule Mountains, and the southern portions of the Palo Verde Valley and Mesa (see **Cultural Resources Figure 3**).

## Historic-Period Built-Environment Project Area of Analysis

For historic-period built-environment resources, the PAA is defined as the project site with a 0.5-mile buffer, as well as the entire Bradshaw Trail, access roads to the project, and the Palo Verde Irrigation District resources (see **Cultural Resources Figure 4**).

# RECORDS AND ARCHIVAL SEARCH

Ethnographic and historical research, relies in part, upon source materials collected and stored in various libraries, archives and other repositories that function to preserve the social and cultural annals of California. Identification of cultural resources in the various PAAs and analysis of the significance of those resources and potential project-related impacts requires resource information specific to the project vicinity.

Various repositories in California hold compilations of information on the locations and descriptions of cultural resources older than 45 years that have been identified and recorded in past cultural resources surveys. Energy Commission regulations require an applicant to provide with their application the results of a cultural resources records search at several repositories. Project-specific results are provided below.

## FIELD INVESTIGATIONS

Energy Commission regulations require an applicant to provide the results of an archaeological pedestrian surface survey and a built-environment windshield survey, both of a specified extent. Additionally, in response to staff Data Requests, an applicant may undertake more intensive investigations, such as a geoarchaeological investigation and/or archaeological excavations at selected sites; Staff also undertakes Native American consultation and ethnographic field research and may undertake archaeological and historic-period built-environment field work, if needed, to facilitate staff's independent analysis. Project-specific results are provided below.

## DETERMINING THE HISTORICAL SIGNIFICANCE OF CULTURAL RESOURCES

### Evaluation Relative to California Register of Historical Resources Criteria

To comply with CEQA, the Energy Commission, as a lead agency, must evaluate the historical significance of cultural resources by determining whether they meet several sets of specified criteria. Under CEQA, the definition of a historically significant cultural resource is that it is a "resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources", or "a resource listed in a local register of historical resources or identified as significant in a historical resource survey meeting the requirements of section 5024.1 (g) of the Public Resources Code," or "any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the agency's determination is supported by substantial evidence in light of the whole record" (Cal. Code Regs., tit. 14, § 15064.5(a)).

In general, to be considered historically significant under the CEQA Guidelines, a cultural resource must meet the criteria for listing in the CRHR. These criteria are essentially the same as the eligibility criteria for the National Register of Historic Places (NRHP). In addition to being at least 50 years old,[5] a resource must meet at least one (and may meet more than one) of the following four criteria (Pub. Resources Code, § 5024.1):

- Criterion 1, resource is associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion 2, resource is associated with the lives of persons significant in our past;

5 The Office of Historic Preservation's Instructions for Recording Historical Resources (1995) endorses recording and evaluating resources over 45 years of age to accommodate a potential five-year lag in the planning process.

- Criterion 3, resource embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values; or
- Criterion 4, resource has yielded, or may be likely to yield, information important to history or prehistory.

Historical resources must also possess sufficient integrity of location, design, setting, materials, workmanship, feeling, and association to convey their historical significance (Cal. Code Regs., tit. 14, § 4852(c)).

Additionally, cultural resources listed in or formally determined eligible for the NRHP and California Registered Historical Landmarks numbered 770 and up are automatically listed in the CRHR and are therefore also historical resources (Pub. Resources Code, § 5024.1(d)). However, even if a cultural resource is not listed or determined to be eligible for listing in the CRHR, CEQA allows a lead agency to make a determination as to whether it is a historical resource and, therefore, historically significant (Pub. Resources Code, § 21084.1).

The assessment of potentially significant adverse impacts to historical resources and the mitigation that may be required of a proposed project to reduce any such impacts depend on CRHR-eligibility evaluations.

## EVALUATION RELATIVE TO HISTORIC CONTEXT

As is evident from the four CRHR eligibility criteria listed above, determining the eligibility of a cultural resource requires specific information about the resource and a historic context, or background, against which to assess the resource's significance. A historic context is different for each kind of cultural resource, although the contexts for several kinds of cultural resources can overlap greatly. Staff compiles the historic contexts needed for their analyses that include the resource-specific data to allow staff to decide if their inventory resources are sufficiently distinguished, relative to similar resources from the same context, to meet one or more of the four CRHR eligibility criteria.

## CALIFORNIA REGISTER OF HISTORICAL RESOURCES EVALUATIONS

Under CEQA, mitigation need only be developed for substantial project-related adverse impacts to historically significant cultural resources (referred to as "historical resources"). Consequently, staff seeks CRHR eligibility recommendations for those cultural resources subject to possible project impacts. The existing documentation for previously known cultural resources may include CRHR eligibility recommendations, and the applicant often makes CRHR eligibility recommendations for newly identified cultural resources they discover and record in their project-related surveys. Staff considers these prior CRHR eligibility evaluations and may accept them or conclude that additional information is needed before making its own recommendations.

When the available information on known or newly identified resources that could be impacted by the proposed project is not sufficient for staff to make a recommendation on CRHR eligibility, staff may ask an applicant to conduct additional research to gather the information needed to make such a recommendation, or staff may gather the additional information. For an archaeological resource, the additional research usually entails some degree of field excavation, called a “Phase II” investigation. For an ethnographic resource, the additional research may be an ethnographic study. For built-environment resources, the additional research would probably be archival. The object of this additional research is to obtain sufficient information to enable staff to validate or make a recommendation of CRHR eligibility for each cultural resource that the proposed project could impact.

## IDENTIFYING AND ASSESSING IMPACTS

To identify construction-related impacts to cultural resources that would need to be mitigated, staff first identifies all historical resources and evaluates the potential project impacts to them to determine if these impacts are substantial and adverse (see “Determining the Significance of Project Impacts on Historical Resources,” below). Staff must then recommend avoidance or mitigation for substantial and adverse impacts to these historical resources. Staff also must assess whether the proposed project has the potential to impact as-yet-unknown buried archaeological resources and recommend mitigation for impacts to previously unknown but historically significant resources discovered during construction, if impacts to such resources cannot be avoided.

CEQA advises a lead agency to make provisions for archaeological resources unexpectedly encountered during construction, and a project owner may be required to train workers to recognize cultural resources, fund mitigation, and delay construction in the area of the find (Pub. Resources Code, § 21083.2; Cal. Code Regs, tit. 14, §§ 15064.5(f) and 15126.4(b)). Consequently, staff recommends that procedures for identifying, evaluating, and possibly mitigating impacts to archaeological resources discovered during construction be put in place through conditions of certification to reduce those impacts to a less-than-significant level, or to the extent feasible.

## DIRECT AND INDIRECT IMPACTS

In the abstract, direct impacts to cultural resources are those associated with project development, construction, and operation (co-existence). Construction usually entails surface and subsurface disturbance of the ground, and direct impacts to archaeological resources may result from the immediate disturbance of the deposits, whether from vegetation removal, vehicle travel over the surface, earth-moving activities, excavation, or demolition of overlying structures. Construction can have direct impacts on historic built-environment resources when, for example, those structures must be removed to make way for new structures or when the vibrations of construction impair the stability of historic structures nearby. New structures can have direct impacts on historic structures when the new structures are stylistically incompatible with their neighbors and the setting, and when the new structures produce something harmful to the materials or structural integrity of the historic structures, such as emissions or vibrations.

Generally speaking, indirect impacts to archaeological resources are those that may result from increased erosion due to site clearance and preparation, or from inadvertent damage or outright vandalism to exposed resource components due to improved accessibility. Similarly, historic structures can suffer indirect impacts when project construction causes obsolescence and demolition or creates improved accessibility, making vandalism or greater weather exposure possible.

Ground disturbance accompanying construction at a proposed plant site, along proposed linear facilities, and at a proposed laydown area has the potential to directly impact unknown archaeological resources. The potential direct, physical impacts of the proposed construction on unknown archaeological resources are commensurate with the extent of ground disturbance entailed in the particular mode of construction. This varies with each component of the proposed project. Placing the proposed plant into this particular setting could have a direct impact on the integrity of association, setting, and feeling of nearby standing historic structures.

### CUMULATIVE IMPACTS

Individually minor but collectively significant actions (usually in the form of ground disturbance) may have a cumulatively considerable impact on cultural resources. A cumulative impact refers to a proposed project's incremental impacts considered over time and together with those of other, nearby, past, present, and reasonably foreseeable future projects whose impacts may compound or increase the incremental impact of the proposed project (Pub. Resources Code sec. 21083; Cal. Code Regs., tit. 14, secs. 15064(h), 15065(a)(3), 15130, and 15355). Cumulative impacts to cultural resources in the Rio Mesa SEGF project vicinity could occur if any other existing or proposed projects, in conjunction with the proposed Rio Mesa SEGF, had or would have impacts that, considered together, would be significant on cultural resources. The previous ground disturbance from prior projects and the ground disturbance related to the future construction of the Rio Mesa SEGF project and other proposed projects in the vicinity could have a cumulatively significant impact on subsurface archaeological deposits, both prehistoric and historic-period. The alteration of the ethnographic setting that could be caused by the construction and operation of the proposed Rio Mesa SEGF and other proposed projects in the vicinity could be cumulatively significant.

## DETERMINING THE SIGNIFICANCE OF PROJECT IMPACTS ON HISTORICAL RESOURCES

Under CEQA, “a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment” (Pub. Res. Code, § 21084.1). Staff analyzes whether a proposed project would cause a substantial adverse change in the significance of any historical resources identified in the Cultural Resources Inventory as CRHR- eligible, or as otherwise significant (Cal. Code Regs., tit. 14 § 15064.5(a)). The regulatory threshold for whether a proposed project would have a significant effect with respect to cultural resources is a finding that the project would materially impair the significance of one or more historical resources (Cal. Code Regs., tit. 14 § 15064.5(b)(1)). The CEQA Guidelines define material impairment, in part, as any project action that “demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA” (Cal. Code Regs., tit. 14 § 15064.5(b)(2)(C)). In order to assess whether a proposed project would materially impair the significance of a historical resource, one would therefore need to know and understand why that resource was eligible for inclusion in the CRHR. A resource's CRHR eligibility status has two parts, a value for which the resource is significant and integrity sufficient to convey that significant value (Cal. Code Regs., tit. 14 § 4852(c)). (Note that "significance" as used in relation to the determination of a resource's CRHR eligibility status is a much more narrowly focused technical use of the term than the broader sense of its use at, among other places, § 21084.1 of the Public Resources Code or § 15064.5(a) of the California Code of Regulations.) The significance component of a resource's eligibility status is determined, as noted in the "Determining the Historical Significance of Cultural Resources" subsection, above, with reference to its potential associative, design or construction, or information values as set out in the CRHR's four significance criteria (Cal. Code Regs., tit. 14 § 4852(b)(1–4). A resource may be eligible under one or more of these values. The integrity component of a resource's eligibility status is determined with reference to "location, design, setting, materials, workmanship, feeling, and association" (Cal. Code Regs., tit. 14 § 4852(c). Which of these aspects of integrity are relevant in a determination of a resource's CRHR eligibility is dependent on the particular values for which that resource has been determined to be significant. The analysis of whether any of the potential impacts of a proposed project cross the threshold of a significant effect under CEQA, therefore, requires the consideration, primarily, of that project's impacts on each applicable aspect of integrity for each historical resource subject to any such impacts. Dependent upon the particular values for which a resource has been determined to be significant, the aspects of integrity under consideration may be mostly related to the characteristics of the resource itself, or they may also be related to the characteristics of the physical and visual contexts that envelope the resource and whether those contexts would retain the ability to convey the values for which the resource has been found to be significant.

The general procedure of staff's determination of the significance of project impacts to cultural resources, then, is to:

- Establish the inventory of historical resources, a subset of the Cultural Resources Inventory;

- Identify and consider the nature of each resource's significance relative to the CRHR's criteria;

- Consider how subject resources' historical significance are manifested physically and perceptually, and assess the baseline integrity of those characteristics and contexts;

- Assess, more specifically, those aspects of each resource's integrity that are critical to that resource's ability to convey its historical significance; and

- Analyze whether potential project impacts would alter any historical resources to the extent that any such resource would no longer be able to convey its historical significance.

## COMPILATION OF EXTANT DATA: RECORD, FILE, AND DATABASE SEARCHES

### CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

The California Historical Resources Information System, or CHRIS, is a federation of 11 independent cultural resources data repositories overseen by the California State Office of Historic Preservation. These centers are located around the state, and each holds information about the cultural resources of several surrounding counties. Qualified cultural resources specialists obtain data on known resources from these centers and in turn submit new data from their ongoing research to the centers. The CHRIS center that holds information pertinent to the Rio Mesa SEGF is the Eastern Information Center (EIC) located at the University of California, Riverside, Department of Anthropology.

### ARCHIVAL AND LIBRARY RESEARCH

Ethnographic and historical research, relies in part, upon source materials collected and stored in various libraries, archives and other repositories that function to preserve the social and cultural annals of California. Archival research, generally supporting staff's independent analysis and, specifically, ethnographic investigations, have been or are being conducted at the following archives:

- California Energy Commission Library;
- California State Library;
- California State Archives;
- Sacramento State University Library;
- University of California, Davis, Peter J. Shields Library;
- University of California, Berkeley, Anthropology Library;
- University of California, Berkeley, Bancroft Library
- Quechan Tribal documents used in preparing cultural resources information for the BLM's California Desert Conservation Area (CDCA); and
- Internet searches.

### LOCAL AGENCY AND ORGANIZATION CONSULTATION

California counties and cities may recognize particular cultural resources as locally historically important by ordinance, in general plans, or by maintaining specific lists. Consistent with the Energy Commission's Data Regulations, the applicant contacted local planning agencies and historical and archaeological societies to acquire information on locally recognized cultural resources specific to the vicinity of the project. Staff will go the CHRIS Eastern Information Center located in Riverside, California, and the Bureau of Land Management State Office, in Sacramento, California, to check historic maps for trail research to be included in the FSA.

## LOCAL HISTORICAL SOCIETIES

Staff made several visits to the Palo Verde Historical Museum and Society for background research, but did not identify any additional cultural resources in the several PAAs.

## NATIVE AMERICAN HERITAGE COMMISSION

The Governor's Executive Order B-10-11, executed on September 19, 2011, directs state agencies to engage in meaningful consultation with California Indian Tribes on matters that may affect Tribal communities. The Energy Commission Siting Regulations require applicants to contact the Native American Heritage Commission (NAHC) for information on Native American sacred sites and a list of Native Americans interested in the project vicinity. The applicant is then required to notify the Native Americans on the NAHC list about the project. The applicant must also provide to the Energy Commission in the AFC a copy of all correspondence with the NAHC and Native Americans and any written responses received, as well as a written summary of any oral responses(CEC Regs 2007, app. B(g)(2)(D):87).

The NAHC is the primary California government agency responsible for identifying and cataloging Native American cultural resources, providing protection to Native American human burials and skeletal remains from vandalism and inadvertent destruction, and preventing irreparable damage to designated sacred sites and interference with the expression of Native American religion in California. It also provides a legal means by which Native American descendents can make known their concerns regarding the need for sensitive treatment and disposition of Native American burials, skeletal remains, and items associated with Native American burials.

The NAHC maintains two databases to assist cultural resources specialists in identifying cultural resources of concern to California Native Americans, referred to by staff as Native American ethnographic resources. The NAHC's Contacts database has the names and contact information for individuals, representing a group or themselves, who have expressed an interest in being contacted about development projects in specified areas. The NAHC's Sacred Lands database has records for places and objects that Native Americans consider sacred or otherwise important, such as cemeteries and gathering places for traditional foods and materials. However, the Sacred Lands file only contains those resources that Tribes are willing to disclose to the NAHC and cannot be considered a comprehensive list of areas, places, objects, or sites that Native Americans consider sacred or otherwise important.

Staff requested that the NAHC perform a Sacred Lands file check. On January 25, 2012, the NAHC responded that the Sacred Lands File did not contain any information that pertained to the area. A list of Tribal contacts was also provided. The NAHC response to the Energy Commission request was similar to two NAHC responses to the applicant's Sacred Lands file search requests. NAHC responses were provided to the applicant on March 4, 2011, and May 18, 2011.

## ENERGY COMMISSION NATIVE AMERICAN CONSULTATION

On February 22, 2012, the Energy Commission sent letters to all NAHC-listed Tribal governments (10), Tribal organizations (1) and individuals (1). On February 28, staff attempted to make verbal contact with all listed Tribes; two Tribes and one individual responded. The Native American individual intended to discuss the issues further with one of the Tribes and with a geoglyph[6] preservation non-profit organization. Of the two Tribes that responded, one requested a meeting to learn more about the project, and the other Tribe said they might request further information later in the process. A second round of phone calls was made on April 24, 2012. As a result, two Tribes verbally responded by requesting meetings.

On March 8, 2012, staff met with La Cuna de Atzlan, a non-profit organization that advocates for the preservation of earth figures in the area. Various earth figures and related trails in the project vicinity were visited and the cultural functions of the earth figures were discussed in relation to the landscape where the proposed project would be constructed.

On March 9, 2012, a staff presentation was made to the Quechan Tribal Historic Preservation Officer (THPO) and Preservation Culture Committee. The THPO expressed interest in working on an ethnographic study and stated that dream trails are in the project vicinity and would likely be impacted by the project.

On May 7, 2012, the Agua Caliente Band of Cahuilla Indians responded by submitting a letter that requested that a 100 percent cultural resources inventory be conducted, that confidential cultural resources survey reports be forwarded to the THPO, that Native American cultural resources monitors be present during all project-related ground disturbing activities, and that if human remains are discovered, then a process detailed in California Health and Safety Code 7050.5 should be followed.

On May 10, 2012, staff met with the Quechan THPO, a Quechan Tribal elder, the Director of the Aha MaKav Cultural Society of the Fort Mojave Indian Tribe, and representatives from the Colorado River Indian Tribes, near the project site. The meeting was informational. Meeting participants discussed the Energy Commission energy facility siting process, the role of ethnography in elucidating Tribal ethnographic resources, and the specific parameters and features of the proposed project. The Tribes provided some information concerning the role and function of traditional dreaming, trails, and landscapes. As a result of that meeting, staff undertook to draft an ethnographic report and provide it to the participating Tribes for review and comment. Based upon review, Tribes might recommend that additional oral history interview data be collected and agreed to facilitate those additional interviews.

An August 23, 2012, meeting was held at the Aha Macav Cultural Resources office on the Fort Mojave Reservation in Needles, California, and attended by the Energy Commission ethnographer and ethnographic assistant; staff from the Fort Mojave Tribe, the Colorado River Indian Tribes, and the Quechan Tribe; and the Tribal Chairman and counsel from the Chemehuevi Tribe. The Energy Commission process was generally discussed, and the Rio Mesa SEGF project schedule in relation to the ethnographic

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[6] During the meeting with staff and Tribes on August 23, 2012, the Tribal cultural resource representative of the Fort Mojave tribe explained that the preferred Native American term for geoglyphs or intaglios is “earth figures,” and consequently this document will use the “earth figure” term.

study and staff's Preliminary Staff Assessment (PSA) was reviewed. The draft ethnographic study was reviewed, and Tribes provided limited comments; however, Tribes noted that they intended to provide additional comments prior to the publication of the PSA. Additional discussions centered on the potential for Tribal oral history interviews to be conducted in the time between the publication of the PSA and the FSA, Tribal input to potential landscape boundary clarification, and the archaeological testing plan for the Rio Mesa SEGF. The Tribes present were adamantly opposed to subsurface testing, collection, and laboratory testing, but acknowledged that mapping and photographic documentation was acceptable. The participating Tribes have broad concerns for other testing plan elements and requested face-to-face consultations with the Energy Commission concerning the testing plan. Additional areas of concern were related to impacts to the Colorado River and water usage by the applicant. During this meeting, Tribes expressed concerns about the ability of new forms of language (i.e., English and science) to express the Tribes' deep understanding of their place in a riverine environment.

## RESULTS OF COMPILATION OF EXTANT DATA

## CHRIS DATA

A total of four CHRIS searches for the Rio Mesa SEGF were performed on behalf of the applicant in preparation of the AFC. Overall, the search area included the area within the project site boundaries, as defined in the original AFC (7,529 acres), a 1.0-mile buffer around the project site, and a 0.25-mile buffer on either side of the centerline of the proposed transmission line (Nixon et al. 2011:2-50–2-56). On December 22, 2010, prior to initiation of the field investigations, URS requested that the staff of the CHRIS EIC conduct a records search within Riverside County for the project site boundaries, a 1.0-mile buffer around the project site, and a 0.25-mile buffer on either side of the centerline of the proposed transmission line. Locations for the proposed Southern California Edison (SCE) Colorado River Substation expansion area and the alternative substation location had not yet been defined at the time of this initial record search, but on February 22, 2011, URS submitted a supplemental record search request to the EIC for additional acreage to cover these. Also in February, URS submitted a separate record search request to the South Coastal Information Center (SCIC), located at San Diego State University, including portions of the record search radius that are within Imperial County. In April, 2011, a third supplemental record search request for the proposed access routes was submitted to the EIC. It is unclear what additional area this third search covered.

In addition, three investigations conducted by Applied Earthworks, AECOM, and ASM Affiliates, Inc., respectively, were not yet available at the Information Centers. The applicant collected the reports for these three investigations independently.

In addition, the CHRIS staff searched the following sources:

- National Register of Historic Places;
- California Register of Historical Resources;
- California State Historical Landmarks;
- California Points of Historical Interest; and

- California Inventory of Historic Resources.

## Reports of Previous Investigations

The CHRIS records searches identified 46 previous cultural resources investigations within the search area (see Appendix A, **Cultural Resources Table A-1**, for a list), 43 of them relevant to the Rio Mesa SEGF project. The areas surveyed for two of the reports (RI-06999 and RI-07349) were significantly outside the project site and therefore have been excluded from this discussion. An additional report (RI-07348) was found to have been a duplicate of record RI-07204. Thus, the actual investigations relevant to the project vicinity total 43 (Nixon et al. 2011:table 2.8-1). Some reports documented more than one kind of effort. Overall, aspects of the following types of investigations were included:

30 intensive pedestrian surveys

7 literature reviews

6 sample surveys

4 resource evaluations

3 environmental documents

3 regional overviews

2 windshield surveys

2 construction monitoring

1 data recovery

1 test excavation

Of the 43 investigations, 35 were located in Riverside County and eight were located in Imperial County reflecting the fact that the 1.0 mile buffer along the southern boundary of the project site extends into Imperial County. Staff found that 17 of the investigations included areas within the boundaries of the solar facility site and 12 within the boundaries of project linear alignments.

Previous investigations on the solar facility site include four intensive pedestrian surveys related to the proposed Sundesert Nuclear Power Plant (San Diego Gas and Electric), conducted in the 1970s. In addition, one investigation related to the North Baja Pipeline (North Baja Pipeline LLC, Sempra Energy International and Proxima Gas, S.A. de C.V. of Mexico) was conducted in 2000. This intensive linear pedestrian survey and related environmental documents covered a narrow area along the eastern boundary of the proposed project site.

Parts of 12 investigations took place within the proposed Rio Mesa SEGF transmission line corridor. Most of these were related to energy and transmission projects, including three major transmission lines that overlap with the proposed Rio Mesa SEGF corridor: the existing SCE Devers-Palo Verde 1 500-kV line, which was surveyed in the late 1970s and early 1980s; the recently completed 230-kV Blythe Transmission Line, which was surveyed in 2009; and the currently under construction Devers-Palo Verde 2 500-kV line, which was surveyed between 2004 and 2009. Additional investigations are associated with the Blythe Solar Power Project interconnection at the SCE Colorado River Substation, the Sundesert project, the North Baja Pipeline, BLM land exchanges, geophysical testing, and a water pipeline.

Previous investigations that partially covered the two proposed access road corridors (134 acres) and the four proposed drainage crossing updates (71 acres) include the Sundesert Nuclear Power Plant project and the North Baja Pipeline (Nixon et al. 2011:2-50–2-56).

## Previously Identified Resources

The CHRIS records search produced a total of184 previously identified cultural resources (**Cultural Resources Table 3**). Of this 86 are prehistoric archaeological resources, 50 are historic-period archaeological resources and 5 are built-environment resources. Both prehistoric and historic-period components are present in 40 archaeological resources. The time period of one archaeological resource was undetermined. As is common practice in cultural resources management, staff has eliminated the isolated finds from its analysis. The above figures include the results of the applicant's Class III pedestrian survey of those portions of the proposed Rio Mesa SEGF project site that have since been excluded from consideration. In **Cultural Resources Table 3** they are labeled as "Excluded from PAAs," indicating that these resources are now outside of staff's prehistoric archaeological, historical archaeological, and built-environment PAAs.

Additional important resources in the region were identified during the review of previous research, including:

- Mule Mountains, BLM cultural Area of Critical Environmental Concern (ACEC) (adjacent);
- Blythe Intaglios (California Historical Landmark #101);
- Ripley Geoglyph Complex (AZ R:10:1);
- 1877 Thomas Blythe Canal Intake, (California Historical Landmark #948) (marker in Blythe).

None of the above is within the Rio Mesa SEGF prehistoric archaeological, historical archaeological, or built-environment PAAs. However, all are within the ethnographic PAA.

**Cultural Resources Table 3**
**Summary of Cultural Resources Identified in Previous Investigations in the Rio Mesa SEGF Vicinity**

| | In Record Search Area | Excluded from PAAs | In PAAs | Total |
|---|---|---|---|---|
| Prehistoric | 49 | 22 | 15 | 86 |
| Historic | 40 | 11 | 1 | 50 |
| Multi-Component | 22 | 3 | 15 | 40 |
| Built-Environment | 0 | 2 | 3 | 5 |
| Undetermined | 0 | 1 | 0 | 1 |
| Total | 111 | 39 | 34 | 184 |

### Solar Power Plant Owner-Sponsored Landscape Studies

In addition to the cultural resources on record at the CHRIS and other repositories, Energy Commission staff identified two cultural landscapes/districts and an archaeological district in the Rio Mesa SEGF region, as a result of the Energy Commission's CEQA review of four large solar energy projects in that region in 2010–11: the GSEP, the BSPP, the PSPP, and the RSEP. The two region-wide cultural landscapes/districts are the Prehistoric Trails Network Cultural Landscape/District (PTNCL) and the Desert Training Center Cultural Landscape/District (DTCCL). The PTNCL consists of archaeological resources (trails and the resources they connect) that additionally have ethnographic value to Native Americans. The DTCCL consists of the archaeological remains of the U.S. Army's World War II training exercises in the Colorado and Mojave Deserts. The archaeological district is the Prehistoric Quarries Archaeological District (PQAD), located along the western margins of the Palo Verde Mesa, that consists of discontinuous deposits of Pleistocene Colorado River gravels visited and used by Native Americans over thousands of years to collect toolstone materials.

The Energy Commission, BLM, and the County of Riverside have adopted a shared cumulative impact mitigation strategy for the two cultural landscape/districts. This approach is designed to increase the quality of the information gathered by focusing on a regional as opposed to a project-by-project perspective and centralizing multiple mitigation efforts through the Energy Commission's compliance function. The approach is also intended to foster collaboration among federal, state, and county staff, and project cultural resources personnel. These cumulative impact mitigation efforts are essentially inter-related, multi-year cultural resources research projects that are region-wide in scope (See "Mitigation for Rio Mesa SEGF Cumulative Impacts to Archaeological Resources," below, for a full description).

So far, the implementation of this approach has involved the creation of overarching mitigation measures for multiple solar thermal projects in the same vicinity. These mitigation measures are designed to be adaptable to later projects in the same region. The intent of this approach is to standardize terminologies, increase statistical sample sizes, and generate shared research questions rather than hiring multiple companies to produce reports in isolation from each other. Coordination among projects has been facilitated by hiring shared specialists to direct the research being conducted by all involved project owners, including the GSEP, the BSPP, the PSPP, and the RSEP. Compensation for these specialists and the costs for their expenses and deliverables have been divided among the project owners in direct proportion to the number of acres each project encloses or otherwise disturbs.

Two conditions of certification that are shared by all four projects generate the funding that sponsors the hiring of three teams of specialists. The historic-period (DTCCL) team includes historians and historical archaeologists. The prehistoric team (PTNCL) includes prehistoric archaeologists, a geoarchaeologist, and ethnographers. Finally, the Global Information System (GIS) team includes both GIS and Information Technology specialists. The historic-period and prehistoric research teams were each tasked with writing regional contexts and field manuals to help guide subsequent cultural resources field work and inform documents produced for other large renewable projects in eastern Riverside County, whether under Energy Commission jurisdiction or not. Next, each team will nominate their respective districts, if justified, to the NRHP using the Multiple Property format. Finally, they will synthesize the results of all of their cultural resources research, and that conducted by the cultural resources consultants of the contributing project owners, into a final report. Since standardizing and sharing information is a key part of this project, GIS plays an important role. The GIS team is tasked with generating a detailed database of all resources associated with the participating projects. Since cultural resources types are not currently categorized using standard terminology, the GIS team created standardized types using the guidance provided by the DTCCL and PTNCL regional contexts. Ultimately the database will be used to conduct comparative cultural resources spatial analyses as NEPA and CEQA cumulative analyses and to predict high density resource locations to assist in the siting of future projects. The following key documents, generated as part of the above research efforts, have guided the cultural resources research and fieldwork, particularly those for archaeological resources, performed by the applicant, as well as the independent analysis completed by staff:

- Chuckwalla Valley Prehistoric Trails Network Cultural Landscape: Historic Context, Research Questions, and Resource Evaluation Criteria (Laylander and Schaefer 2011a);
- Chuckwalla Valley Prehistoric Trails Network Cultural Landscape: FIELD & LAB MANUAL (Laylander and Schaefer 2011b);
- Documenting the Desert Training Center and California-Arizona Maneuver Area Cultural Landscape (Bischoff et al. 2010);
- Desert Training Center and California-Arizona Maneuver Area Cultural Landscape: Field Manual (Allen et al. 2011).

### Previously Known Archaeological Resources in the Archaeological PAAs

#### *Prehistoric Resources*

Previous research in the project vicinity suggests the presence of the Colorado River made the area an attractive location for many different activities for Native Americans prior to Euro-American settlement. The terraces above the floodplain were consistently used for winter habitation during seasonal river flooding, quarrying for both lithic and ground stone tools, processing resources using hearths, travel along trails, and ceremonial activities (Castetter and Bell 1951; Apple 2005). Evidence of prehistoric quarrying, particularly for materials for ground stone tools, is commonly reported along the Colorado River (Ezzo and Altschul 1993; Mitchell 1989; Laylander and Schaefer 2007; Singer 1984; Schneider 1993a, 1993b). Prehistoric trail segments are also common in the proposed Rio Mesa SEGF project vicinity. Some important nearby destinations likely included: the Blythe Intaglios to the north; the Ripley Geoglyph complex to the southeast; springs, tanks, and rock art sites in the Mule Mountains to the west; the spring and rock art at McCoy Spring to the northwest; and permanent villages in the floodplain near modern day Blythe to the east. Intensive research on trails in the region is on-going, and results will be incorporated into the FSA. A detailed discussion of the regional culture history is presented in the “Context for Prehistoric Archaeology” subsection, below.

Prehistoric site and feature types in the region are irregularly defined. Using inconsistent types assigned by multiple archaeologists runs the risk of obscuring important prehistoric patterns. In their cultural resources technical report, the applicant defined feature types based on the guidance supplied by Laylander and Schaefer (2011a; 2011b) and identified the presence of these feature types in particular sites. However, they did not provide clear criteria for their categories, leaving staff uncertain as to why certain features were placed in particular categories (Nixon et al 2011:4-5–4-7). In addition, arguments justifying the classification of individual features were not provided in the site descriptions. Finally, the detailed descriptions of features were obscured in the Department of Parks and Recreation (DPR) 523 site recordation forms provided, making it impossible for staff to classify many of the features using description alone (Nixon et al 2011:app. G). For those descriptions that were readable, staff disagreed with some of the classifications. For example, the applicant determined that all of the cleared circles (defined below) were natural rather than cultural features. Staff concluded that the information provided was not sufficient to make this determination and requested additional information (CEC 2012ap:#173). While the information that was received from the applicant included more detail (URS 2012j:#173), the type of information provided was still insufficient for staff to determine if the cleared circles are cultural or natural. Consequently, staff requests that the applicant conduct a supplemental field visit to collect the needed information.

In staff’s review of the reports and records written by previous researchers in the region, certain kinds of prehistoric features were found repeatedly. These features were: lithic reduction features, thermal features, pot drop, trail segments, cleared circles, rock rings, cairns, and artifact scatters. These terms were developed by specialists in the prehistory of the southern California desert (Ezzo and Altschul 1993; Laylander and Schaefer 2011a, 2011b), and specialists in the study of prehistoric quarries (Giambastiani 2009). As discussed above, generally speaking these feature types were used both by the applicant and staff. However, the definitions below are those generated and used by staff:

*Lithic reduction features*—Discrete concentrations of debris associated with the production of flaked stone tools or ground stone tools. These features are thought to be evidence of a single tool-making event, particularly if only one type of raw material was used. Concentrations with only one type of raw material are called segregated reduction features or chipping stations. Concentrations with more than one type of material are called lithic scatter features. Other researchers have referred to these features as “flaking stations” (Ezzo and Altchul 1993:29; Giambastiani 2009:70).

*Thermal feature*—Concentrations of stones that are reddened or broken by fire. These features were likely used as hearths. Those found near sources of lithic raw material may have been used to heat treat chert, which makes the material easier to flake. Those found near important plant resources, such as mesquite, may have been used to cook seeds or other plants. Other researchers have referred to these features as “hearths.”

*Pot drop*—Concentrations of broken pieces of pottery (ceramic sherds). Some appear to be portions of a single vessel, while others appear to represent multiple vessels. Some researchers refer to these concentrations as “ceramic scatters.” They are often found in association with trails, where they may serve as a shrine (McCarthy 1993).

*Trail segment*—Long, narrow depressions or pathways in desert pavement where most of the pavement surface has been removed either deliberately or inadvertently giving them a light color. Pot drops, cleared circles, and cairns are often found along trails. Water sources, temporary camps, ceremonial locations, and important resources such as tool stone quarries are often the destination of trails. Numerous trail systems are present in the region. Trails may have been used for ceremonial pilgrimages, trade, warfare, or visiting other communities. (See “Ceremonies and Sacred Trails,” below.)

*Cleared circle*—Cleared areas in desert pavement, often associated with trails and often found in clusters. Larger circles have been called “sleeping circles” and are thought to be short-term camping areas. They range in diameter from 2–9 m, possibly reflecting the size of the group using the space. Smaller circles are called “vision circles” and have a diameter ≤1.0 m. These circles may have been places where individuals meditated or dreamed (Ezzo and Altchul 1993). Dreaming and vision seeking is an integral part of the ceremonial systems of the Yuman-speaking peoples along the lower Colorado River (Kroeber 1925). (See “Ceremonies and Sacred Trails,” below.)

*Rock ring*—A single course of stones forming a circular shape. The interior of the ring may contain intact desert pavement or it may be scraped clear. They are similar in size to cleared circles and may have had similar functions. However some scholars have noted that, unlike cleared circles, rock rings are found singly, away from ceremonial activities and are not associated with trails (Ezzo and Altschul 1993).

*Cairns*—Stacks of rock deliberately piled up on each other, usually two to three courses high. They are often found near trails, washes, or passes through hills and may have been used as directional or territorial markers. Like pot drops they may also have served as shrines (McCarthy 1993).

*Artifact scatters*—Low-density scatters of artifacts in contrast to the concentrations that characterize lithic reduction features and pot drops. Short-term use is likely.

Previous investigations in the project vicinity, including the applicant's pedestrian surveys of areas that have since been excluded from the prehistoric archaeological PAA, have provided a detailed picture of the prehistoric archaeological feature types present. In **Cultural Resources Table 4**, staff re-classified all of the features reviewed into the feature types identified above. Of all features identified by staff, 85 percent (n=1,083) are lithic reduction features clearly suggesting that the primary activity in the area was stone tool material quarrying. Hearths are 4 percent (n=55) of the features, demonstrating that resource extraction and processing was also an important activity in the project vicinity. The size and shape of the hearths suggests that something small was baked. Unfortunately it is not clear what sort of resource was being processed. Some likely possibilities are plant materials such as seeds, or lithic materials such as chert. Features associated with ceremonial activities (pot drops, trails, cleared circles, rock rings, cairns) are also common, being 11 percent (n=136) of all identified features.

**Cultural Resources Table 4**
**Summary of Prehistoric Archaeological Loci and Features Identified in Previous Investigations in the Rio Mesa SEGF Vicinity**

| Prehistoric Loci and Features | In Record Search Area | Excluded from PAA* | In PAA | Total |
|---|---|---|---|---|
| Lithic reduction features | 20 | 38 | 1,025 | 1,083 |
| Thermal feature | 10 | 1 | 44 | 55 |
| Ceramic concentration/Pot drop | 24 | 7 | 41 | 72 |
| Trail segment | 5 | 3 | 16 | 24 |
| Cleared circle | 2 | 3 | 26 | 31 |
| Rock ring | - | 3 | - | 3 |
| Rock cairn/Cluster | 1 | - | 5 | 6 |
| Total | 62 | 55 | 1,157 | 1,274 |

*Includes the results of the applicant's pedestrian surveys of areas that have since been excluded from the Rio Mesa SEGF project boundaries.

In contrast with standard professional practice, the applicant did not place each site into a site-type category in their cultural resources technical report (Nixon et al 2011:3-2–3-3), despite using categories identified by staff as appropriate (Laylander and Schaefer 2011a; 2011b). As demonstrated in the discussion above, regional trends can be usefully delineated by analyzing spatial patterning of features. However, the unit of analysis for a cultural resources technical report is the site. Sites, not features, must be evaluated for their eligibility for listing on the CRHR. Staff completed the required analysis for the PSA, classifying all of the previously known archaeological resources into the site types developed by Laylander and Schaefer (2011a; 2011b). The six site types that are relevant to the Rio Mesa SEGF project vicinity are defined below:

*Extractive camps*—Locations where small groups of people camped for short periods of time while collecting nearby resources such as quarrying stone or gathering seeds. Some places would have been reused annually. Features and artifacts associated with camping and processing resources are expected, such as cleared circles, rock rings, thermal features, finished lithic tools, ground stone, and ceramics. Sites should be located near important resources such as quarries.

*Travel camps*—Locations where small groups of people camped for short periods while traveling. Features and artifacts associated with camping are expected, such as cleared circles and thermal features. Tools showing evidence of manufacture, repair, and use may be present, including projectile points, ground stone. and ceramics. Sites tend to be located near trails and water sources.

*Lithic quarries/Workshops* —Locations where stone suitable for making lithic or ground stone tools is collected, tested, and turned into a tool "blank." Lithic reduction features, lithic scatters, and possibly thermal features for heat-treating chert are some of the features expected. Finished tools are not expected. These sites may be located near permanent villages or extractive camps.

*Resource extraction/Processing sites*—Locations where groups of people collected and processed animals and plants. Features such as thermal features are expected. Other features not present in the project vicinity include hunting blinds, drive fences, observation points, and milling stations. Tools showing evidence of manufacture, repair, and use may be present, including projectile points, ground stone and ceramics.

*Religious/Ceremonial locations*—Locations where ceremonies take place, or features that are of religious importance. Such sites may include rock art, earth figures, cairns, rock clusters, trail shrines, cremations, rock rings, cleared circles, and/or trail-side pot drops.

*Incidental artifact scatters*—Locations where a small number of artifacts were used, lost, or thrown away. Some of the expected artifacts include isolated projectile points and lithic flakes or "debitage." Features are not expected.

Overall, 126 individual prehistoric archaeological sites were identified in previous investigations in the Rio Mesa SEGF vicinity. Of these, 4 are possible extractive camps, 48 are quarry/workshops, 5 are resource extraction/processing sites, 33 are religious/ceremonial locations, 28 are artifact scatters, and 7 are isolated prehistoric artifacts within multi-component sites (see **Cultural Resources Table 5**). The latter, since they are isolates, are not considered further here. The classification of individual sites was made difficult by the presence of combinations of features that were not predicted by Laylander and Schaefer (2011a, 2011b). Contrary to expectations, both extractive camps and artifact scatters were predominantly associated with quarrying activities. In addition, features associated with religious/ceremonial activities were present at camps, quarry/workshops, and artifact scatters, blurring the boundaries among these categories. A factor contributing to the blurring of these boundaries is the regional difficulty in controlling chronology—a lithic reduction features, trail, cairn, cleared circle, or rock ring made 5,000 years ago cannot be distinguished from one made 500 years ago. Currently no reliable scientific techniques exist that might resolve the situation. Without a clear understanding of the temporal relationship between/among features, it is difficult to argue that any of the features located within the boundaries of the same site actually reflect the behavior of the same people at the same time. Because of this concern, in **Cultural Resources Table 5**, staff analyzed the previously known resources both by site type (underlined) and by feature type (italics).

**Cultural Resources Table 5**
**Summary of Prehistoric Archaeological Sites and Associated Features Identified in Previous Investigations in the Rio Mesa SEGF Vicinity**

| | In Record Search Area | Excluded from PAA* | In PAA | Total |
|---|---|---|---|---|
| Extractive Camp | 0 | 1 | 3 | 4 |
| Quarry/Workshop | | | | |
| *Only lithic reduction features* | 18 | 13 | 5 | 36 |
| *With thermal feature* | 2 | 1 | 2 | 5 |
| *With pot drop* | 1 | 1 | 3 | 5 |
| *With both thermal features and pot drop* | 0 | 0 | 2 | 2 |
| Resource Extraction/Processing | | | | |
| *Only thermal feature* | 1 | 0 | 3 | 4 |
| *With trail* | 0 | 0 | 1 | 1 |
| Religious/Ceremonial Location | | | | |
| *Only trail* | 4 | 1 | 5 | 10 |
| *Trail with cleared circle* | 1 | 0 | 1 | 2 |
| *Only rock ring* | 0 | 1 | 0 | 1 |
| *Only pot drop* | 14 | 5 | 1 | 20 |
| Artifact Scatters | | | | |
| *Only scatter* | 17 | 2 | 3 | 22 |
| *With thermal feature* | 3 | 0 | 0 | 3 |
| *With pot drop* | 2 | 0 | 0 | 2 |
| *With pot drop and cairn* | 1 | 0 | 0 | 1 |
| Isolated prehistoric artifacts within multi-component sites | 7 | 0 | 0 | 7 |
| Total | 71 | 25 | 30 | 126 |

*Includes the results of the applicant's pedestrian surveys of areas that have since been excluded from the Rio Mesa SEGF project boundaries.

Previous projects in the Rio Mesa SEGF project vicinity have identified two archaeological districts. An archaeological district is a group of historically related archaeological resources that is considered significant under CEQA. Resources within a district can be physically adjacent to each other (contiguous) or physically separated (discontiguous). A district can reflect one main activity or several related activities. For archaeological districts, resources are usually related by cultural affiliation, period of use, or site type. Examples of archaeological districts include transportation systems and industrial complexes (NPS 1997:5–6).

In analyses of the Genesis Solar Energy Project (Bagwell and Bastian 2010:C.3-126–C.3-129), the Blythe Solar Power Project (BSPP) (Bastian 2010:C.3-44–C.3-45), and the Palen Solar Power Project (Tremaine and Bastian 2010:C.3-79–C.3-81), Energy Commission staff identified a discontiguous archaeological and ethnographic district that incorporates prehistoric archaeological sites associated with the Halchidhoma Trail (CA-Riv-0053T), referred to here as the Prehistoric Trails Network Cultural Landscape/District (PTNCL). This district consists of important destinations in the Colorado Desert near Blythe, California, the network of trails that ties them together, and the features and sites associated with the trails. The boundaries of the district extend along the length of the historically known route of the Halchidhoma Trail, from where it begins near Blythe at the Colorado River, continuing to the west through the Chuckwalla Valley towards modern San Bernardino. Some of the prehistoric archaeological resources in the Rio Mesa SEGF prehistoric archaeological PAA may be contributors to this district. A more detailed discussion of this district is provided in the "Multi-Site Prehistoric Archaeological Resources" discussion, below.

During staff's analysis of the BSPP, a second discontiguous archaeological district was identified (Bastian 2010:C.3-43–C.3-44). The Prehistoric Quarries Archaeological District (PQAD) represents one principal activity, prehistoric quarrying of raw materials for stone tool production along the west side of the Colorado River in the vicinity of Blythe, California. Key features include lithic reduction features and hearths thought to be for heat treating chert (thermal features). Many of the sites in the Rio Mesa SEGF prehistoric archaeological PAA (**Cultural Resources Table 5)** may be contributors to this district. A more detailed discussion of this district is provided in the "Multi-Site Prehistoric Archaeological Resources" subsection, below.

### *Historical Archaeological Resources*

In general the previous research in the project vicinity suggests that historical archaeological sites are typically located along historic trails. However, due to the maneuverability of off-highway travelers and particularly the military forces that trained in the project vicinity (in World War II (WWII) DTC and 1964 Desert Strike), historical archaeological sites are found throughout the landscape.

As identified from previous investigations, resource types in the project site footprint and vicinity include military ration cans and bottles, evidence of military maneuvers, mixes of military and non-military artifacts in multi-use sites, artifacts dating to the pre- and post-WWII periods, government survey markers related to the General Land Office and the U.S. Geological Survey, mining claim markers, and trash dumps from nearby communities.

The applicant defined two broad categories of previously known historical archaeological sites, WWII-era DTC sites[7] and Other Historic-Period sites (Nixon et al. 2011:4-7, 4-8), under which were seven site types, consisting of:

**Bivouac Sites**: These property types may contain both archaeological and architectural elements, such as rock-lined walkways, vehicle parking areas, tent sites, unit symbols, latrines, a mess facility, and associated pit trenches, foxholes, camouflage fortifications, and refuse scatters and dumps. Bivouac site types represent locations where military personnel or units would temporarily camp, or bed in for various amounts of time, and are believed to be commonly related to military training areas.

**Campsites**: Property types that contain both archaeological and architectural elements, such as cleared areas, tent pads (some with plasterboard floors), tent stakes, refuse scatters or dumps, concrete pads or foundations, food storage facilities, and rock insignias, are referred to as campsites.

**Maneuver Features/Areas**: These property types may contain both archaeological and architectural elements, such as tank tracks, obstructions (mine fields, concertina wire, tank traps, road blocks), built fortifications (foxholes, slit trenches, bunkers), telephone lines, and refuse scatters (typically c-ration cans and motor oil cans).

**Small Unit Training Areas**: Small Unit Training Areas are property types that may contain both archaeological and architectural elements, such as foxholes, rock defensive walls or positions, bunkers (earthen or concrete), berms, trenches, craters, tank and vehicle tracks, shrapnel, mortar and grenade fragments, shell casings, ration cans, and other small refuse scatters.

**Rock Cluster Features or Cairns**: Historic-period, non-military, rock cluster features, or cairns, are property types that may occur as isolated finds or can be associated with historical archaeological sites. These features are constructed rock concentrations (not defined in the DTC types above) that stand out from the surrounding ground surface. Such features can consist of a single course of rocks, or rocks stacked higher than one course. These features may represent historic-period land survey activities, mining claims and homesteading land claims. Similar modern rock clusters are also commonly placed by off-highway-vehicle (OHV) users to demarcate OHV tracks, trails, and racecourses. This modern use of such features makes identification of these types of features more challenging.

**Historical Refuse**: This historic-period, non-military, archaeological property type consists of a deposit or sparse distribution of domestic commercial, construction, or industrial debris (e.g., cans, bottles, ceramic tableware, milled lumber, machinery, and appliances) that pre-dates 1966. Refuse deposits or scatters can be found in isolation, as a by-product of historic-period architecture or occupation, or a result of historic-period dumping activity.

**Historical Survey/Mapping Features**: These architectural, non-military property types are constructed features erected prior to 1966 (not including rock cluster features) that

[7] DTC/C-AMA was the army's official acronym for this unit, but for brevity's sake, here staff uses DTC.

may be isolated or associated with other site types listed. These types are technically classifiable as historic-period structures; however, as a result of their common occurrence and unique attributes, they have been classified into a separate site type. Examples of such features include GLO benchmarks, aerial photograph markers, and concrete foundations."

In general, the previous research in the project vicinity suggests that historical archaeological sites are typically located along historic-period trails. However, due to the maneuverability of off-highway travelers and particularly the military forces that trained in the project vicinity, historical archaeological sites are found throughout the landscape.

Historic-period archaeological materials in the project site footprint and vicinity include military ration cans and bottles, evidence of military maneuvers, mixes of military and non-military artifacts in multi-use sites, artifacts dating to the pre- and post-WWII periods, government survey markers related to the General Land Office and the U.S. Geological Survey, mining claim markers, and trash dumps from nearby communities. **Cultural Resources Table 6** provides the numbers of historical archaeological resources previously identified in the project vicinity.

**Cultural Resources Table 6**
**Summary of Historical Archaeological Loci and Features Identified in Previous Investigations in the Rio Mesa SEGF Vicinity**

| | In Record Search Area | Excluded from PAA | In PAA | Total |
|---|---|---|---|---|
| DTC food-related refuse | 28 | 7 | 6 | 40 |
| DTC maneuvers | 10 | 2 | 5 | 17 |
| Early 20th-century refuse | 5 | 2 | 1 | 7 |
| Mid-20th-century refuse | 0 | 0 | 3 | 1 |
| Historic-period refuse (non-military) | 7 | 3 | 1 | 13 |
| Government survey marker | 5 | 0 | 0 | 6 |
| Isolated historic-period artifacts | 7 | 0 | 0 | 7 |
| Total | 62 | 14 | 16 | 92 |

## Previously Known Ethnographic Resources Identified in the Ethnographic PAA

Applicant and Energy Commission staff inquiries to the NAHC resulted in no identifications of previously known ethnographic resources.

Due to extensive research conducted by staff on the Hidden Hills Solar Energy Generating System (HHSEGS) project, located approximately 225 miles to the north of the Rio Mesa SEGF project, staff was aware that the Salt Song Trail corridor, running through the HHSEGS project vicinity, also runs along the Colorado River and adjacent to the Rio Mesa SEGF project vicinity (see **Cultural Resources Figure 5**).

Prior to Rio Mesa SEGF project review, staff was aware that a Quechan dream trail also passes through the project vicinity. A portion of a dream trail was the center of a controversy (*circa* 2000) that pitted the Quechan Tribe against the BLM when that agency was considering a mining permit, that, had it been issued, would have removed large portions of Glamis Mountain, known to contain gold. The proposed Glamis Mine project location is approximately 25 miles south of the proposed Rio Mesa SEGF project.

Prior to conducting original research for Rio Mesa SEGF project review, staff was also aware that the Lower Colorado River corridor, and specifically the Blythe area, contained world-renowned earth figures. The Blythe Intaglios (earth figures) are well known, listed on the State Historical Landmarks inventory and are contributing elements to one of the ethnographic landscapes described later in this PSA.

### Previously Known Built-Environment Resources in Built-Environment PAA

Record searches revealed few built-environment resources in the PAA and even fewer on the project site. The types of resources that are present are associated with electricity generation (e.g., transmission lines), agriculture and water diversion (e.g., elements of the irrigation district), and transportation (e.g., historic-period trails).

## ACQUISITION OF NEW PROJECT-SPECIFIC DATA: FIELD INVESTIGATIONS

### Archaeological Field Investigations

#### Geoarchaeological Field Investigation

Phase I Geoarchaeological Research (Geoarchaeological Background Research and Field Reconnaissance)

The primary purpose of studying the geoarchaeology of a proposed project vicinity is to understand the group of landforms that are the physical contexts for the cultural resources there. A geoarchaeology study seeks first to identify and delimit individual landforms. The study then gathers evidence to elucidate the different natural forces that acted to create each landform, when in time those forces acted, and how subsequent physical forces may continue to shape the evolving character of each landform.

Knowledge of the development and the history of local landforms is critical to the understanding of the potential character, and of the lateral and vertical distribution of archaeological deposits in a proposed project vicinity. The knowledge enables one to interpret whether the structure of archaeological deposits exposed on the surface of the ground is the result of past human behavior or of natural forces. The knowledge also provides a factual basis to argue whether a particular archaeological deposit may be strictly a surface phenomenon or may include buried components. Knowledge of the geoarchaeology of a proposed project's vicinity provides the further benefit of helping to discern which landforms may contain buried archaeological deposits that are not presently evident on the surface and how old such buried deposits may be. A reasonably thorough understanding of the geoarchaeology of an area leads to a better informed analysis of the potential impacts that a proposed project may have on cultural resources.

The applicant initiated geoarchaeological research in the prehistoric archaeological PAA in conjunction with the preparation of the cultural resources technical report (Nixon et al. 2011), part of the technical documentation that supports the Cultural Resources section of the AFC (BS 2011a:sec. 5.3). The *Geoarchaeological Assessment* (Assessment) subsection of the technical report, text derived from the confidential May, 2011 *Geoarchaeological Sensitivity Analysis: Rio Mesa Solar Generating Electric Facility Project*, provides useful preliminary research into the physical contexts that support and encase the archaeological deposits in the proposed project vicinity.

#### ***Methods***

The purpose of the methodology for the assessment was to facilitate the construction of a relatively coarse, preliminary perspective on the character and the age of project vicinity landforms to help assess whether further research was warranted and to serve as a foundation for that research, if it were found to be warranted. The methodology for the Assessment sought to achieve this goal through both archival research on the extant regional literature in disciplines such as geology, geomorphology, and hydrology, and through the execution of field research. The Assessment largely uses three sources to construct the basic geologic and geomorphic frameworks for the proposed project vicinity (Bull 1991, Metzger et al. 1973, and Stone 2006). The primary source that the applicant uses to inform the development of a landform map for the area is a relatively recent geologic study of the northern portion of it (Stone 2006). The applicant extrapolates this information to the south across the proposed project vicinity and supports the extrapolation with what appears to have been a field reconnaissance. The field reconnaissance portion of the Phase I geoarchaeological research had multiple purposes. It sought to:

- Verify and refine the basic geologic units mapped by Stone, and the applicant’s own extrapolation of those units to the south;
- Refine the approximate ages of the landforms that had been correlated in the Assessment with landforms that other researchers had observed in the region (Bull 1991and Metzger et al. 1973);
- Establish a framework of relative ages among the landforms in the proposed project vicinity; and
- Assess the relative sensitivity of the different geologic units for buried archaeological deposits on the basis of soil profiles and other physical indicators of landform age and processual development.

The resultant Assessment reflects this field effort and serves as a useful initial sketch of the geoarchaeology of the proposed project vicinity.

#### ***Results***

The results of this preliminary phase of geoarchaeological research form the basis for the “Geomorphology” subsection, above. The background research, field observations, and resultant preliminary conclusions inform the research design that was the focus of staff Data Request #96 (CEC 2012v) for the subsurface investigation of the landforms in the prehistoric archaeological PAA, which may date from the Terminal Pleistocene through the Holocene epochs (*circa* 16,000 years ago to the present).

### Phase II Geoarchaeological Research (Subsurface Geoarchaeological Field Investigation)

Among the multiple purposes of the second phase of geoarchaeological research are the refinement of the geographic definitions of the landforms that compose the proposed project vicinity, and the more accurate reconstruction of the processual and historical geomorphology of each constituent landform. The reconstructions would facilitate both the definition of the lateral variation in the depositional energy responsible for the development of each pertinent landform, and determinations of lateral and vertical variations in the age of the stratigraphic units that compose each landform. The new investigation will broaden the scope of inquiry beyond the heavy emphasis in the Assessment on the search for paleosols. Paleosols are convenient stratigraphic markers of past land surfaces, but the quality of archaeological preservation is higher in relatively low energy depositional environments that have high depositional rates, such as mid-to-distal fan reaches, than it is at or near the surface of paleosols where archaeological deposits are intrinsically subject to hundreds or thousands of years of mechanical weathering and biological disturbance. This information will enable staff to address these landforms in a meaningful and substantive manner.

The ultimate research design, which is presently the subject of ongoing consultation among staff, the applicant, Native American communities, and the public at large, will include, among other elements, detailed descriptions for the landforms and geologic units that the Assessment cites as correlates of the landforms and geologic units in the proposed project vicinity, and detailed descriptions of the latter landforms and geologic units that also did not appear in the Assessment. This information will assist staff in assessing the veracity of these tentative correlations and the ascriptions of equivalent age between the correlated landforms and units. The research design will also include explicit discussions of the choices of field methodology and the suite of techniques that the applicant would intend to use in the service of any particular methodology, the size and structure of the subsurface sample that the investigation would employ, and the proposed suite of attributes for each stratigraphic unit that would be observed and documented. Staff continues to emphasize that the scope of the sample should be limited to those areas where the construction and operation of the proposed project would entail the disturbance of natural ground deeper than 1m below the present surface.

### Status of the Investigation and Consequences for the Analysis of the Cultural Resources Inventory

The research design for the second phase of geoarchaeological research has been a subject of negotiation between staff and the applicant since February 2012, and, as noted above, now continues to be the subject of ongoing consultation among a number of different parties. Staff filed a request with the applicant in February (CEC 2012v, Data Request #96) for the applicant to prepare a research design for the subsurface investigation of landforms in the prehistoric archaeological PAA. In mid-March email correspondence, the applicant sought clarification from staff on the appropriate scope of the research, and staff replied with an explanation of the staff perspective on that scope, a comment on the overarching purpose of the study, and a request that the applicant take into account a particular paleosol that the applicant and staff paleontologists were in the process of discussing and that radiocarbon dates appeared to suggest may be a young as 16,000 years old. The applicant submitted a draft research design for the second phase geoarchaeological study at the end of May 2012. At the end of June 2012, staff sent the applicant a letter that, along with other issues, offered comment on the draft research design (CEC 2012ap). Staff found that the draft research design did not provide a preliminary reconstruction of the historical geomorphology of the landscape that encompasses the prehistoric archaeological PAA, did not identify or justify the geographic scope of the proposed study, did not provide a cogent theoretical orientation or rationale for the subsurface geoarchaeological research, and did not provide a thorough explanation of nor an explicit rationale for the proposed field methodology in the draft design. The applicant responded to staff comment on the draft research design in mid-July (URS 2012k) largely by referencing the parts of the draft research design that the applicant felt already answered the questions that were the result of staff review of that same document. Given the character of the applicant's response to staff comment on the draft research design, staff decided to attempt the resolution of the outstanding issues in the more open forum of a public workshop. That workshop was held on August 2, 2012 at the Energy Commission in Sacramento. Staff was able to clarify for the applicant a number of the comments that had been released to the applicant back in June, 2012, and the applicant agreed to make their geoarchaeological consultant available to staff for a face-to-face meeting to more effectively and efficiently orchestrate the revision of the original draft research design to more closely reflect staff comment on that document. Staff met with the applicant's geoarchaeological consultant on August 13, 2012 in Sacramento, and reiterated in greater detail the clarifications to staff's June 2012 comment on the original draft of the research design that staff had presented at the August 2 workshop. On August 31, 2012, the applicant made an informal electronic submission to staff of revisions to the original May, 2012 research design for the second phase geoarchaeological study. The revisions to the original document largely reflect the clarifications and modifications to the research design that staff sought in the August 2 public workshop. Staff transmitted informal electronic comments on the revisions back to the applicant on October 9, 2012. As of the date of the preparation of the present document, the applicant has staff's October 9 comment under review.

The delays in the development and execution of the subsurface geoarchaeological field investigation have had a number of substantive implications for staff's ability to provide a more complete cultural resources analysis for the present PSA. Information on the age and the depositional origin of the landforms in the prehistoric archaeological PAA is critical evidence to establish on which landforms known surface archaeological deposits would require no archaeological excavation to support determinations of historical significance. The same information is also critical to establishing whether monitoring related to construction or facility operational activity would be warranted on particular landforms, and, if so, what the age of the archaeological deposits encased in those landforms would be. Absent subsurface geoarchaeological field data, the applicant and staff have marginal-to-no factual basis to exclude from excavation any known surface archaeological deposit for which a recommendation of historical significance must be made. Staff does not have this information, and, as one consequence of that fact, staff has had to request that the applicant subject a greater number of archaeological sites to evaluation-phase excavations than would probably have been necessary, had staff had the subject information. The applicant will undoubtedly now have to spend a significant amount of additional time and money on the evaluation-phase excavation of archaeological deposits in the PAA, and staff is presently unable, absent these evaluations, to propose mitigation for a historical resources inventory, the extent of which remains unclear. The absence of the geoarchaeological field data also requires that staff recommend monitoring of project construction and operation across the entirety of the proposed project area, because staff presently has no factual basis to exclude the monitoring of any particular landform. Staff is hopeful that the applicant may at least make the pertinent geoarchaeological data available in time to help shape the monitoring program for the proposed project.

### Intensive Pedestrian Archaeological Resources Survey

The Energy Commission's Data Regulations require applicants to conduct surveys to identify previously unrecorded cultural resources in or near their proposed project vicinities. These surveys include a pedestrian archaeological survey and a built-environment windshield survey. Staff may also undertake additional field research to supplement information provided by the applicant.

As of August, 2012, the applicant had conducted two surveys to inventory the cultural resources in the Rio Mesa SEGF site footprint, transmission line corridor, and access road corridor (Nixon et al. 2011:4-2–4-3). These included one intensive pedestrian archaeological survey (BLM Class III, for both prehistoric and historical archaeological resources) and one built-environment survey. The applicant did not conduct a survey to identify ethnographic resources. This fieldwork identified 248 cultural resources within the prehistoric archaeological, historical archaeological, and built-environment PAAs, which are summarized below (**Cultural Resources Table 7**).

**Cultural Resources Table 7**
**Summary of Cultural Resources Identified in the Applicant's Field Surveys in the Prehistoric Archaeological, Historical Archaeological, and Built-Environment PAAs**

| | |
|---|---|
| Prehistoric Archaeological | 123 |
| Historical Archaeological | 81 |
| Multi-component (Prehistoric and Historical) | 30 |
| Built-Environment | 13 |
| Undetermined | 1 |
| Total | 248 |

The applicant originally surveyed approximately 9,500 acres (BS 2011a). Since the completion of these surveys, the project has been modified, with Unit 3 eliminated from the project description (approximately 1,500 acres). Based on this change, only those portions of the area surveyed for archaeological resources that remain within the boundaries of the redesigned Rio Mesa SEGF project are considered here (5,993 acres) (URS 2012j). The other resources identified in the applicant's survey are considered in the "Previously Identified Resources" subsection, above.

### *Methods*

Archaeological fieldwork took place in the spring of 2011 and the winter of 2012. Teams consisting of 4–7 persons walked across the parts of the project site where direct disturbance is expected, spaced 15 meters apart. Steep areas (greater than a 30 to 45 degree slope), where access was difficult or unsafe, were not surveyed. Artifacts, features and sites were classified according to definitions in field manuals provided by the BLM and the Energy Commission (Allen et al. 2012; Laylander and Schaefer 2011b). Based on these field manuals, archaeological sites were defined as four or more historic-period or prehistoric-period artifacts within 30 meters of each other. Groups of three or fewer prehistoric or historic-period artifacts not within 30 meters of each other were recorded as isolated finds. Resources previously recorded within the recently surveyed areas were revisited in order to be certain that the information was still accurate. If a change in the site was noticed, a site record update was generated. Each survey crew was guided by a sub-meter Global Positioning System (GPS) unit that contained the location and descriptions of previously identified resources.

When an archaeological resource was found, survey teams identified the site boundary and recorded the resource on the appropriate DPR 523 site recordation forms. Information was collected using a combination of staff observations and data-recording devices, including sub-meter GPS equipment and digital cameras. Each isolated find and site was given a designation that included the project acronym, initials of the team leader, and a sequential number (e.g., RMS-RN-001), with isolated finds including the designator “ISO” (e.g., RMS-RN-ISO-002). Site boundaries were delineated by team members transecting the area of the find, with transects spaced no greater than 3 meters apart. Individual artifacts and artifact concentrations or features were flagged, quantified by type and material, mapped, described, and photographed. Digital photographs were taken of unique or temporally diagnostic artifacts, and representative samples of artifacts within features were recorded in the field.

URS undertook no subsurface testing and collected no artifacts (BS 2011a:4-2–4-3).

### *Results*

Based on staff’s analysis, 266 archaeological resources were found within the prehistoric and historical archaeological PAAs (4,243 acres). This total includes 235 newly identified resources, 21 previously identified resources that were revisited and updated, and 8 previously identified resources that could not be relocated. This total only includes sites found in the proposed Rio Mesa SEGF site footprint, transmission line corridor, and access road corridor. Sites found in areas that have been subsequently excluded from the project are discussed in the “Results of Compilation of Extant Data” subsection, above, and are listed in **Cultural Resources Table A-3** in the appendix. The 235 newly identified archaeological resources consisted of 123 prehistoric, 81 historic-period, 30 multi-component, and 1 undermined resource.

During staff’s analysis the Rio Mesa SEGF project was modified twice. These modifications substantially changed the boundaries of the archaeological PAAs. Although some of these changes are reflected in the applicant’s Environmental Assessment Proposal (BS 2012v:5.3-54), an accurate list of the archaeological resources within the project boundaries was not provided, requiring staff to generate this information independently. The list was subsequently provided at staff's request after an August 9, 2012 workshop. The applicant provided no information about isolates that remain within the modified project boundaries. Therefore, staff was unable to include isolates in its analysis. **Cultural Resources Tables A-2**, **A-3**, and **A-4** (in the appendix) briefly describe archaeological resources found during previous investigations within the archaeological PAAs and the project vicinity (n=112), archaeological resources that have subsequently been excluded from the archaeological PAAs (n=290), and archaeological resources that remain in the archaeological PAAs (n=266). In total, these tables include 668 archaeological resources.

Based on the applicant's records searches and field surveys, **Cultural Resources Tables 8** and **9**, below, present the total inventory of prehistoric archaeological and historical archaeological sites for the Rio Mesa SEGF project. The descriptions and the evaluations of the CRHR eligibility of these resources are set out in the "Prehistoric Archaeological Resource Inventory and Evaluation, Impact Assessment, and Mitigation Recommendations" and "Historical Archaeological Resource Inventory and Evaluation, Impact Assessment, and Mitigation Recommendations" subsections, below.

Of the 266 archaeological sites in the archaeological PAAs, 183 were prehistoric or had prehistoric components (**Cultural Resources Table 8**). Isolated prehistoric artifacts comprised nine of these components within multi-component sites, and are not considered further here. Broadly speaking, the prehistoric activities that took place within the prehistoric archaeological PAA were focused on stone tool quarrying. Staff identified 128 quarry/workshops, 24 religious/ceremonial locations, 9 artifact scatters, 7 camps, and 6 resource extraction/processing sites.

**Cultural Resources Table 8**
**Prehistoric Archaeological Resources Inventory:**
**Previously Known and Newly Discovered Resources**
**in the Rio Mesa SEGF Prehistoric Archaeological PAA**

| | Previous | Previous, Not Relocated | Updated | New | Total |
|---|---|---|---|---|---|
| Camp | 1 | - | 2 | 4 | 7 |
| Quarry/Workshop | - | 1 | 12 | 115 | 128 |
| Resource Extraction/Processing | - | - | 4 | 2 | 6 |
| Religious/Ceremonial location | - | 4 | 3 | 17 | 24 |
| Artifact scatters | - | 3 | - | 6 | 9 |
| Isolated prehistoric artifacts within multi-component sites | - | - | - | 9 | 9 |
| Total | 1 | 8 | 21 | 153 | 183 |

Historic-period sites, or those multi-component sites having historic-period components, comprised 127 of the 266 archaeological sites identified in the prehistoric archaeological and historical archaeological PAAs (**Cultural Resources Table 9**). Of these, three were isolated historic-period artifacts within multi-component sites. Most activities appear to be associated with DTC maneuvers, mining, and surveying of the public lands. Staff identified 50 DTC Food-Related refuse scatters, 41 DTC Maneuver sites, 21 non-military refuse scatters, 8 mid-twentieth-century refuse scatters, 2 cairns, 1 boulder alignment, and 1 government survey marker.

**Cultural Resources Table 9**
**Historical Archaeological Resources Inventory,**
**Previously Known and Newly Discovered Resources**
**in the Rio Mesa SEGF Historical Archaeological PAA**

| | Recent | Updated | New | Total |
|---|---|---|---|---|
| DTC Food-Related refuse | 1 | 5 | 44 | 50 |
| DTC Maneuver sites | - | 5 | 36 | 41 |
| Historic-period non-military refuse | - | 3 | 18 | 21 |
| Mid-20th-century refuse | - | 1 | 7 | 8 |
| Rock boulders | - | - | 1 | 1 |
| Government survey marker | - | 1 | - | 1 |
| Cairn | - | - | 2 | 2 |
| Isolated historic-period artifacts within multi-component sites | - | - | 3 | 3 |
| Total | 1 | 15 | 111 | 127 |

Additional field studies—geoarchaeological fieldwork and evaluation-phase excavation of prehistoric archaeological resources—are currently being planned but are not yet complete (CEC 2012as). The geoarchaeological field work will help identify the parts of the project's landforms where there might be buried cultural resources. Although pedestrian surveys can identify resources that are visible on the surface of the ground, geoarchaeological work and excavation in sites located on sensitive landforms are required to be certain that the vertical dimensions of a resource are identified, as well as the horizontal dimensions. Also, for some resources, additional data beyond the basic descriptive information collected during pedestrian surveys are needed to find out if resources are historical resources under CEQA, requiring staff to do impact analyses and develop appropriate mitigation measures. Staff has identified a subset of the resources within the prehistoric archaeological PAA that will require excavation to learn if buried resources are both present and historical resources under CEQA (CEC 2012as). The applicant has submitted a draft archaeological research design and testing plan (URS 2012l), but the field work is still incomplete.

As noted in staff's letter regarding these field studies (CEC 2012as) the Energy Commission Committee for the Rio Mesa SEGF has set milestones for the licensing process. These include specific dates for publication of the PSA and FSA. Because the applicant has not provided the archaeological or geoarchaeological information within the timeframes to which they committed at the March 19, 2012 status conference (EHS 2012d), the identification of significant archaeological sites in the prehistoric archaeological PAA is incomplete. The absence of these data has precluded staff's ability to adequately assess, in the PSA, the potential impacts that the proposed Rio Mesa SEGF project would have on archaeological resources buried beneath the present surface of the project site or to include, as one mode of mitigating the project's impacts, a construction monitoring plan appropriate to the project.

## ETHNOGRAPHIC FIELD INVESTIGATIONS: ENERGY COMMISSION ETHNOGRAPHY STUDY

Ethnography fulfills a supporting role for other anthropological disciplines as well as contributions on its own merits. Ethnography provides a supporting role to the discipline of archaeology by providing a cultural and historic context for understanding the people that are associated with the material remains of the past. By understanding the cultural milieu in which archaeological sites and artifacts were manufactured, utilized, or cherished, this additional information can provide greater understanding for identification efforts, making significance determinations per the National Historic Preservation Act (NHPA) or CEQA; eligibility determinations for the NRHP or the CRHR; and for assessing if and how artifacts are subject to other cultural resources laws, such as the Native American Graves Protection and Repatriation Act.

In addition, ethnography has merits of its own by providing information concerning ethnographic resources that tend to encompass physical places, areas, or elements or attributes of a place or area. Ethnographic resources have overlap and affinity to historic preservation property types referred to as cultural landscapes, traditional cultural properties (TCPs), sacred sites, heritage resources, historic properties, or historical resources that are areas or places, and specific historic property or historical resource types of sites, objects, buildings, structures, districts, areas or places. There is notable overlap in terminology when referring to ethnographic resources. Studies that focus on specific ethnographic resource types may also take on names such as ethno-geography, ethno-botany, ethno-zoology, ethno-semantics, ethno-musicology, etc. In general, the ethnographic endeavor attempts to minimize human conflict by facilitating an iterative cross-cultural understanding and, by extension, self-awareness.

While several definitions of ethnographic resources can be found in historic preservation literature, the National Park Service provides the most succinct and commonly used definition (NPS 2007:chap.10):

> Ethnographic resources are variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users. The decision to call resources "ethnographic" depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their lifeways.

For the purposes of this study, the resource focus is with Native American places and areas otherwise referred to as ethnographic resources and how those resources may stand alone or contribute to ethnographic landscapes located in and around the proposed Rio Mesa SEGF project vicinity.

## Ethnographic Methods: Rapid Ethnographic Assessment Procedures (REAP)

Ethnography at its best takes years to complete. Ethnographers can spend a lifetime studying another culture and still find that their cross-cultural knowledge of their “second” culture is incomplete. Minimally, it is advised to spend at least one year in studying another culture so that one can learn about the various seasonal variations and adaptations. Academic and self-funded anthropologists may have such luxury. However, the merits of ethnography, when employed to understand project impacts to ethnographic resources, often require less than optimal study durations. A method called “Rapid Cultural Assessment” was developed in the 1930s to assists sociologists’ understanding of American rural agricultural community responses to socioeconomic impacts ensuing from evolving environmental conditions (NPS 2007, Chap. 10:8) The National Park Service (NPS) has developed similar methods for understanding ethnographic resources within the shortened time frames related to project review. The REAP method was generally followed for this project-related ethnographic study.

REAP consists of a selection of ethnographic methods that relies on interview, observation, and research techniques to describe a way of life common to a group of people, that can include their knowledge, customs, beliefs, social habits, technology, arts, values, and institutions. REAP involves active participation of people in a cultural group to render representations of a way of life from a community’s point of view. Unlike traditional ethnography, REAP focuses investigations and resultant descriptions on solving specific problems or issues that may arise as a result of proceeding with a development project.

REAP’s truncated methods are (NPS 2007):

1. Group meetings/interviews where the ethnographer explains the project to the group, answers general questions and solicits immediate responses, fears, apprehensions, benefits, or other general perceptions from the participants concerning the project, the area where the project is being proposed, and the general connections of traditional people to the project vicinity. Often issues of confidentiality are discussed. Surmounting the issues of confidentiality, the ethnographer may be successful in scheduling follow-up activities with specific individuals to increase ethnographic understanding.

2. Areas worth further ethnographic inquiry are identified; a research design, including research or interview questions, is developed; and specific people are scheduled by the ethnographer and the group for follow-up interviews. Follow-up interviews should be conducted according to the protocols of documentation and confidentiality identified during the group meeting or interview. Interview notes, however recorded, should be vetted with the source individuals to verify accuracy and to gather additional nuanced information.

3. Follow-up interviews with the same or additional people often occur while both the ethnographer and the community begin to further think about the project, the project

effects, and additional information that is necessary for fully identifying, evaluating, assessing effects, or otherwise considering impacts to ethnographic resources.

As steps 1 through 3 are being conducted, a parallel archival “search, retrieve, and assess” process should be undertaken to provide supporting or conflicting information to what is being discovered through the interview process. In addition to archive, book store, and other informational repositories (e.g., the internet), the people themselves or other ethnographers with previous experiences with the same people, may provide source materials.

Field visits will help the ethnographer triangulate between what people currently say, what people have written in the past, and what is actually or perceived to be in the project vicinity as a potential ethnographic resource.

## ETHNOGRAPHIC RESEARCH DESIGN

Based upon the general meetings, an abbreviated research design was developed that generated various research questions or directives. The following research design provided general guidance for preliminary archival research and allowed the ethnographer to prepare for interviews.

- Research specific Lower Colorado River/Palo Verde Native American history and culture beyond what is generally provided in the applicant’s report prepared for the Rio Mesa SEGF AFC.
- Determine what plants and animals have cultural significance for the Cocopah, Quechan, Mojave, or Chemehuevi Tribes, or ones that may be located in the project vicinity. Plants and animals determined to have associated Native American cultural values should be further studied to understand ethno-botanical and ethno-zoological details.
- Research the general Cocopah, Quechan, Mojave, or Chemehuevi cultural relevance and history of water knowledge and use in the Lower Colorado River Valley and surrounding mountains.
- Research and understand the importance of spring environs in the project vicinity for the continuance of Cocopah, Quechan, Mojave, or Chemehuevi lifeways.
- Research and understand Tribal ceremonies performed in the project vicinity. Determine to what extent these ceremonies are still practiced today and to what extent the proposed project would impact such ceremonies.
- Research and further understand the history, practices, and meaning of the Salt Song Trail for Chemehuevi, with emphasis on ethno-geography and specific attention paid to the nature of the trail aspects of physical travel, song-scapes and related practices, beliefs, and related ceremonies.
- Research and further understand the history, practices, and meaning of the Xam Kwatcan or “Dream” Trail, with emphasis on ethno-geography and specific attention paid to the nature of the trail aspects of physical travel, dream travel, and related practices, beliefs, and related ceremonies.
- Research the history of Cocopah, Quechan, Mojave, or Chemehuevi agriculture in the project vicinity from pre-contact to current times.

- Research and map, to the extent feasible, Native American Trails located in and near the project vicinity that are not necessarily “Dream Trails” or the Salt Song Trail.
- Understand to what extent the Bradshaw Trail is also a Native American trail.
- Inquire and document the importance of the Mule Mountains, McCoy Mountains, Big and Little Maria Mountains, Trigo Mountains, the Palo Verde Mountains, and other surrounding landforms in general as view/auditory -sheds in relation to the project vicinity, other landforms, and other ethnographic resources.
- Research traditional and current Cocopah, Quechan, Mojave, or Chemehuevi burial practices, including cremation.
- Inquire as to the interrelation of Cocopah, Quechan, Mojave, Chemehuevi, and Cahuilla cultures in general and specifically in the Rio Mesa SEGF project vicinity.
- Research the history of Tribal governments: Chemehuevi Tribe, Fort Mojave Indian Tribe, Colorado River Indian Tribes, Agua Caliente Band of Cahuilla Indians, Fort Yuma Quechan Indian Nation, and Cocopah Tribe.

## Interviews

Tribes affiliated with the ethnographic PAA will consider participation in ethnographic interviews after the completion of archival research and production of a draft ethnographic study that relies primarily upon archival data sources. The draft ethnographic study is being prepared in tandem with this PSA. Ethnographic interviews will occur after publication of the PSA.

The remainder of this subsection will be completed after publication of the PSA.

## Archival Research

Staff made efforts to seek, obtain, and assess culturally relevant information from various archival and other sources. Archival and other source locations are included in the list provided in the “Compilation of Extant Data: Record, File, and Database Searches” subsection.

## Ethnographic Method Constraints

Constraints on the ethnographic methods described above were identified:

1. Confidentiality of specific traditional cultural knowledge;
2. Not enough time to conduct thorough ethnography;
3. Language barriers in expressing and understanding information; and
4. A trail study was not completed in time to include relevant trail information to bear on the ethnographic resources identified.

Due to the sensitive nature of some of the potential answers to research questions and the confidentiality that participating Tribes attach to such information, Tribes requested that thorough archival research be conducted and a draft report then be provided for Tribal review. Based upon that review, Tribes would then, perhaps, convey some confidential information. While this process is a rational approach to protecting sensitive information by only providing the bare minimum required, the approach also requires more coordination and therefore a lengthier schedule for completing the ethnographic study and subsequent report.

The Cocopah, Quechan, and Mojave or Chemehuevi cultures, and particularly traditional cultural practices related to epistemology (belief systems), world view, and religion, are too complex to understand within the limits of a three-to-six-month study.

Some cultural practices and understandings are foreign to the English language and scientific way of knowing and can only be articulated in Chemehuevi, Mojave, Quechan, and Cocopah languages.

Constraints were surmountable, partially surmountable, or not surmountable as described below.

- This draft study only provides what can be learned from the written ethnographic record. Staff anticipates some oral history interview information to be obtained and incorporated into the study after PSA publication. *Constraint Partially Surmounted.*
- The REAP was adapted to this ethnographic study. While REAP cannot replace the quality of long-term ethnography, it does provide some ability to include ethnographic resources in the Energy Commission siting review process; a process that only affords Energy Commission staff with a few months, at most, to conduct independent research. *Constraint Partially Surmounted*.
- Staff does not speak or understand any of the languages traditionally spoken by Native Americans of the Lower Colorado River. Additionally, Tribes expressed concerns about the ability of new forms of language (i.e., English and science) to express the Tribes' deep-seated understanding of their place in a riverine environment. However, information conveyed in this study is provided in the English written language only. *Constraint Not Surmountable*.
- Due to budget and time constraints, the trail study was reduced to a minimal effort to obtain information and plot trail locations in and around the proposed project vicinity. Consequently a trail study was delayed and will not be initiated until about the time of PSA publication. Trail study results will be included in a final ethnographic report that will inform the FSA. However, enough trail information is available to inform the definition of two sacred trail landscapes. *Constraint Partially Surmounted.*

## ETHNOGRAPHY RESULTS

## ETHNOGRAPHIC ATTRIBUTE ANALYSIS

Based upon what can be found through archival research[8], the various themes of the research questions are condensed and reduced to eight broad attribute categories as follows:

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[8] The following analysis provides what was discovered through archival research. Document or personal communications citations will cue the reader as to the source that substantiates a statement or assertion.

- Water
- Plants
- Agriculture
- Animals
- Trails
- Landforms
- Mortuary Treatment
- Ceremonies and Sacred Trails

The eight categories are each described in the staff ethnographic study. However, for purposes of brevity and relevancy, only the categories of Agriculture, Mortuary Treatment, and Ceremonies and Sacred Trails are included in the PSA because these three categories best support the three ethnographic landscapes found to be in the vicinity of the project. However, all eight categories have some supporting information that contributes to the three ethnographic landscapes.

During the August 23, 2012 Energy Commission General Meeting with Tribes, Tribal representatives added another category, called “Totemic Clan Names,” the subject matter of which has relevance to all of the other categories and the three ethnographic landscapes described later in this PSA.

### Totemic Clan Names

Totemic clan names are an important identifying characteristic among Yuman speakers. These totems can take the forms of, or have over-arching bearing on, several attribute categories, i.e., water, plants, animals, or other natural phenomena.

It is understood that these totems are assigned by the Creator, and that these totems belong to specific clan groups (Kelly 1942:677). There is some information that the God *Mastamho*, residing in his northern “house” immediately after the creation of humans, sent forth varying Yuman people who migrated and inhabited various portions of the lower Colorado River from Spirit Mountain (the “Big House”) south to the Gulf of Mexico. While the first migratory wave (some literature suggests that the last wave was the Mohave who stayed close to the place of origins) stayed nearer to Spirit Mountain, successive waves migrated further south (Johnson 2003:161). Each wave was also provided with totemic clan names. This totemic clan system “comprises patrilinear, exogamous, nameless groups of totemic reference,” and except for the Cocopah, totem taboos are either slight, or lacking (Kroeber 1925:741). Today, members of a specific clan are understood to be well informed of the nature and characteristics of the totem and should be considered experts on the aspects of the totem. For example, Mesquite Bean Clan members are thought to have specific knowledge concerning the mesquite tree and the species’ treatment as a source of food and other cultural materials (Tribal Communication, Tribal Meeting, August 23, 2012).

## Agriculture

Archaeological evidence indicates that Yuman speakers began to practice agriculture around 800–1000 AD in the Lower Colorado River Valley, with the Palo Verde Valley being the farthest western extent of the Meso-American agricultural florescence, resulting from Yuman agricultural adaptations after their migration into the area (Moratto 1984:358). Maize is known to have been cultivated approximately 1,000 years earlier in the San Juan Basin, about 600 miles upriver (Castetter and Bell 1951:101).

However, Tribal knowledge suggests alternative origins. The Lower Colorado River Tribes consider that the Creator gave the people the knowledge and plants with which to conduct agriculture. For the Mohave, the god *Mastamho* told the people that food was incomplete until the vessels (i.e., pottery) in which to cook the food were provided. Therefore, in the Mohave mind, pottery and agriculture are associated, and both are thought of as something that was given to them (Kroeber 1925:736). A Mohave story, similar to the biblical story of Cain and Abel, describes how corn and wheat are understood to have become part of the diet. In this story, *Hatapa-aqwaoOtse* was with the brothers *Pukehane* and *Tsitsuvare*, but they had nothing to eat and so *Hatapa-aqwaoOtse* reached his arm to the southeast and obtained corn for them to eat, and reached his hand to the northeast and obtained wheat (Kroeber 1963b:5). The Mohave understand that *Mastamho* instructed the Mohave to plant the crops that he created in the ground after the floods had subsided (Bourke 1889:88).

The Tribes along the Lower Colorado River (and Paiutes to the northwest as far as the Owens Valley) were some of the few Indians in California who practiced agriculture; most other Tribes in the state were hunter-gatherers with perhaps some limited practices related to cultivating specific plants, such as mesquite, clover, or tobacco. The development of agriculture in the Lower Colorado River Valley significantly improved groups' ability to obtain reliable subsistence and led to population aggregation into groups larger than what was typical of California Tribes (Kroeber 1963a:104). The annual flooding of the Colorado River provided a rich, silty floodplain on which Native Americans were able to plant and harvest a variety of crops. However, the floods varied yearly, and when the floods were slight, groups had to intensify their wild food-collecting efforts to make up the difference in the smaller crop yield. At other times the floods were heavier than normal, or a second round of floods would occur. In these cases, crops would sometimes be severely damaged, or the second flooding could provide an opportunity to plant another crop (Castetter and Bell 1951:67–69).

Before flood controls on the Colorado River, the waterway was frequently changing course (Heintzelman 2008:92) and forced groups to move to higher ground when the spring floods would start, and then to move back to the floodplain after the floods subsided (Bee 1963:209; Castetter and Bell 1951:70).

Here is a general description of planting techniques by a mid-nineteenth-century observer:

> The river bottom is wide and fertile… and is intersected by a great number of sloughs and lagoons, former bends of the river. On these the Indians plant in the month of July, or soon as the waters of the annual rise

> commence or subside. No vegetables will grow beyond the influence of the overflow (Heintzelman 1857:34–35).

And further:

> Their agriculture is simple. With an old axe… knives and fire, a spot likely to overflow is cleared. After the waters subside, small holes are dug at proper intervals, a few inches deep, with a sharpened stick, having first removed the surface for an inch or two, as it is apt to cake. The ground is tasted, and if salt the place rejected; if not, the seeds are then planted. No further care is required but to remove the weeds (Heintzelman 1857:34–35).

In the vicinity of the Rio Mesa SEGF, it was known that a group of Quechan resided south of Blythe in the Palo Verde Valley from after 1829 to around 1890, likely in a village called *Avi"kwotapai* (Bean and Toenjes 2012:29; Bee 1963:208), and were likely able to maintain their traditional pattern at this time (Bean et al. 1978, Chap. 5:47). It is suggested that at least one Quechan party, escaping the California Militia at the Yuma Crossing in 1850, moved north to perhaps the Palo Verde Valley (Forbes 1965:321–322). Bean et al. report that Chemehuevi people farmed the Palo Verde Valley in historic times (1978:7–30). During times of flooding groups moved to mesas or other nearby high ground (Bee 1963:208; Forbes 1963:57–61), and it is probable that this village, and any other floodplain villages in the vicinity, would have moved west to the Palo Verde Mesa, close to or within the Rio Mesa SEGF project vicinity, during annual flooding periods. It is reported that people moving away from the floodplain in anticipation of the seasonal floods moved to higher ground; some moving to the nearest high ground, others to the river bank escarpment that bordered the Colorado River, and others further inland and nearer to reliable spring areas. The distance that a group would move from the floodplain was dependent on how much of a flood was anticipated, how little or great were the food stocks that had to be transported, and the distance to be covered for procuring wild foods. In addition, food crops were stored on the mesa and in the first set of foothills to facilitate the annual migration and to prevent the loss of all food stock should a village or family unit be subject to raiding or warfare and subsequent loss of food (Castetter and Bell 1951:164–165). A likely caching area for the Palo Verde area would have been the lower and eastern portions of the Mule and Palo Verde Mountains.

Kroeber (1951:map 2) indicates at least three places, possible villages, on the western side of the Colorado River in the Palo Verde Valley. *Ahpe-hwelyeve*, one of these places, is located just east of the present-day town of Palo Verde. It appears to be a place where a Mohave culture hero solidified an amity alliance by sharing tobacco with the men assembled in the main house. It is assumed that the people who dwelled in this village were Quechan. The village leader and people of *Ahpe-hwelyeve* reciprocated by providing a wife and a meal of beans and corn mush. This place is located on a rise in the floodplain of the Palo Verde Valley. The Palo Verde Mesa escarpment is approximately three miles to the west and a good quality spring (Clapp Spring) is located another five miles west across the Palo Verde Mesa and just underneath "The Thumb," a monumental outcrop of rock.

While cultivated crops provided up to 40 percent of the diet for those dwelling in the Palo Verde Mesa, and while fish provided another 10 percent of the diet, the remaining 50 percent of the diet came from wild and semi-wild plant gathering and animal hunting. The plant and animal subsistence activities occurred in the floodplain, mesas, immediate mountains, such as the Mule and Palo Verde Mountains, and in the washes that incise the alluvial fans that surround the mountains. Despite the abundance of soil fertility of the lower Colorado River valleys and the ease of cultivation there, leading to abundant food supplies, there were times when the river did not flood, or repeatedly flooded and seasonal crops were not secured. In these times, upland mesas, alluvial fans, and nearby mountains became essential sources for food procurement. Warfare and alliances and related plunder and trade may have been another method for food procurement (Kroeber 1980).

Knowing when to plant crops was gauged astronomically, i.e., when the Big Star, *xamacevetai*, rose at dawn it was time to plant, and this star was also watched continuously to suggest the time to harvest—when it set in the west just after sunset (Forde 1931:109). Another Quechan informant suggested that when the Pleiades first appeared in the east in the morning the land would be in a condition ready for planting, and by the time Orion appeared at dawn, all plants should be in the ground (Forde 1931:109). Another agricultural specialist suggested that the periodicity of river flow, flooding, and subsidence were more keenly considered in determining seasonal agricultural activities and that the astronomical calculations only informed the Indian farmer of when it might be too late to plant (Castetter and Bell 1951:146). Nonetheless, a general monthly and seasonal subsistence schedule is provided in **Cultural Resources Table 10**.

**Cultural Resources Table 10**
**Lower Colorado River Native American**
**Seasonal Subsistence Activities and Migrations**

| Month | Indicator | Activities | Locations |
|---|---|---|---|
| Late February–Early March | Cottonwood trees Bud | Hunting and gathering, travel and trade | Mesas and mountains |
| March | Willow and mesquite bud, windy | Early garden plot clearing and hunting | Un-flooded parts of floodplain, mesas, and mountains |
| April | Early floods subside | Garden plot clearing, early planting, fishing and hunting | Floodplain, river sloughs and lagoons, mesas, mountains |
| Late April–Early May | Berries ripen | Gathering of berries on the mesas, Time to harvest Winter Wheat if planted, fishing and hunting | Floodplain, mesas, mountains |
| May–Early June | Highest, most extensive flooding | Hunt for stranded fish, harvest any early crops if flood waters permit, a time of food scarcity and uncertainty. Begin planting main crops | Floodplain, mesas |

| Month | Indicator | Activities | Locations |
|---|---|---|---|
| Late June–July | Mesquite beans ripen | Men complete planting, women gather mesquite pods, mesquite harvest festival held, many wild plants with green shoots gathered in the floodplains. Summer homes in floodplain erected | Floodplain and mesas |
| July–August | Weeds grow | Gardens are hoed by men, women gather screw bean mesquite pods, summer homes are erected in floodplain. River fishing at its best | Floodplain and river |
| September-October | Green corn ripens | Early corn is picked and consumed, fishing, mesquite pod processing, and storage basket nests constructed | Floodplain and river |
| Late October-early November | Garden harvest | Gardens are harvested, rabbits and birds hunted, harvest festivals held, lots of procurement activities to store food for winter months | Floodplain |
| November | Frost | Move harvest to mesas and build/restore winter homes | Floodplain and mesas |
| December | Cold | Live off of stored food, rabbit and bird hunting, travel and trade | Mesas and floodplain |
| January-Early February | Dried canes | Inactivity, live off of stored food, rabbit and bird hunting, travel and trade | Mesas and floodplain |

The Lower Colorado River Valley was so fertile that the carrying capacity of the cultivatable land was “greatly in excess of the needs of the aboriginal population” (Castetter and Bell 1951:66). Despite the fertile ground, groups in the Lower Colorado River Valley did not place much emphasis on maintaining large caches of crops to last them until the next harvest, or conduct ceremonies or prayers to improve their agricultural yield (Castetter and Bell 1951:87–88; Kelly 1977:23). The Cocopah, and other groups, were very generous with their food, but food was not seen as a symbol of wealth or social prestige (Castetter and Bell 1951:71). Sometimes groups would grow extra food when they knew there was going to be a ceremony in which large amounts of food were needed, but, in general, they were somewhat limited by the short window of opportunity in which to plant their crops after the floods, and by limited available labor. It is estimated that the maximum amount of land that a single family unit could have cultivated was about two acres, with the average family’s plot consisting of about one acre in the Lower Colorado River Valley (Castetter and Bell 1951:75).

Several different crops were planted and harvested by Tribes within the Lower Colorado River Valleys. **Cultural Resources Table 11** displays the crops that are likely to have been cultivated in the area.

**Cultural Resources Table 11**
**Crops Cultivated by Native Americans in the Lower Colorado River Valleys**

**Legend:**
**A: Mohave** **D: Cocopah**
**B: Chemehuevi** **E: Cahuilla**
**C: Quechan** **F: No specified Tribe**

| Common Name | Scientific Name | Indian Name | Use | Reference |
|---|---|---|---|---|
| Wheat | | ?Atsita(B) | Food (B, A) | Laird 1976; Kroeber 1925 |
| Maize/ Corn | | Hawiv? (B), ta?'?tsake's – yellow (C), ta?'?tshama'l, - white (C), ta?'?tsaxwa't, - red (C), ta?'?tshavaló – blue (C), ta?'?tsiruwá – speckled (C); Hača·sɔ̃han - flour, Hača·swur – flint (D) | Food (B, C, A, D) | Laird 1976; Forde 1931; Kroeber 1925; Kelly 1977 |
| Beans | Vigna sinensis | Axma – large (C), vata'x – small, noku – cowpea (C), ama?otar – blind bean (C); Hemapatai, hemaramas (D)Murih (B); Merik (D) | Food (C, A, B, D); stalk fiber used for coradage (A, D) | Forde 1931; Kroeber 1925; Kelly 1977; Laird 1976 |
| White tepary bean | Phaseolusa cutifolius | Mare'kxama'l (C) | Food (C) | Forde 1931 |
| Yellow tepary bean | | Mare'kakwe's (C) | Food (C) | Forde 1931 |
| Yellow musk-melon | | Akwe's (C) | Food (C, A) | Forde 1931; Kroeber 1925 |
| Dark green water-melon | | Nya (C) | Food (C, A) | Forde 1931; Kroeber 1925 |
| Yellow pumpkin | Curcubita pepo | Axmatahan (C); Ichiluk (A) | Food (C, A); rinds used for ring-and-pin game (A); juice used to protect face against wind and wrinkles (A) | Forde 1931; Taylor and Wallace 1947; Kroeber 1925 |
| Gourds | Cucumis sp. | Halma (D) | Rattles (C, A, D); Food (D) | Forde 1931; Langdon 1976; Kelly 1977 |
| Various wild grasses | | Akata'l, aksam, akyirc (C); Akatai, aksamta, ankithi (A) | Food (C) | Forde 1931; Kroeber 1925 |
| Pumpkin | Cucurbita moshata | Kwura' - common cheese, hamča' - cushaw (D) | Food (D) | Kelly 1977 |
| Water-melon | Citrullus vulgaris | Kwi-yup | Food (D) | Kelly 1977 |
| Musk-melon | | | Food (D) | Kelly 1977 |

| Legend: A: Mohave; B: Chemehuevi; C: Quechan; D: Cocopah; E: Cahuilla; F: No specified Tribe | | | | |
|---|---|---|---|---|
| **Common Name** | **Scientific Name** | **Indian Name** | **Use** | **Reference** |
| Cotton | | | Textile (F) | Castetter and Bell 1951 |
| Alfalfa | | | Food (C) | Castetter and Bell 1951 |
| Sorghum | | | Food (C) | Castetter and Bell |
| Barley | | | Food (F) | Castetter and Bell 1951 |

Warfare played an important cultural and social role for most groups along the Lower Colorado River, but groups tried to avoid going to war during the planting and harvesting times if possible (Castetter and Bell 1951:72). The planting began as soon as the floods subsided, with watermelon planted first among the Yuma, followed by maize, cow-peas, tepary beans, cantaloupes, and large calabashes, and often the beans and melons were planted between rows of corn (Forde 1931:109). Wheat, introduced by the Spanish, was usually planted in the winter, and was harvested in late spring. In less fertile areas, various wild grasses were planted. Typically, half of the corn was eaten as green corn, a favorite delicacy (Castetter and Bell 1951:75).

Both cultivated and wild foods were stored, and the hot, dry climate made this a relatively easy task. Among the Cocopah, both pottery jars and woven baskets were used as storage containers, and sometimes these were placed on the roof of a house, but a specially built platform at the entrance of the house was the primary storage location (Kelly 1977:42–43). Constructed of willow and tule, this platform kept their important foods off the ground and away from the flood waters. Pumpkins and melons were dried in strips and stored, but pumpkins and watermelons were also sometimes buried in arrow weed-lined pits (Forde 1931:111; Kelly 1977:43).

The Yuman speakers all practiced agriculture along the river to some degree, with the Mohave obtaining about 50 percent of their subsistence from agriculture, the Cocopah about 30 percent, and the Quechan somewhere in between the two (Castetter and Bell 1951:74). The Chemehuevi also practiced agriculture and grew the same crops as the Yuman speakers, but did not tend to the fields after planting and before harvesting (e. g., weeding, scaring away birds) (Bean and Toenjes 2012:50). Most Yuman speakers are known to have done at least two weedings of their crop, and children would try to scare away birds and other animals with bows and arrows (Bee 1986:87, Forde 1931:113).

There was an informal division of labor among Lower Colorado River Tribes regarding agriculture; among the Cocopah, men did most of the farm work, but women were not opposed to participation. Men would clear the fields, usually by burning trees to kill them and clearing other brush, and plant the seeds, but both sexes helped with farm tasks

(Kelly 1977:30). The division of agricultural labor seems to have been informal at best among the Mohave and Quechan Tribes, as well (Kroeber 1925:736).

Among the Mohave, farm land was owned, and the land could be sold for other property or beads. Generally, lineage-group-area outer boundaries for agricultural use were determined by establishing lines of sight from a place on or near the river and up to a distant peak. Within the broad area demarcated, separate families were free to establish garden patches, often done by predicting where flood waters would provide the best features for what and how the family headman decided to plant. If there was a dispute over land claims, as often happened after floods destroyed a landmark denoting boundaries, a non-lethal shoving match, *thupirvek*, would take place among the quarrelling parties. The two disputing men would each be surrounded by their supporters and the two ensuing "scrums" would each try to shove/drag their man to the other edge of the disputed boundary and through the other scrum. If this shoving match did not resolve the situation, then a stick fight, *chetmana'ak*, occurred, wherein the disputers would beat each other over the heads until one of them became too weary to continue (Kroeber 1925:744-745). However, further south, it appears as though agricultural patches were not owned beyond one season. Yearly flooding would make boundaries difficult to relocate, and some amount of labor was expended every late spring to clear a new plot for planting. There was more available land, particularly in the lower Colorado River Valleys, than there were families to work the land. As long as a man worked his patch year after year, it was considered his. A son could inherit his patch. However, upon a man's death the patch was avoided by the mourning family for up to a year. During this time, especially if the area was an ideal spot, then other families might encroach.

With increased non-Indian settlement in the river valley in the late nineteenth century, agricultural practices started to go into disuse among most groups (Kroeber 1925:735). Indian gardens were increased for a period in the late nineteenth century in order to provide fresh produce to local miners and military outposts in exchange for cash and credit. The Cocopah were able to maintain their traditional agricultural practices the longest because they were the farthest from American development, but when the Laguna Dam was completed and the Imperial Valley Canal was washed out in 1905, the delta region became barren for the next few years. The Cocopah were not able to regain their economic lifeways, even though some located to the southern Salton Sea area (Castetter and Bell 1951:73-77). Dams (1905 for the Laguna Dam, 1935 for the Hoover Dam, and 1938 for the Parker Dam) controlled the yearly flooding and the resultant soil fertility renewal on Indian gardens. The Lower Colorado River Valleys changed in response to the new methods of agriculture that required extensive irrigation canals, chemical fertilization, mechanized farm equipment, new forms of manual labor, and alternating (checkerboard) and permanent land ownership concepts. Yuman people became cash laborers in the burgeoning mining and agricultural industries, and personal gardening only occurred in Indian backyards close to permanent Tribal housing. There are anecdotal stories of Yuman and Chemehuevi laborers who dug irrigation canals for wages, but because the pay was not enough to support Indian families, the families also maintained gardens along the canals, while and where the Indians labored on the canals. The mesas and mountains remained as places providing indigenous sources of wild food.

Despite the Colorado River water controls imposed by the dams, the river remains a dynamic force in Lower Colorado Indian Tribal thought, reverence, and related cultural traditions.

Irrigated agriculture is practiced today on several of the reservations, with cotton being the main crop, but alfalfa, barley, wheat, corn, and sorghum are also grown. However, in most cases the Tribes have leased their farmland to white farmers, and prefer to work day-labor positions (Castetter and Bell 1951:83-85).

#### Trails

There is a large overlap of trails as a cultural resource type germane to the sub-disciplines of prehistoric archaeology, historical archaeology, ethnography, and built-environment. Because trails are cultural resources that link diverse features in systems, districts, and landscapes, there are many contributing attributes to trail systems. Earth figures are one cultural resource type that is a contributing element to trails, trail networks, and ethnographic landscapes, such as the Keruk Trail/Xam Kwatcan Earth Figures Landscape, discussed below.

Additional research for this subsection is on-going, and trail research findings will be included in the FSA.

#### Earth Figures

Earth figures are “ground paintings” that are made by clearing away desert pavement in order to make a depiction of various real or supernatural phenomena (Bean et al. 1978, Chap.7:15). These depictions can be abstract, zoomorphic, geometric or anthropomorphic designs and are located at multiple places along the *Xam Kwatcan* Trail, from Pilot Knob to Spirit Mountain (Altschul and Ezzo 1995:134; Cleland 2007:45; Johnson 2003:163). The closest earth figures to the Rio Mesa SEGF project vicinity are:

- Blythe Earth Figures
- Ripley Earth Figures
- Palo Verde Peak Earth Figures
- Mule Spring Earth Figures
- Southern McCoy Earth Figures

There is some literature that suggests that current Native Americans attribute the earth figures (and petroglyphs) to ancient ancestors; and while the meanings are not well understood today, the images are still considered sacred. Another body of literature, generated by and about the La Cuna de Aztlan Sacred Sites Protection Circle, suggests that the earth figures commemorate a time when the Palo Verde Mesa was occupied by the ancestors of the Aztecs and is referred to in the Aztec Codices as the mythical land of the Atzlan. Further, La Cuna de Atzlan suggests that the earth figures assist in the sorting of the souls of the deceased based upon a person’s life history of good and bad deeds, career choices, and manner of death. The group identifies the Palo Verde and Mule Mountains area as one place where the deceased souls dwell (Kelly 2012). There is some Chemehuevi, Mohave, and Quechan corroboration with the interpretation that the earth figures guide the souls of the deceased to certain destinations on their journey to the afterlife (Kelly 2012). Johnson (2003:175–176), after much research, suggests the following:

The primary function of the earth figures of the Lower Colorado and Gila River valleys was to serve as a mode of communication between the Earth People (local Tribal people) and the Sky People (deities and ancestral spirits).

Johnson goes on to explain that there are three “Big Houses” related to the Xam Kwatcan Dream Trail, one of the “houses” being Palo Verde Peak. The living, interacting with the deceased along this trail, make petitions to the deceased at such earth figure sites near the Big Houses, to particularly move on to the afterlife from this world, where they may dwell in a “wandering area.” Johnson suggests that the Mule Mountains is one “Wandering Place.” Johnson explains the function of Summit Path (Site CA-IMP-4387), a complex of one earth figure, a trail complex, rock cairns, a cleared circle, and lithics:

> The function of the Summit Path…serves as a processional avenue leading to a shrine at the hilltop. Usually these shrines are associated with the journey to the afterworld by local ancestor spirits. Living relatives of a deceased family member, led by a religious practitioner, would ascend the summit path in ceremonial procession to the cairn/shrine where an offering of some type would be made…. [T]he cul-de-sac trail west of the cairn/shrine may have been a place where people would visit their deceased relatives to encourage them to continue their journey to beyond the Big House associated with Palo Verde Peak…and eventually beyond the hole-in-the-sky.

There is also an interpretation that some of the earth figures’ characteristic differences result from warring factions making territorial claims by creating earth figures in areas that were occupied after removing the previous inhabitants (Altschul and Ezzo 1995:142). That the earth figures balance between unity and schism among warring factions that all participate within a common cultural framework is an interesting interpretation, but remains unfounded and contrary to how traditional practitioners understand and use earth figures that contribute to the Xam Kwatcan Trail Landscape in current times.

Research on earth figures is on-going, and results will be incorporated into the FSA.

### Rock Rings

Rock rings have been interpreted to be secular, utilitarian features, i.e., for use in subsistence activities, warfare, or trade (Apple 2005:108), but others have also inferred a more significant cultural element to these. When interpreted as non-secular features, these rock rings or rock alignments are associated with the earth figures, which are themselves associated with trail systems (Altschul and Ezzo 1995:133).

## Mortuary Practices in the Ethnographic Literature

### *Chemehuevi*

The Chemehuevi traditionally buried their dead and destroyed (burned) the property of the deceased. However, if the person died away from home they could be cremated (Bean and Toenjes 2012:53; Tribal Communication Meeting August 23, 2012). The Chemehuevi also buried their dead by placing the body in a rock cleft or in a shallow wash (Kelly and Fowler 1986:380). The property of the deceased was cremated, and mourners would add belongings to be destroyed with the deceased's property (Kroeber 1925:599). Rock cairns or shrines marked trails and sometimes burials (Bean et al. 1978, Chap. 6:40). After a year of mourning a Salt Song ceremony was performed in order to assist the deceased's spirit to the afterlife.

### *Mohave*

The Mohave practiced cremation of their dead. All property of the deceased was destroyed at death and the body was cremated on a funeral pyre. Mourners threw offerings onto the pyre, and the deceased's house and granary were burned (Kroeber 1925: plate 69; Stewart 1983a:59, 66). Individual Mohave frequently made requests regarding the disposal of their property upon death. Examples include orders for mourners to eat the deceased's prized animal or being cremated with a special belonging (Kroeber 1925:751).

A detailed description of Mohave funeral pyres and cremation is available from Kroeber (1925:750). After death, a trench was excavated near the deceased's house, willow (*Salix* sp.) or cottonwood (*Populus* sp.) logs piled above the trench, and the body lain on the pyre with the head facing south. More recently, mesquite (*Prosopis* sp.) branches were used for this purpose instead of willow and cottonwood (Stewart 1983a: fig. 11). Burning arrow weed (*Pluchea sericea*) was inserted into the pyre to set it ablaze. When the fire sunk into the pit, sand was pushed over it. The house and shade were immediately set on fire with all contents therein. Mourners threw offerings onto the pyre (Kroeber 1925:750).

About 1970, most Mohave still cremated their dead on funeral pyres. Some property was still burned, but not the house (Stewart 1983a:68). A Tribal member remarked that they stopped burning houses when they became too expensive to replace (Tribal Communication Meeting, August 24, 2012).

A special mourning ceremony (*keruk*) was held for men with illustrious war records and perhaps for chiefs (see below). It appears to have been held either immediately after cremation or days or weeks later. In the morning after the ceremony, the dead warrior's house and property, as well as the ceremonial shade and ceremonial paraphernalia, were burned (Forde 1931:252–253; Kroeber 1976:750–751; Stewart 1983a:67).

The Mohave Keruk shelter was built in a manner similar to the Quechan's (see "Preparation and Conduct of Post-Death/"Annual" Ceremonies," below). The Mohave Keruk shelter ceremony was held in a clearing 50–60 yards long, extending south from the main gathering shelter. The shade was set afire, and the ceremonial gear was burned. Mourners threw clothing and beads into the fire (Forde 1931:252–253).

Cahuilla (Desert Cahuilla)

The Desert Cahuilla cremated their dead and held a feast after cremation but before the image[9] ceremony (Forde 1931:258). The image ceremony was held approximately a year after the cremation and was functionally equivalent with other Yuman practices that attempted to bring closure to grieving families. Their treatment of the deceased's remains and property was otherwise similar to the other groups described here.

The Pass Cahuilla of the Palm Springs area used a ceremonial dance house for their mourning ceremony. This was a permanent structure and was not burned at the conclusion of the ceremony. Images were burned on a separate fire (Forde 1931:259, 262).

### *Quechan*

The Quechan treated the remains and property of their deceased in a manner similar to the mode described for the Mohave. The Quechan cremated their dead after a day of mourning. A shallow pit was dug to underlie the funeral pyre. Ashes and unconsumed bone would fall into the pit and were easily buried (Forde 1931:207–208). In pre-reservation times, all property of the deceased was destroyed or given away, including the family home. Cremation took place near the house (Bee 1983:89, 94; Forde 1931:208). The mourning ceremony, including the construction of a special shade structure, is similar to that of the Mohave (Bee 1983:93–94; Kroeber 1976:792).

Forde (1931:208, 210, fig. 9) presents detailed observations on a Quechan funeral that took place in 1928. The body was fully dressed, wrapped in many blankets, was carried to the cremation ground, where it was laid onto a frame of wooden poles. The frame was built over a pit that measured 6 feet long and 2 feet wide. The pit was fashioned with a bed of dried arrow weed and three large logs (7 feet long, 1 foot diameter). Supported by stakes driven into the ground, two other logs of the same length were placed along the outer edges of the floor. Arrow weed and brush were placed in the trough so formed, and a wall of twigs was arranged around the outside. Blankets were thrown on top. The body was laid in the trough and covered with brush.

Trippel (1889:582) described the cremation pit as v-shaped, measuring 7 feet by 3 feet by 3 feet. The body was wrapped in a heavy canvas. Short, thick pieces of wood were placed atop the body until the pyre was 7 feet high. Personal effects of the deceased were arranged on the pyre.

Traditionally, the house and belongings of the deceased were all burned, and favorite horses killed and <u>buried</u> (emphasis added); others were given away (Forde 1931:211). Bolton (1931, 4:337; as cited in Forde 1931:211) also reports that ceramic jugs were broken after death occurred.

The cremation of Pasqual, a principal Quechan leader (*$k^{w}$axoț*) from 1845 to 1887 (Bee 1983: fig. 10), followed a more elaborate pattern (Forde 1931:211–212):

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[9] Images are effigies of the deceased that take up to a year to manufacture and require traditional practitioners to travel around ancestral territory collecting specific materials used to construct the image or "doll."

> Two decorated horses were led to two deep holes dug at either side of Pasqual's body. The horses were killed with axes and thrown into the holes, which the Quechan covered with dirt. Mourners threw offerings onto Pasqual's burning pyre: calico cloth, pottery, weapons, other objects, even their own clothing.

The Keruk ceremony was held in a clearing (about a 250-square-yard area) among the brush of the Colorado River floodplain. The clearing was ringed by temporary shelters of cottonwood boughs. Booths were located along the north side of the clearing. The pyre was placed centrally in the clearing and was roughly flanked by the Keruk house on the north and a temporary shelter on the southwest. The temporary shelter is a square roof of arrow weed thatch supported by cottonwood poles at the center and along the sides The east or front side of the shelter had 6-foot-tall posts, while the back or west side had 3-foot-tall posts, creating a marked slope to the roofline of the structure (Forde 1931:224–225, fig. 10, plate 56).

To build the Keruk house, post holes were dug for the sides, corn placed in the bottom of the holes, and the poles inserted. Placement of the center poles followed the same procedure. Like the temporary shelter, the east side was supported by taller poles than the west side. Dense brushwood was placed on a light pole roof frame. During the Keruk ceremony, a small fire was built and moved between the east and west sides of the Keruk house (Forde 1931:228, 229, plate 57a). Images of the dead were burned on a brushwood pyre, and the Keruk house was burned. The small temporary shelter was burned as well. Ceremonial paraphernalia was burned on the pyre while mourners and onlookers threw blankets and clothing on it (Forde 1931:243–244).

Separate areas were made for storing arrow weed brush and poles. The image makers had a separate work area. The area of the image makers had a shelter (not described) (Forde 1931:224, 229, fig. 10).

### *Cocopah*

The Cocopah, too, destroyed all possessions and the body of the deceased at funerals (Kelly 1977; Williams 1983:110–111). As of 1981, this was still the American Cocopah's mortuary practice (Williams 1983:111).

The deceased was fully dressed before cremation. The house of the dead and all belongings were destroyed; even footprints were removed. Mourners threw offerings onto the funeral pyre. The Cocopah collected the ashes and removed them from the cremation site (Forde 1931:208).

Currently, the deceased's belongings are more often given away or sold. A year or so after a death, the Keruk ceremony is held in memory of one or more persons that died since the last Keruk ceremony. A shelter is erected specifically for the ceremony, and it is traditional to burn the structure in addition to the body (Williams 1983:110–111).

The ceremonial house was a rectangular shade structure supported by 12 poles, 4 in each of 3 rows from front to back. The front of the shelter was tall, the rear short. The dimensions of the house were about 27 feet wide and 13.5 feet deep. The sides of the structure were walled by brush. An enclosure was formed in front of the house by erecting two fences of poles and arrow weed. A fire was made in the resulting court (Forde 1931:255).

The Keruk house was burned, but devoid of any contents. A separate pit was dug in which clothes, money, bows, and arrows were burned. The pit was afterwards closed up with earth (Forde 1931:256).

## Ceremonies and Sacred Trails

### *Dreaming*

Dreaming, the knowledge and methods for proper dreaming, and the revelations resulting from dreaming are thought to be the basis of Lower Colorado Native American lifeways (Kroeber 1976:754–755, 783–784; Forde 1931:201–204; Gifford 1926:58–69; Wallace 1947:252–258). Dreamers are said to place the import of dreams above the reality that sensory perception provides in the awake state of consciousness. That is to say that dreams guide the person more than the immediately perceived world guides the person. Bad dreams mean a person will have bad luck in the world, good dreams mean that the person will have good luck in the world. This cultural phenomenon, specifically honed in the lower Colorado River area, has led anthropologists to herald the people and practice “as one that can grow only out of a remarkable civilization” (Kroeber 1976:754).

Some may argue that dreaming is a matter for individuals and only individuals. That is to say dreaming has no relevancy for any cultural collectivity beyond the idiosyncratic musings of an individual with him or herself. While that may be true for the role of dreaming in other cultures, including American popular culture, that is not the case with the cultures of the Lower Colorado River. Without asserting that all Yuman dreaming is relevant to the larger social whole, methods have been developed for classifying dreams into, 1) categories relevant to social groups, and 2) those relevant to individuals (Lincoln 2003:189–206). Lincoln distinguishes between “cultural pattern dreams” and “individual dreams.” Lincoln also suggests that, as cultural traditions change or fragment, so also may the dreaming motifs, qualities, and relative importance placed on dreaming switch from culture-pattern dreaming to individual dreaming. Lincoln provides an example of how a Yuman dreamer of the last century, undergoing a conversion from traditional Yuman religion to Christianity, also underwent a change in the quality and relevance of dreaming (Lincoln 2003:192–193).

An example of Yuman culture-pattern dreaming is where various dreamers, independent of one another dream of the same series of events with the same deities engaged in helping the dreamer to gain some aspect of knowledge, insight or foresight, or other power. Characteristically, one of the most prevalent culture-patterned dreams involves the Creator *Mastamho* assisting the dreamer along the Xam Kwatcan/Dream Trail on a journey to Spirit Mountain, the place of Yuman creation. Yuman people wishing to reconnect with the fundamental principles of their culture can physically walk the Xam Kwatcan/Dream Trail as a form of reconnection back to the place or origin. Those that wish to make the journey often can dream the pilgrimage. Yuman dreamers currently travel the Xam Kwatcan/Dream Trail on a regular basis.

Lincoln (2003:189–206) further bifurcates the individual dreaming phenomenon into two other categories, 1) those dream events that do not purport to be the same as others' dreams (and are therefore not culture-pattern dreams) but remain relevant to cultural phenomena, and 2) those dreams that are individually based and that do not have any basis in the larger culture. Dreamers will often have familiar landscapes that are culturally significant that are travelled within the dream state. Various landscape contributing features such as vegetation, animals, and landforms become pivotal markers on the landscape for anchoring the person's dream journey. These contributing features exist both in the physical world that the dreamer visits in the waking world, as well as in the dream world that the dreamer traverses while dreaming. Therefore, an alteration in the physical landscape has a direct effect in the quality and ability of the dreamer to traverse the landscape while in a dream state.

It is specifically culturally-patterned and individual cultural dreams that dreamers discuss with others, either in deciphering meaning, predicting events, or admonishing or pre-cautioning family and community members about past or future events that may bode well or ill for those involved. It is in the telling of the dream that the power of dreams guides a people towards a culturally relevant destiny.

### ***Ceremonies***

#### Keruk Ceremony

After a funeral, there was generally a year of grieving that was then followed by a the Keruk Ceremony to move the soul along the dream trail towards Spirit Mountain and the afterlife in the above world. This journey of the deceased, grieving family members, and the traditional specialist who assists in this journey is further described below in the "Keruk/Xam Kwatcan Trail" subsection.

#### Mesquite and Harvest Festivals

During the month of July and after the mesquite pods have ripened, lineages and extended families mobilized for the gathering of the important food source. Up until July most people subsided on a "catch as catch can" basis. The previous year's agricultural harvest had usually given out sometime during February. Hence the arrival of ripe mesquite was enthusiastically welcomed. The following excerpt from Castetter and Bell (1951:229) will suffice:

> When the mesquite crop was abundant it was made a matter of universal rejoicing and congratulations. As the fruit ripened, the outlying districts were notified of the date of the ceremony by runners, and when a sufficient number of Indians had assembled, a large open bower or shed was built and at sunrise each morning young and old went to the mesquite groves to gather the pods in large baskets. The fruit was then brought to the shed and prepared by first discarding the inferior pods, then saturating the rest with water and burying the sticky masses in the ground. After a day or two they were taken up, much shrunken and almost solidified, and piled in stacks beneath the shed. When enough had been gathered for storage, a light brush fence was constructed around the shed and bundles of pods were placed in different parts of the enclosure, in sets for each district represented. The evenings were spent in singing, dancing, playing

> games, and love-making. On the last day the participants gathered outside the frail fence and, at a given signal, dashed through the fence toward the piles of beans, each seizing as many bundles as possible, meanwhile in good nature seeking to prevent his neighbor from securing a share. Then all shouldered their bundles of pods and departed for home.

During the month of November, just after harvesting and before people departed from the agricultural areas of the floodplain and made their way to the mesa for the winter, harvest festivals were held. The fall Harvest Festival was similarly more of a social gathering and less of a religious event. Castetter and Bell (1931:230) further describe the festival:

> The Indians sang songs of rejoicing and old men made speeches about the goodness of nature. Foot races, wrestling matches, kicking ball contests, gambling games, and later horse races characterized the celebration during which men bet articles of clothing, etc. If the harvest were abundant in any section of a tribe's territory, the chief or some other prominent individual summoned the tribe to a prearranged point for the celebration.…The host families were instructed to bring generous contributions of pumpkins, maize, etc., being certain to bring the best of each crop, for it was the habit of the tribes to give away only the best. Families brought this produce with no thought of their own later needs. The products were sorted and stacked in large heaps in front of a special shelter constructed for the event.…Yuma singing, dancing, frolic, and feasting continued throughout the night, songs having to do particularly with the growing and abundance of crops.…The following morning the guests departed, and as they were leaving each passed in front of the shelter and gathered up an arm load of the crop, which he took home.

### ***Sacred Trails***

Salt Song Trail—Southern Paiute, Chemehuevi

The Salt Song Trail has been researched and described in a previous Energy Commission document (Gates 2012:72–74). The previous study, conducted in response to a proposed solar project that may be approved for construction in the Pahrump Valley, was done in collaboration with a Southern Paiute Salt Song practitioner. The following has been excerpted from that study.

> Many and various Southern Paiute still believe in, practice, understand, and educate others concerning the Salt Song Trail. The song trails are for all Southern Paiute. It can be argued that Salt Song Trails are the most important of all trails for Southern Paiute because, sooner or later, all Southern Paiute will travel that trail (Stoffle 2009:40).
>
> Upon death, a person's spirit or soul travels to a place towards the north called *Naugurivipi*, or the "spirit land." The funeral ceremony is held soon after death. Within three months to a year later the *Yagapi* or "Cry" or "Mourning" ceremony is held. Several deaths could be handled in one ceremony. Runners were sent out to travel the trails to send word of the selected date for the ceremony. Parties traveling to participate in the Cry

ceremony would collect items useful for constructing the ceremonial structures. Singers were selected to sing the deceased along the Salt Song Trail and eventually on to permanent residence in the afterlife.

The Salt Song is sung at the Annual Morning Ceremony or Cry Ceremony. The Song ushers the ceremony participants and the spirit of the deceased from place to place in a circuit and naming places, landforms and other natural phenomena. The song-travels are done at night. Each place along the way has its own story and part of a song. The man shacks [shakes] the rattle and both man and woman sing the songs. The Salt Song describes where to go and how to get there and what can be found at specific places. Southern Paiute people travel on these trails physically across the land, mentally in a dream state, and spiritually after death.

The following additional information was provided by a Salt Song singer. This information is provided to summarize what Salt Song Trails mean and how they function in the Southern Paiute world today.

Various trail songs are vocal snapshots of the landscape. Various places and geographic features are covered, but that does not mean that a song has less significance for a particular area because a place is not mentioned in a song. However, playas and flat desert areas are mentioned in songs…not just prominent landscape features, such as springs or mountain ranges/peaks. There are 364 plants and 170 animals mentioned in the songs. The vocal snapshot is a total experience; not just a visual experience. It is sung and therefore it is an auditory experience. Therefore, there is a reverberation, resonance quality that rings throughout valley/mountains.

When something is taken that was not properly requested, then traditional Southern Paiute believe that physical and spiritual imbalance results. Imbalance causes sickness and that increased imbalance places a burden on singers and healers. It is not a matter of whether a traditional system works in the face of incompatible change, but rather the difficulty or additional burden to continue adapting and adjusting to incompatible change.

When singing, the traditional system is very complex and requires cognizance of ten directions: cardinal directions (4), up/down (2), past, present and future (3), and self (1).

Songs follow a tradition, but also are individual expressions that resonate, reverberate with the land, the songs both re-make the land and are made by the land. Because of individual singers with multiple directions, there are multiple landscape iterations. Songs do not follow linear trails, but fill/make space. Prayers/Songs respond to the land and the land speaks back. This is two way “memory lane.” Weather and climate are part of this memory.

Singing requires a visual, auditory, and spiritual solitude. Large land developments in the midst of these song-scapes cause havoc or chaos…not just for the singer, not just for what the singer seeks to balance, but also the entire Paiute world…and the entire world …cosmos.

Havoc or chaos confuses and angers spirits who are the environment and its constituent plants and animals. Water spirits are one such spirit. Magma is a type of water spirit…just from a lower world. It can be angered.

The land has emotions just like humans: joy, anger, jealousy, confusion, clarity etc. The songs are an antidote to harm (Interviewee, Personal Communication).[10]

The following information concerning the Salt Song Trails is provided:

Salt Songs can be obtained by going to certain caves (Laird 1976:38-39).

Every tribe and practitioner has a different version of the songs so it can be confusing.

Performing the Salt Song ceremony is an obligation.

The grieving family is the host. The singers meet in a common area before entering into the host's place. The host sends a runner to meet the ceremonial singers, who are then ushered into the funeral/ceremonial area. The host then announces to the assembled group who the singers are.

The funeral ceremony can go on for days and in the past it was expected that all attendees were required to stay for the entire duration of the ceremony. Now-a-days, the people come and go to pay respect. But the singers still stay for the whole ceremony. The bird songs and ceremony are for the one-year memorial. Some other tribes sing the bird songs for entertainment. All of these ceremonies are serious matters and should be taken seriously. These are not things to be played with [This expression, "The Salt Song Trails are very sacred and are to be taken seriously and are not to be played with," was repeated several times throughout the interview].

The Salt Songs continue to be sung and the trails continue to be travelled into the present. The following summary information comes from a publication of the Storyscape Project of The Cultural Conservancy.

The Salt Songs are the sacred songs of the Nuwuvi people and describe a physical and spiritual landscape spanning ocean and desert, mountains

[10] This citation references the traditional practitioner interviewed for a project proposed for the Pahrump Valley. Anonymity is preferred when interviewees discuss cultural information of a sacred nature that will be used in documents that may be read by the public.

> and rivers, life and death. The landmarks identified on the map, are described by the songs and represent ancient villages, gathering sites for salt and medicinal herbs, including routes, historic events, sacred areas, and cultural landscapes. At memorial ceremonies, Salt Song singers “throwing the gourd” are accompanied by dancers as they perform the 142 song cycle from sunset to sunrise to assist the decreased in their sacred journey. The Salt Songs begin their journey at *AviNava/Ting-ai-ay* (Rock House), a sacred cave at the confluence of the Bill Williams and Colorado Rivers. The songs travel north along the Colorado River to the Kaibab and Colorado Plataeu, into Southern Utah, and then west to the great mountain *NuvaKaiv* (Mt. Charleston)—the place of origination of the *Nuwuvi* People—and then further west to rise above the Pacific Ocean before arcing back east through the Mojave desert to their origin at *Avi Nava*.
>
> At memorials it is the responsibility of the lead singer to guide the singers across the spiritual landscape to gather at *NuvaKiav* (Mt. Charleston) at midnight when the mourners assist the deceased in their spiritual crossing (Klasky 2009:1–2). “I am like a bus driver…making sure that the singers visit all the right stops at the right times along the way,” said a lead Salt Song Singer (Larry Eddy quoted in Klasky 2009:1–2).

A map of the Salt Song Trail is provided as **Cultural Resources Figure 5**. This map was produced in 2009 and was constructed based upon input from current Salt Song practitioners, including those of Chemehuevi descent. **Cultural Resources Figure 5** depicts the trail corridor coming to the Colorado River from the west and across the Chocolate Mountains and Indian Pass area towards the Colorado River. The trail corridor then follows the Colorado River up-river and past the project vicinity. An early map provided by Laird (1975) has the Salt Song Trail proceeding southward along the western side of the McCoy Mountains, and cutting across the northern tip of the Mule Mountains as it makes an eastward turn towards the Colorado River. Practitioners today adhere to the course depicted in the more recent 2009 map.

The Salt Songs cross, reverberate, and provide passage for deceased Southern Paiute, including Chemehuevi, in the vicinity of and to the immediate north and south of the project site.

Keruk/Xam Kwatcan Trail

The Keruk/Xam Kwatcan Trail runs the length of the Colorado River between Spirit Mountain (Newberry Mountains) in the north and Pilot Knob (Carzo Machacho Mountains) in the south. This distance, approximately 140 miles in length, is depicted on **Cultural Resources Figure 6**. The trail follows the river along the various mesas that align the river and, where possible, avoids the river’s various floodplains. In some places, particularly along the southern extent, the trail is located on both sides of the river. The trail on the eastern side that stops in Parker Valley has relevance for plant medicinal journeys. The three “Big Houses,” Spirit Mountain in the north, Pilot Knob in the south, and Palo Verde Peak in the middle, are abodes of ancestor sprits (relatives who have passed away) (Johnson 2003:163). After the deceased’s funeral, a year of mourning is completed. The Keruk ceremonial function is intended to bring closure to the grieving family and community. Family members will travel near to the Big Houses and, utilizing the various earth figures along the trail, will address the ancestor spirits and ask that they move on to the next world. The Mule Mountains, located adjacent to Palo Verde Peak, are thought to be a place of wandering ancestral spirits waiting to depart. The areas reserved for beseeching ancestral spirits to depart this world are often marked with earth figures, cairns, and trails. At a comfortable distance away from the earth figures are cleared camp sites. Hence the earth figure sites (approximately 300 sites) along the Keruk/Xam Kwatcan Trail are major foci for intense activity between the living and the deceased. The larger earth figure sites (three of which are near the project site) also tend to be crossroad locations for trails running east and west. Along the outer perimeters of this trail corridor are smaller earth figures with accompanying cairns, cleared rings, nearby camp sites, and smaller interconnecting trails. Lithic scatters, including crushed quartz rock, are sometimes found in association with the other site types. Throughout the entire Keruk/Xam Kwatcan Trail corridor, the areas are covered with various specific objects of archaeological importance and cultural relevance such as lithic sites and pot drop sherds. (See **Cultural Resources Tables A-2**, **A-3**, and **A-4**, in the appendix, for a listing of archaeological objects and sites found in or near the project vicinity that may have ethnographic importance related to trail systems.)

The entire system of the Keruk/Xam Kwatcan Trail consists of various segments of the trail, several significant mountain ranges and specific peaks, numerous side trails, numerous earth figures, and thousands of objects such as lithics, cairns, pot sherds, and cleared sleeping or camping areas. The trail system, following the river both adjacent to and along the river escarpments, is also a route for secular travel.

## Implications for the Archaeological Record of Ethnographically Known Mortuary Practices

The mortuary practices reviewed above show considerable parallels among the Tribal groups in terms of the physical preparation and disposal of the deceased’s corporeal remains and property. The pattern of the Tribal groups discussed herein can generally be described thus: 1) the body is prepared for cremation or burial; 2) the remains are cremated or buried, with or without the property of the deceased; 3) the deceased’s property and home might be burned separately from, but at about the same time as the body; 4) the remains of the body and any burned property are removed or abandoned; and 5) the post-death/”annual” ceremonies are prepared and conducted (see “Preparation and Conduct of Post-Death/“Annual” Ceremonies,” below). This subsection of the report explores their potential archaeological consequences in this approximate sequence.

### Preparation, Cremation, and Burial

Concerning preparation of the body, the aboriginal practice seems clearly to have been cremation among the Yuman speakers. Prior to cremation, the body was dressed and/or wrapped in blankets (Forde 1931:258– 259; Williams 1983:110). Items special to the deceased were sometimes placed on the body prior to burning. In other cases, as with the Quechan, the deceased’s belongings were placed on the pyre prior to burning. The funeral pyres of the Cocopah, Mohave, and Quechan overlaid pits of approximately the same dimensions: 6–7 feet by 2–3 feet by 3 feet. Only the Cocopah are reported as removing the cremains from the pit; the other groups simply filled in the hole. Cemeteries are not recorded for the Tribal groups addressed here, doubtlessly because cremations were usually conducted near the home of the deceased and left in state. At times, animals might have been buried near the deceased or burned on the funeral pyre. Mourners and on-lookers threw offerings onto the funeral pyre as well.

Little is said in the ethnographic record about mode of burial. The Chemehuevi placed the deceased in a rock cleft or shallow wash.

Given the mode of cremation described in the regional ethnographic record, human cremations could be manifested in the project vicinity as pits filled with ash, wood charcoal, bones and teeth (cremains), and various grave goods. Accoutrements could reasonably include charred clothing, bone, shell beads, faunal remains, and other artifacts. The remnants of cremation pits may or may not be evident on the ground surface. As to the likely appearance of interments in the archaeological record, the option evidenced among Yuman speakers is bones and perhaps grave goods buried in washes or collapsed in rock crevasses.

The ethnographic context of cremation reported here calls for cautious interpretations of the status and wealth of individual cremations. With entire communities contributing items to funeral pyres, the quantity of goods present with crematory remains in archaeological context should not be construed as a direct indication of individual status or wealth. Comparative data from other cremations would permit reasonable inferences about individual status and wealth, given sufficient sample sizes.

Cremations will likely be in close proximity to structural archaeological features under favorable preservation conditions, since cremations were typically conducted near the deceased’s residence. Dedicated cemeteries are not reported for the Chemehuevi, Cocopah, Quechan, Desert Cahuilla, or Mohave.

Rock cairns, which variably mark trails, burials, or other phenomena, occur in the project vicinity as piles of rock standing from one to three courses in height. Older cairns are frequently indicated by stronger desert varnish or patina (Nixon et al. 2011).

### Destruction of Home and Property

The destruction of the deceased’s property by fire was practiced by the Cahuilla, Chemehuevi, Cocopah, Mohave, and Quechan. The ethnographic record indicates that the body (discussed in the previous subsection), property, residence, and associated structures were destroyed at about the same time. The majority of personal property was burned with the body, although some possessions may have been left in the residence, which was then burned. All five Indian groups described herein burned the deceased’s residence and other structures. To derive potential archaeological consequences of structural burning, it is necessary to consider the construction and materials of native structures. Structures known to have been built in the project vicinity include six types: winter houses, domed brush houses, granaries, field houses, ramadas, and open-air brush enclosures.

Winter houses and domed brush houses must have been the most frequently burned structures, as they were the primary residence for much of the year. Among the five

Tribal groups of the project vicinity, the winter house was supported by 2–6 central wood posts. Further roof support and wall structure was provided by up to 20 additional posts at the perimeter of the structure. Other notable features of winter houses were occasional semi-subterranean construction and indoor floor hearths. The winter house followed a rectangular plan, 20–50 ft. on a side (Bee 1983:89, fig. 2; Forde 1931:120–122, fig. 4; Kelly and Fowler 1986:375, fig. 3; Kroeber 1925:731; Stewart 1983a:57, fig. 5; Williams 1983:105).

Domed brush houses also were made throughout the project vicinity. These structures were approximately 9–20 feet in diameter and composed of bent wood poles with arrow weed thatch. Field houses were built in a similar manner, although they were more ephemeral structures that were open at the front and back (Bean 1978:577, fig. 2; Forde 1931:122; Kelly and Fowler 1986:375, fig. 3; Williams 1983:105).

Granaries were constructed of arrow weed and/or willow and placed on a four-post wood frame (Bean 1978:578, figs. 4–5; Kelly and Fowler 1986:375, fig. 3).

Ramadas were flat-topped shades, lacking walls, supported by nine or more perimeter posts and covered with arrow weed or willow thatch. Ramadas were sometimes built next to or in front of residences (Bee 1983:89, fig. 2; Forde 1931:120–122, fig. 2; Kelly and Fowler 1986:375, fig. 3; Kroeber 1925:731; Stewart 1983a: 57).

Open-air brush enclosures are reported among the Cocopah and Quechan. Arrow weed or willow was used to fashion the structure, which sometimes was free-standing, but often erected adjacent to a residence. The literature reviewed for this study contains no reference to deliberately burning enclosures that had belonged to the deceased, but the firing of granaries among the Mohave and their frequent proximity to residences indicate a distinct possibility that the enclosures would at least occasionally be burned (Bee 1983:89, fig. 2; Forde 1931:120–121; Williams 1983:105).

The most enduring aspects of the aboriginal structures reviewed here would be the support structure of winter houses and dome houses. Having been burned, the support poles are likely to leave charcoal-filled postholes. Hearths also may be preserved, evidenced by fire-discolored soil, charcoal, and perhaps a stone ring. The location of these features can aid in the interpretation of site function. Fragments of roof fall might also be preserved after burning. Various artifacts could be expected in this context, though their preservation will vary with material type and its resistance to fire.

The ramada can be expected to leave post holes after being burned, but generally less structural and artifactual material. The field house, granary, and brush enclosure were far more ephemeral structures and may leave little recognizable trace in the archaeological record.

### Preparation and Conduct of Post-Death/“Annual” Ceremonies

Although the Desert Cahuilla employed a permanent ceremonial structure for their “annual” ceremony, the Cocopah, Mohave, and Quechan are known to have built ceremonial structures and burned them during the proceedings. Preparation and conduct of the annual ceremony has several implications for the structure of the archaeological record, affecting the representation of structures, other ceremonial features, and distribution of site and landscape elements on the ground.

In its most elaborate form, recorded among the Quechan, the annual ceremony involved the construction of three ceremonial structures, numerous shelters and booths for participants, and shelters for image-makers. The ceremonial structures (temporary shelter and keruk house) resembled the winter houses but were not covered with earth. Keruk houses were generally about the same size as winter houses (25–35 feet diameter).

After burning, these structures would potentially leave the same traces in the archaeological record as described in the previous subsection: charcoal-filled post holes, hearths, fire-discolored soil, and perhaps roof fall. In addition, corn may have been placed at the bottom of the post holes before insertion of the poles. Keruk houses, therefore, might be recognizable as such, should charred corn be found in post-hole remains. Under favorable conditions, fragments of clothing and beads—offerings from mourners and on-lookers—might be preserved within burnt structural remnants.

Other features associated with annual ceremonies that can leave a discernible archaeological remnant include free-standing hearths and pyres constructed for burning images of the dead and offerings. Images were fashioned from wood or, more rarely, reeds and were wrapped in clothing (Forde 1931:229).

The conduct of the annual ceremonies might also be expressed on the archaeological landscape in constellations of related features. Although a certain amount of variability characterized the practice of annual ceremonies among historically documented Indian groups (to say nothing of potential variability during approximately 12,000 years of prehistory) the Mohave and Quechan made specific use of space and modified their surroundings during these ceremonies. Earlier, this report disclosed that cleared areas among river-floodplain brush were an essential element of Mohave and Quechan annual ceremonies. Within the cleared areas, ceremonial structures and features were patterned in ways that are archaeologically discernible. According to the description of the Quechan annual ceremony, a ceremonial ground might manifest in the archaeological record as follows: a centrally located hearth-like feature representing the image pyre, flanked north and south by burned post-hole remnants and other burnt structural debris. Nearby, the edges of the ceremonial ground might be marked by sparse artifact scatters consistent with short-term occupation by several family groups. Expected artifacts might include pottery fragments, ground-stone tools, and faunal remains. Hearths would be marked by fire-affected soil and perhaps rock rings.

## ETHNOGRAPHIC LANDSCAPES

### *Analysis Summary*

This analysis has divided some of the Native American lifeways, and how those lifeways are intertwined with a landscape, into eight attributes: water, plants, agriculture, animals, trails, landforms, mortuary treatment and ceremonies and sacred trails. The reader will note that there is crossover between categories. For example, trails are waterways, trails are songs, trails are ceremony, trails are for hunting and gathering, and trails run through all of the landforms that allow traditional practitioners (and others), to travel between the mountains, valleys, gardens, plants and animals, and homes and camps. Likewise any of the other attributes can be explained in terms of, or have overlaps with, the other attributes. The world is one holistic phenomenon. This whole is segmented into attributes so that non-Native Americans can understand something about the lifeways of a different people.

Native Americans from the various tribes consulted for this study, continue to practice their traditional ways as best they can against the backdrop of modern dominant society and the various developments that come with modern society.

Several overlapping ethnographic landscapes comprise the area. They have as their contributing attributes or elements: water, plants, agriculture, animals, trails, landforms and ceremonies and sacred trails. These ethnographic resources encompass the project site.

### *Ethnographic Resources Inventory: Ethnographic Landscapes*

Staff has identified three ethnographic landscapes that, with varying proximity, are in the vicinity of the project:

1. Salt Song Trail Landscape
2. Keruk Trail/Xam Kwatcan/Earth Figures Landscape
3. Palo Verde Mesa Ethnographic Landscape

These landscapes are described and evaluated below. (See "Evaluations of CRHR Eligibility of, and Project Impacts on, Ethnographic Resources Identified by Record Search and Field Investigation.")

## HISTORIC-PERIOD BUILT-ENVIRONMENT FIELD INVESTIGATIONS

The applicant conducted a windshield survey of the project vicinity on March 9, May 3–5, and May 18, 2011 (Nixon et al. 2011:5-1327). A windshield survey consists of systematically driving the public roads in the survey area and observing and recording built-environment resources that appear to be 50 years of age or older, without trespassing on private property.

The applicant identified no buildings on the project site, but identified 13 built-environment resources. These resources included:

- The Bradshaw Trail (RMS-ML-003/CA-RIV-5191/P-33-5119)
- Pilot Knob-to-Blythe161-kV Transmission Line (RMS-ML-001/P-33-011110)
- Niland-to-Blythe 161-kV Transmission Line (RMS-ML-002/CA-RIV-7127H/P33-012532)
- Open Pit Mines No. 1 and No. 2 and Access Road (RMS-ML-004)
- Hodges Mine Access Road (RMS-ML-005)
- Portion of Opal Hill Mine Access Road (RMS-ML-006)
- State Route 78 (PVM-ML-007)

- Bradshaw Trail Borrow Pit (RMS-ML-008)
- Portion of Palo Verde Irrigation District (PVID) Hodges Drain (RMS-ML-009)
- Portions of PVID C-03 Canal (RMS-ML-010)
- Portion of PVID Palo Verde Drain (RMS-ML-011),
- Portion of PVID Estes Drain (RMS-ML-012)
- Portion of PVID Private Drain No. 1 (RMS-ML-013)

Staff visited the Rio Mesa SEGF built-environment PAA on two occasions; December 14, 2011, and May 10–11, 2012. Staff observed the majority of the applicant-identified resources. Open Pit Mines No. 1 and No. 2 and Access Road (RMS-ML-004), and Hodges Mine Access Road (RMS-ML-005) were not observed, but these resources are no longer within the built-environment PAA due to the reduction in project size since the original application. Staff did not identify any additional resources. The discussion of the drains and canals is included in the CRHR eligibility evaluation of the PVID, below, under “Evaluations of CRHR Eligibility of, and Project Impacts on, Individual Historic-Period Built-Environment Resources Identified by Record Search and Pedestrian Survey.”

## PREHISTORIC ARCHAEOLOGICAL RESOURCE INVENTORY AND EVALUATION, IMPACT ASSESSMENT, AND MITIGATION RECOMMENDATIONS

## CONTEXT FOR PREHISTORIC ARCHAEOLOGY

Human populations have occupied the California desert for at least 10,000 years (Moratto 1984). Stratified sites that would aid in providing temporal controls and help establish a cultural chronology are virtually unknown in the study area. The earliest explorations of the Mojave and Colorado Deserts took place in the 1930s and 1940s (Campbell 1931, 1936; Campbell and Campbell 1935; Campbell et al. 1937; Rogers 1939, 1945). During this time a basic cultural-historical outline was established that has formed the foundation for subsequent efforts (Arnold et al. 2002:46–48; Love and Dahdul 2002; Schaefer 1994; Warren 1984). However, these early attempts were based on surface scatters and inference rather than large-scale data recovery projects or regional surveys.

Numerous cultural resource management projects have resulted in dramatic increases in our understanding of the prehistory of the region. The BLM’s large-scale cultural resources inventory of the Central Mojave and Colorado Desert Regions (Gallegos et al. 1980) and Crabtree‘s (1980) overview are two of the most notable synthetic works. It was not until the late 1990s that any archaeological site was excavated and reported in the literature within 100 kilometers (km) of the Rio Mesa SEGF project site. Jones and Klar’s (2007) recent review of California archaeology builds from where these earlier authors left off, including the results of recent data recovery projects (Schaefer and Laylander 2007; Sutton et al. 2007). The following discussion and culture-historical sequence primarily follows the sources listed above.

## Culture History

### Paleo-Indian Period (about 10,000–8000 BC)

The Paleoindian Period occurs during the first half of the Early Holocene. Isolated fluted projectile points, assignable to the Western Clovis Tradition have been recovered from the Pinto Basin, Ocotillo Wells, Cuyamaca Pass, and the Yuha Desert (Dillon 2002:113; Moratto 1984:77, fig. 3.1, 87; Rondeau et al. 2007:64–65, fig. 5.1, table 5.1). All are surface finds, and have no associations with extinct fauna.

### Lake Mojave Complex (8000–6000 BC)

The Lake Mojave complex, also known as the Western Pluvial Lakes/Western Stemmed Tradition (Beck and Jones 1997; Erlandson et al. 2007; papers in Graf and Schmitt 2007; Schaefer 1994:63–64; Sutton et al. 2007; papers in Willig et al. 1988), occurs during the second half of the Early Holocene. It is characterized by Great Basin Stemmed Series projectile points (Lake Mojave and Silver Lake types), abundant bifaces, steep-edged unifaces, crescents, and occasional cobble tools and ground stone tools. These artifacts often occur in undated surface contexts. Assemblage composition and site structure suggest highly mobile foragers, often traveling considerable distances. Little reliance upon vegetal resources is evidenced. The value of wetland habitats remains unclear. Lake Mojave lifeways may have resulted from relatively rapidly changing climate and habitats during the Early Holocene. This would have produced unpredictability in resource distribution and abundance, producing a high degree of residential mobility.

### Pinto Complex (8000–3000 BC)

The Pinto complex spans portions of the Early and Middle Holocene. Toolstone use, based on sites attributed to this complex, focus upon materials other than obsidian and cryptocrystalline silicate (CCS). Pinto Series points are stemmed with indented bases, and display high levels of reworking. Bifacial and unifacial cores/tools are common. Ground stone tools are moderately to very abundant, indicating greatly increased use of plant resources. Pinto sites occur in a broad range of topographic and environmental settings, especially within remnant pluvial lake basins. Moderate to large numbers of people, practicing a collector subsistence strategy, occupied large residential base camps for prolonged periods. Logistical forays into surrounding resource patches probably were made from these sites.

### Deadman Lake Complex (7500–5200 BC)

Currently, the Deadman Lake complex appears confined to the Twentynine Palms area. Sites usually are surficial and located on old alluvial pediments. Artifacts include small-to-medium-size contracting stemmed or lozenge-shaped points, large concentrations of battered cobbles and core tools, and abundant bifaces, simple flake tools, and ground stone tools. The abundance of cobble tools suggests an emphasis upon plant processing. The Deadman Lake and Pinto complexes may represent two different human populations practicing different seasonal/annual rounds, or Deadman Lake may represent a component of the overall Pinto complex adaptation.

### Possible Abandonment (3000–2000 BC)

Beginning roughly at this time, conditions in the Mojave Desert were warmer and drier. Few archaeological sites date to this period. This suggests population densities were very low. It is possible some areas were largely abandoned. This period corresponds in part to the latter part of the proposed “Altithermal Abandonment,” recognized by some prehistorians as characterizing portions of the Great Basin (see Kelly 1997:8–9).

### Gypsum Complex (2000 BC–200 AD)

The Gypsum complex, spanning most of the Early Late Holocene, is characterized by the presence of corner-notched Elko Series points, concave-base Humboldt Series points, and well-shouldered contracting-stemmed Gypsum Series points. Numerous bifaces also occur. Manos and metates are relatively common. During the early portion of the Gypsum complex, settlement-subsistence appears focused near streams. At this time, increased trade and social complexity apparently occurred. Gypsum components are smaller, more abundant, and occur over a more diverse suite of settings than those dating previously. Evidence for ceremonial activities include quartz crystals, paint, split-twig animal figurines, and rock art. Gypsum sites are uncommon in the southern and eastern Mojave Desert.

### Rose Spring Complex (200 AD–1000 AD)

Cultural systems profoundly changed in the southern California deserts during the Late Late Holocene with the introduction of the bow and arrow, represented by Rosegate Series points. During this time, a major increase in population is thought to have occurred, possibly resulting from a more productive environment and a more efficient hunting technology. Sites often are located near springs, along washes, and sometimes along lakeshores. Intensive occupation is indicated by the presence of wickiups, pit houses, and other types of structures. Well-developed middens have yielded artifact assemblages containing knives, drills, pipes, bone awls, various ground stone tools, marine shell ornaments, and large amounts of obsidian. Obsidian procurement and processing apparently significantly structured settlement-subsistence.

During the middle of this period, a drought referred to as the Medieval Climatic Anomaly occurred, resulting in hypothesized resource shortages.

### Late Prehistoric Period (1000 AD–1700 AD)

During the Late Prehistoric period, horticultural practices and pottery were introduced (most likely from the Hohokam area in southern Arizona or from northern Mexico), having its greatest impact along the Lower Colorado River (McGuire and Schiffer 1982; Schaefer 1994:65–74; Schaefer and Laylander 2007:253–254). Ceramic artifacts began to appear in the Colorado Desert approximately 1000 AD, assigned to the Lowland Patayan (Lower Colorado Buff Ware) and Tizon Brown Ware traditions (Lyneis 1988; Waters 1982a, 1982b).

A complex cultural landscape composed of rock art, trails, and earth figures[11] developed during the Late Prehistoric period. Trade and exchange were elaborated, with an emphasis on links between coastal southern California and the Southwest. In addition to pottery, artifact assemblages include Desert Series projectile points, shell and steatite beads, and a variety of milling tools. Obsidian use declines significantly, with CCS becoming the dominant toolstone.

## Research Topics

Research topics commonly appearing in the Colorado Desert archaeological literature include toolstone procurement, ceramic traditions, horticulture, trade and exchange, and cultural landscapes.

### Toolstone Procurement

The geology of the Colorado Desert provided prehistoric peoples with a variety of lithic materials for artifact production (Schaefer and Laylander 2007:252–253). These included obsidian, cryptocrystalline silicates (chert), crystalline volcanics (basalt, rhyolite), quartz, and plutonic, metamorphic, and sedimentary rocks.

Coso obsidian was the dominant source of obsidian used by Colorado Desert peoples prior to 1000 AD. Other obsidian sources, from the southern Mojave Desert, include Bristol Mountains and Devil Peak (Shackley 1995). Approximately a dozen sources located in Baja California, extreme northwest Sonora, and western Arizona may also have been used (Shackley 1988, 1995, 2005). During the last thousand years, however, Obsidian Butte was the principal obsidian used in the Colorado Desert and coastal southern California (Hughes 1986; Hughes and True 1983; Laylander and Christenson 1988; Schaefer and Laylander 2007:251). Obsidian Butte, located near the southern edge of the Salton Sea, was inaccessible when Lake Cahuilla rose to inundate it (130 feet above sea level).

Several topics relating to prehistoric quarrying and tool manufacturing/use have been identified, including: distinction between formal versus the expedient procurement of toolstone (Wilke and Schroth 1989); lithic reduction strategies and transport of toolstone (Bamforth 1990, 1992); scales of production at ground stone tool quarries (Schneider et al. 1995); and differences in tools/toolstones by gender (Walsh 2000).

Bamforth (1990, 1992) considers Holocene settlement, raw material, and lithic procurement at several quarry sites in the central Mojave Desert. He suggests that quarry use was conditioned upon mobility strategies, regional quality and abundance of toolstone, as well as quarry location. Bamforth suggests that an emphasis on transporting prepared cores during the period 2000 BC–500 AD may have resulted from the formation of relatively large and stable communities in areas with concentrated plant resources.

[11] Earth figures, also known to archaeologists as geoglyphs or intaglios, were created on desert pavements by rearranging and/or clearing pebbles and rocks to form alignments, clearings, and/or figures. Rock alignments are present throughout this region, while representational figures only occur close to the Lower Colorado River. It is assumed that they played some role in sacred or ritual activities.

Singer (1984) studied two quarry workshop sites located in Chuckwalla Valley. Core production and reduction from locally available aplite was emphasized. This yielded flakes and bifaces that appear to have been exported from the quarries for final reduction at other sites. Few formed tools were observed. Those that were present were choppers and scrapers, possibly used to manufacture wooden digging or prying sticks and shafts. The quarry sites appeared to have experienced long-term occupation and use.

Manufacturing efforts appear to have been directed towards production of expedient, rapidly discarded cutting/scraping/pounding/milling tools from locally available toolstone(s) (Ludwig 2005; Schaefer and Laylander 2007:252–252; Singer 1984). Specialized tool manufacturing included production of sandstone metates along the western side of the Colorado Desert, projectile point (arrow) workshops at seasonal task sites situated around playas, and large quarries at volcanic outcrops within the Lower Colorado and Gila River Valleys, where mortars and pestles were made (Schaefer and Laylander 2007:252).

### Ceramic Traditions

Schaefer and Laylander (2007:252–253) note that buffware pottery occurring within the Colorado Desert was initially assigned to the Hakataya ceramic series (Schroeder 1958, 1979). Subsequent studies (Waters 1982a, 1982b, 1982c) place it within the Lowland Patayan Ceramic Tradition. Both typologies are based on surface collections of sherds, with little data resulting from stratigraphic excavations, or associated radiocarbon dates. Schroeder focuses upon details of temper, inclusions, and surface treatment, while Waters emphasize rim form. Both attempt to define geographic limits of production for each type. Difficulties in applying either typology and problems with stratigraphic integrity, archaeological contexts, and anomalous associated radiocarbon dates, have allowed only gross chronological estimates and have limited identification of manufacturing regions.

In the Salton Basin, some sites dating between about 350 and 1200 AD contain pottery (Love and Dahdul 2002). This evidence suggests pottery was not introduced or rarely used prior to about 1000 AD. Earlier dates from the preceding 200 years suggest Lake Cahuilla may have attracted Colorado River peoples (and their pottery). Early ceramic dates from the Colorado Desert correspond closely with the inception of widespread use of Tizon Brownware pottery in the Peninsular Ranges and along the Pacific Coast (Lyneis 1988; Griset 1996), although some dates suggest initial introduction of ceramics by 1200 BC, if not before.

Viewed regionally, pottery use within the Late Prehistoric of the Colorado Desert can be divided into three periods (Arnold et al. 2002:46–47; Love and Dahdul 2002:72–73; Waters 1982a, 1982b, 1982c). Patayan I times, about 1200–950 BC, witnessed the inception of several ceramic traditions. During Patayan II times, 950–500 BC, increased local manufacture and use of pottery occurred. Patayan III, 500–240 BC, saw the introduction of "Colorado Buff" pottery, and the westerly spread of ceramics to coastal southern California.

With respect to social and cultural factors governing pottery adoption and use within the Colorado Desert, recent analyses of pottery from the Mojave Desert and surrounding areas provide models focused on behavioral implications regarding its manufacture and function. Of concern has been determining if ceramic vessels were locally made (Eerkens 2001; Eerkens et al. 1999; Eerkins 2002a; Griset 1996). Neutron activation analysis and petrographic studies have been used to identify chemical and material signatures (Eerkens 2002b). Pottery manufacture does not appear to have been organized at a higher regional level. Instead, pots generally appear to have been locally produced and used, with limited exchange of pots between different groups. Production appears to have been organized at an individual or family level, emphasizing production of largely utilitarian wares.

Pottery from sites in the northern Mojave is characterized by a relatively high number of elemental signatures suggesting higher levels of mobility (Eerkens 2002b). In addition to a higher degree of residential mobility, Eerkens (2003b) suggests people inhabiting the northern Mojave Desert produced a fairly large numbers of pots. The combination of high mobility and a fairly high volume of pottery production is seen as leading to caching pots near lowland wetlands, which were fixed in the landscape, development of pottery attributes promoting fuel consumption, and a high degree of standardization of largely utilitarian ceramics.

Sedentism in the Owens Valley, northeast of the project vicinity, appears to have developed concurrently with, or immediately prior to, an emphasis on resource storage, at approximately 500 AD. Small seed intensification appears to have occurred about 700–600 BC, at the time brownware pottery became widely used. Eerkens concludes that social models, such as those suggesting the activities of aggrandizers or the stabilization of long-distance exchange networks, do not explain these developments. The role played by decrease(s) in population-to-resource balance(s), resulting from increased population pressure, remains unclear.

Eerkens (2003c; 2004) suggests the significant increase in small seed use and the advent of brownware pottery around 700–600 BC are linked. People focused upon seeds because they could easily be privatized. That is, they could be individually owned and thus would not be subject to unrestricted sharing. Pots were a critical component of small seed intensification, because they generally were individually made and owned and could be used within houses, allowing food preparation and consumption to occur in private. Privatization of small seeds may have resulted from increased population size yielding more potential “freeloaders,” new community kinship structures, and the creation of resource surplus.

### Horticulture

At the time of initial Euro-American contact, 240 years ago, native peoples living along the Lower Colorado River and the Colorado Delta were growing a wide variety of domesticates and wild grasses, which provided 30–50 percent of their subsistence economy (Bean and Lawton 1993; Castetter and Bell 1951; Schaefer and Laylander 2007:253–254). Annual flooding of the floodplains along the Colorado rejuvenated the soil and provided enough moisture to sustain crops. Lower Colorado River agriculture is presumed to have begun around 700 AD. It probably spread either from the Hokokam area (to the east), or from northern Mexico (to the southeast) (McGuire and Schiffer 1982).

Horticulture subsequently appears to have spread west from the Colorado River. Desert Tipai peoples practiced floodplain agriculture along the New and Alamo Rivers. They also constructed small dams and ditches along washes to direct irrigation water onto adjacent terraces. Agricultural elements probably reached the Imperial Valley around 300 BC. Seed caches and mythological references to cultigens possibly indicate very late prehistoric adoption of agriculture. However, the caches contained both native and Old World cultigens. Thus it is unclear if agriculture penetrated west of the Peninsular Ranges in southern California before Euro-American contact and the sustained influence that came with the establishment of Spanish missions.

Native cultigens may have reached the western Colorado Desert through trade instead of by local production (Schaefer and Laylander 2007:254). Within the Colorado Desert, several archaeological sites have ceramic jars or rock-lined cache pits containing food remains of native or Old World plants (cf., Bayman et al. 1996; Swenson 1984; Wilke 1978; Wilke and McDonald 1989; Wilke et al. 1977). Pumpkin seeds occur in human coprolites (fossilized feces) from the Myoma Dunes at the north end of Lake Cahuilla, and also in a ceramic jar from the west shore of Lake Cahuilla, north of the Fish Creek Mountains. The latter dated to 580–340 BC (Wilke 1978; Wilke et al. 1977).

Early-to mid-nineteenth-century Cahuilla archaeological sites contain glass beads, flaked glass, domestic animal bones, carbonized maize and tepary beans, and uncarbonized gourds. Abundant evidence exists indicating the Cahuilla practiced irrigated agriculture during the early- and mid-nineteenth century. The paucity of macro- and micro-fossil cultigen remains from prehistoric archaeological deposits in Cahuilla territory strongly suggests agriculture did not play a significant role in the Cahuilla economy until the early nineteenth century. Early historic intensification of agriculture may have resulted from final desiccation of Lake Cahuilla, regional population growth, decreased mobility, and acculturation, including introduction of Euro-American irrigation techniques.

In the Mojave Desert and environs, in the approximate period from 2000 to 800 BC, agriculture first was practiced in southern Nevada and environs as a consequence of the Anasazi Intrusion (Warren 1984:421, fig 8.25). Maize, squash, beans, grain amaranth, and sunflowers were grown. Agriculture was practiced along with foraging for wild plants and animals. Fields probably were irrigated in some manner. Agriculture appears to have intensified over time.

The Owens Valley Paiute were Great Basin Numic-speaking horticulturalists (Lawton et al. 1976; Liljeblad and Fowler 1986:417–418; Steward 1930, 1933, 1938, 1941, 1970). Ditch and surface irrigation of blue dicks (*Brodiaea capitata*), yellow nut grass (*Cyperus esculentus*), and spikerush (*Eleocharis* sp.), was practiced. This most likely developed during late prehistoric times, possibly triggered by increased population pressure resulting from climatic change and/or immigration (Bouey 1979).

Yohe (1997) notes aboriginal cultigens, such as melons, squash, and beans, were present at two rockshelters dating to the late nineteenth or early twentieth century in Death Valley. Fowler (1995:110–112; 1996:91–98) details garden horticulture among the Southern Paiute and Panamint and Timbisha Shoshone. Stream-irrigated gardens were cultivated, in which corn, beans, squash, sunflowers, and amaranth were grown.

These groups also planted gardens near springs, had communal fields with irrigation ditches, and unirrigated stream-bank garden plots. Various land management practices were employed, including intentional burning, clearing, pruning, and coppicing, transplanting and cultivation, and cleaning of water sources.

Winter and Hogan (1986:125–127, table 1) note that during protohistoric times, agriculture was practiced by the southern California/Nevada Chemehuevi and Ash Meadows, Pahrump, Las Vegas, and Moapa Southern Paiute bands. Among the crops grown were corn, beans, squash, and sunflowers. Forms of plant husbandry directed towards non-domesticates included burning to encourage growth of new plants, broadcast seed sowing, and irrigation of wild stands of bulb and seed plants (Winter and Hogan 1986:128–129, table 2). These practices are thought to have begun prehistorically, continuing and possibly expanding during early historic times. (Specific indigenous agricultural and other supplemental subsistence practices reported to have occurred in the Lower Colorado River and Palo Verde Mesa areas are more fully described in the ethnographic discussion of "Agriculture," above.) Wallace (1980) suggests Native American agriculture in the Mojave region was exclusively a historic-period phenomenon.

### Trade and Exchange

As Schaefer and Laylander (2007:254–256) note, prehistoric and ethnohistoric Colorado Desert peoples had a highly developed network of connections linking locations within and beyond the region. High mobility produced considerable cross-cultural interaction and integration in spite of frequent open aggression and warfare between different groups. This integration and interaction occurred between mobile hunter-gatherers and sedentary horticultural peoples. They are archaeologically manifested by the spatial distribution of site types, rock art, artifacts (especially ceramics and shell ornaments), and toolstones (especially obsidian).

Archaeologists monitor the dynamics of prehistoric trade in the Colorado Desert by analysis of the distributions of artifacts made from various toolstones, shell beads and ornaments, and ceramic types and composition (Schaefer and Laylander 2007:255–256). As previously stated, with respect to toolstones, obsidian from Obsidian Butte is fairly commonly represented in sites located within montane and coastal southern California (Hughes 1986; Hughes and True 1982; Laylander and Christensen 1988). Obsidian from sources in northern Baja California may have been routed via the Colorado Desert to coastal southern California sites (McFarland 2000). Wonderstone from the Rainbow Rock source is present in western San Diego County and the northern Coachella Valley (Bean et al. 1995; Pigniolo 1995). Material for steatite artifacts found in Colorado Desert sites probably comes from sources in the Peninsular Ranges. Material for argillite artifacts may be from a central Arizona source.

Artifacts made from shellfish species inhabiting the northern Sea of Cortez occur in coastal southern California and the Great Basin (Bennyhoff and Hughes 1987; Fitzgerald et al., 2005) and may have been traded through the Colorado Desert (Schaefer and Laylander 2007:255). Shells from southern California coastal species have been found at a number of Colorado Desert sites and those in the Southwest (Ford 1983). These artifacts may have resulted from direct procurement of shells, or exchange. At the Elmore site, associated with the protohistoric recession of Lake

Cahuilla, shell debitage indicates local manufacture of shell beads and ornaments (Rosen 1995). In the Coachella Valley, shell artifacts may reflect close ties to peoples living along the Santa Barbara Channel.

A cache of Lower Colorado Buffware (i.e., Patayan) anthropomorphic figures found in an Orange County site indicates interregional connections (Koerper and Hedges 1996). These also are suggested by the frequency of Lower Colorado Buffware (i.e., Patayan/Hakataya) pottery throughout the Colorado Desert (Bean et al. 1995; Cordell 1997; McGuire 1982; Schaefer and Laylander 2007:255; Schroeder 1979; Shaul and Hill 1998; Waters 1982a, 1982b, 1982c). However, its use occurred among a number of prehistoric peoples practicing divergent settlement and subsistence patterns. Consequently little effort has been made to refine or apply the Patayan tradition as an integrative model.

On a local level, Plymale-Schneeberger (1993) examined pottery from three sites in Riverside County. Petrographic and geochemical analyses allowed quantitative distinction between Tizon Brown Ware and Lower Colorado Buff Ware. The study concluded that Brown Ware was locally produced while Buff Ware was imported. Seymour and Warren (2004) examined proportions of Tizon Brown Ware and Lower Colorado Buff Ware present at sites in Joshua Tree National Park and noted correspondence of pottery types with approximate boundaries of territories occupied by ethnohistorically known native peoples (that is, Cahuilla, Serrano, Chemehuevi).

Davis (1961) and Sample (1950) note that a considerable degree of historic-period trade between Native Americans occurred within and across the Colorado Desert. Trade networks across the Colorado Desert extended to the Yokuts and Chumash. Native peoples living along the Colorado River received and reciprocated goods from many groups living to the west.

### Cultural Landscapes

In the Colorado Desert, trails, cairns, earth figures, cleared circles, rock rings, other desert pavement features, rock art sites, and artifact scatters appear to be elements of prehistoric-ethnohistoric cultural landscapes[12] (Schaefer and Laylander 2007:254–255; Cleland and Apple 2003). Specific localities include the Pilot Knob Complex, the rock art complex at Palo Verde Point, the Ripley Locality, and the Quien Sabe-Big Maria complex. Lower Colorado River earth figure and rock art sites may represent prehistoric ceremonial centers, located along a route extending between sacred places, representing the cosmology and iconography of Yuman peoples (Altschul and Ezzo 1995; Cleland 2005; Ezzo and Altschul 1993; Gregory 2005; Hedges 2005; Johnson 1985, 2004; Woods et al. 1986).

[12] "Ethnohistoric" refers to the period during which Euro-American accounts of Native Americans augment the archaeological record and Native American oral traditions as sources of information on Native Americans. Cultural landscapes, when related to specific ethnic groups, are referred to as "ethnographic landscapes" (Hardesty 2000).

### Trails

During late prehistoric and ethnohistoric times, an extensive network of Native American trails was present in the Colorado Desert and environs (Heizer 1978; Cleland 2007; Sample 1950:23; Apple 2005; Earle 2005; McCarthy 1993; Melmed and Apple 2009; Von Werlhof 1986). Segments of many trails are still visible, connecting various important natural and cultural elements of landscape, for example, these trails are often marked by votive stone piles (cairns) and ceramic sherd scatters (pot drops).

A late prehistoric-early historic-period Native American trail has been reported traversing roughly east/west through the Chuckwalla Valley (Johnson and Johnstone 1957, map 1). Johnson (1980:89-93, fig. 1) identifies this route as part of the Halchidhoma Trail (recorded as CA-Riv-53T) running from San Bernardino through San Gorgonio Pass to the Colorado River at present day Palo Verde Valley. In the vicinity of the Chuckwalla Valley, the trail proceeded roughly east-northeast from Hayfield Dry Lake past the future site of Desert Center to Gruendike Well. From there it went east, south of Palen Dry Lake to Sidewinder Well, then turned east, north of Ford Lake to McCoy Spring. It then headed south, around the south end of the McCoy Mountains, before going northeast towards the Colorado River. Work by McCarthy (1993, Fig. 10) suggests that offshoots of this trail may have crossed the GSEP site footprint leading to Ford Dry Lake and points to the south and west.

### Earth Figures

Earth figures (also known as geoglyphs or intaglios) were constructed on desert pavements by rearranging and/or clearing pebbles and rocks to form alignments, clearings, and/or figures (Arnold et al. 2002; Gilreath 2007, pp. 288–289; Solari and Johnson 1982). These rock alignments (Harner 1953) occur throughout the deserts of southeast California and adjacent portions of southern Nevada, western Arizona, and northern Sonora. Rock alignments are present throughout this region, including two recorded along the western foot of the McCoy Mountains (McCarthy 1993). Representational figures have only been noted in close proximity to the Lower Colorado River.

In the Mojave Desert, large rock alignments are found in Panamint Valley, Death Valley, Eureka Valley, and the Owens River Valley (Davis and Winslow 1965; Gilreath 2007:288–289; von Werlhof 1987). They have been interpreted as resulting from group ceremony(ies) (von Werlhof 1987). Many appear characterized by multiple-use episodes, with portions added through the years as part of ongoing ceremonies.

Colorado River earth figures include the Top Rock Maze (Rogers 1929) and a few dozen giant ground figures (Harner 1953; Setzler and Marshall 1952), often first observed from the air. During historic times, the Top Rock Maze was used by Yuman peoples for spiritual cleansing.

Johnson (1985, 2003), von Werlhof (2004), and Whitley (2000) relate the earth figures to Yuman cosmology, origin myths, and religion. Cation ratio dating[13] of desert varnish

[13] Cation ratios between weathered rock varnish and unweathered rock are used as a relative dating technique to roughly determine the age of prehistoric rock carvings (petroglyphs). The quantity of

has provided estimated ages of approximately 1200–1000 BC for the Colorado earth figures (Dorn et al. 1992; Schaefer 1994:63; von Werlhof 1995), although use of the technique remains controversial (Gilreath 2007:289).

Von Werlhof (1995, 2004) relates these sites to the Yuman creation story. They also may have functioned as focal points for shamanistic activities, vision quests, curing, and group ceremonies. Symbolic activities also were represented by intentional pot drop distributions along trails near water sources. The importance to Native Americans of water sources for survival during long-distance trips and seasonal rounds is obvious. Water sources also manifested significant spiritual values and often were associated with major rock art complexes (McCarthy 1993; Schaefer 1992).

## EVALUATIONS OF THE CRHR ELIGIBILITY OF, AND PROJECT IMPACTS ON, INDIVIDUAL PREHISTORIC ARCHAEOLOGICAL RESOURCES IDENTIFIED BY RECORD SEARCH AND PEDESTRIAN SURVEY

From records searches and field surveys, staff identified 138 prehistoric archaeological resources and 45 prehistoric components of multi-component archaeological sites as located in the Rio Mesa SEGF prehistoric archaeological PAA. Of these, eight had been previously identified but could not be relocated during the applicant’s pedestrian survey. In addition, nine of the prehistoric components of multi-component sites consisted of isolated prehistoric artifacts (3 artifacts or fewer) and were therefore not analyzed by staff. The remaining 166 prehistoric resources have similar feature types and site types as those discussed in the “Previously Identified Resources” subsection, above. The feature types identified by staff within the prehistoric archaeological PAA include: lithic reduction features, thermal features, pot drop, trail segments, cleared circles, rock rings, and artifact scatters. The applicant’s technical report identified similar feature types and similar site types (Nixon et al. 2011:3-2–3-3). However, as discussed above, the applicant did not place each site into a site-type category. While their discussion of spatial patterning of features across the project vicinity was informative, it did not provide key information needed by staff for their analysis. Staff completed the required analysis internally. As part of this process, staff placed each site into one of the site types defined for the region (Laylander and Schaefer 2011a), including: extractive camps, quarries/workshops, resources extraction/processing sites, religious/ceremonial locations, and artifact scatters.

Staff identified 166 individual prehistoric archaeological resources that would be subject to direct impacts and recommends that 42 are not eligible for the CRHR (see “Ineligible Resources,” below), 41 are potential contributors to the PTNCL (see “Evaluation of the CRHR Eligibility of the Prehistoric Trails Cultural Landscape/District,” below), 104 may be contributors to the PQAD (see “Evaluation of the CRHR Eligibility of the PQAD Archaeological District,” below) and14 potentially contribute to both districts. In all, 108 resources will require additional field and laboratory analysis to determine if buried components are present, and/or each resource has the potential to yield information important in prehistory. Individual resources are listed and described in **Cultural**

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positively-charged ions within the varnish (a chemically changed layer built up of calcium and potassium leachate over time) is compared to those within the unweathered rock beneath the varnish.

**Resources Tables A-2**, **A-3**, and **A-4**, in the appendix. Site descriptions and more detailed discussion of these resources and the rationale behind these recommendations will be forthcoming in the FSA.

## Ineligible Resources

Surface observations have provided the evidence necessary to develop recommendations on the CRHR eligibility of 42 individual prehistoric archaeological resources. On the basis of a thorough analysis of technical field data that the applicant provided in conjunction with the AFC (BS 2011a), staff recommends that 1 small artifact scatter and 41 small lithic quarry/workshop sites are ineligible for listing in the CRHR. This evaluation reflects the thresholds of eligibility for cobble terrace quarries that staff adapted from Giambastiani (2009), based on his multiple studies of quarries in the Southern California desert. Prehistoric quarries are generally considered significant because of their data potential, however, many quarries produce redundant information. Staff considered quarry/workshop sites with some or all of the following characteristics to have low data potential and therefore ineligibilty for listing on the CRHR under Criterion 4:

- Dispersed artifact scatters rather than clearly defined reduction features;
- Small reduction features with less than 40 surface artifacts;
- Five reduction features or fewer;
- Lacking datable materials; and
- Artifacts only related to stone working.

All of the ineligible resources seem to reflect prehistoric lithic quarrying activities associated with the high-quality raw materials that are naturally occurring across most of the Rio Mesa SEGF project site, but they do not meet the above thresholds. Site descriptions and more detailed discussion of these resources and the rationale behind these recommendations will be forthcoming in the FSA.

## SUMMARY OF RECOMMENDED MITIGATION OF IMPACTS TO INDIVIDUAL PREHISTORIC ARCHAEOLOGICAL RESOURCES IDENTIFIED BY RECORD SEARCH AND PEDESTRIAN SURVEY

All 166 individual prehistoric resources are potential contributors to two previously identified and related CRHR-eligible archaeological districts, the PTNCL/District and the PQAD (Bastian 2010). Staff has been able to identify cumulative impacts to these districts and recommend mitigation. However, staff is lacking key information about these individual resources. Phase II field and laboratory work is required to supplement the very basic descriptive information collected during the initial pedestrian surveys. Without these additional studies, staff cannot adequately identify potential impacts to resources or design project-specific mitigation measures, as advised by CEQA (Pub. Resources Code, § 21083.2; Cal. Code Regs., tit. 14, §§ 15064.5(f) and 15126.4(b). Staff will recommend mitigation measures after the required information is received.

## EVALUATIONS OF CRHR ELIGIBILITY OF, AND PROJECT IMPACTS ON, INDIVIDUAL ARCHAEOLOGICAL RESOURCES INCLUDED IN THE PHASE II ARCHAEOLOGICAL INVESTIGATION

The sediments on which the Rio Mesa SEGF project and linear facility alignments are proposed to be built are considered to have varying possibility (low to high) to contain well-preserved, buried cultural materials. It is uncertain at what depth these materials could be expected. An unknown portion of the Rio Mesa SEGF project's proposed ground-disturbing activities have the potential to substantially and adversely change the CRHR eligibility of archaeological deposits that may lie buried. Staff-requested additional geoarchaeological field explorations (discussed above) will be required in order to establish a factual basis for the assessment of potential effects to buried deposits within the project limits.

Additionally, staff has requested Phase II archaeological investigation to provide staff with additional information to make CRHR eligibility recommendations on 108 sites (see "Additional Information Required" column, **Cultural Resources Table 12**, below).These sites include 7 camps, 83 quarry/workshops, 2 ground stone workshops, 6 resource extraction/processing sites, 5 religious/ceremonial locations, and 5 artifact scatters. These investigations will include excavation that will determine if well-preserved buried cultural materials are present by building upon the results of the geoarchaeological field explorations discussed above. In addition, Phase II field and laboratory work will supplement the very basic descriptive information collected during the initial pedestrian surveys. Without these additional field and laboratory studies, staff cannot adequately identify potential impacts to resources or design project-specific mitigation measures, as advised by CEQA (Pub. Resources Code, § 21083.2; Cal. Code Regs., tit. 14, §§ 15064.5(f) and 15126.4(b).

**Cultural Resources Table 12**
**Summary of Prehistoric Archaeological Sites by Type, and by *Associated Features*, in the Rio Mesa SEGF Prehistoric Archaeological PAA**

| | Not Relo-cated | Additional Informa-tion Required | Eligible | Not Eligible | Total |
|---|---|---|---|---|---|
| Extractive Camp | 0 | 7 | 0 | 0 | 7 |
| Lithic Quarry/Workshop | | | | | |
| *Only lithic reduction features* | 1 | 66 | 0 | 38 | 105 |
| *With thermal feature* | 0 | 7 | 0 | 0 | 7 |
| *With pot drop* | 0 | 6 | 0 | 3 | 9 |
| *With both thermal feature and pot drop* | 0 | 3 | 0 | 0 | 3 |
| *With trail* | 0 | 0 | 1 | 0 | 1 |
| *With rock ring* | 0 | 1 | 0 | 0 | 1 |
| Ground stone Workshop | 0 | 2 | 0 | 0 | 2 |
| Resource Extraction/Processing | | | | | |

| | Not Relo-cated | Additional Informa-tion Required | Eligible | Not Eligible | Total |
|---|---|---|---|---|---|
| *Only thermal feature* | 0 | 5 | 0 | 0 | 5 |
| *With trail* | 0 | 1 | 0 | 0 | 1 |
| Religious/Ceremonial location | | | | | |
| *Only trail* | 3 | 0 | 11 | 0 | 14 |
| *Trail with cleared circle* | 1 | 0 | 0 | 0 | 1 |
| *Only pot drop* | 0 | 5 | 4 | 0 | 9 |
| Artifact scatters | | | | | |
| *Only scatter* | 3 | 3 | 0 | 1 | 7 |
| *With cleared circle* | 0 | 1 | 0 | 0 | 1 |
| *With thermal feature and pot drop* | 0 | 1 | 0 | 0 | 1 |
| Isolated prehistoric artifacts within multi-component sites | 0 | 0 | 0 | 9 | 9 |
| Total | 8 | 108 | 16 | 51 | 183 |

## Phase II Methods

The applicant submitted a draft plan outlining their proposed Phase II methods in July of 2012 (URS 2012l). This draft document is presently the subject of ongoing consultation among staff, the applicant, BLM staff, Native American communities, and the public at large.

## Phase II Results

Staff's discussion of the results of the Phase II archaeological investigation will be forthcoming in the FSA.

Summary of Recommended Mitigation of Impacts to Individual Prehistoric Archaeological Resources Based on Phase II Archaeological Investigation

Staff's recommendations for mitigation of project impacts to individual CRHR-eligible prehistoric archaeological resources, based on the staff-requested Phase II archaeological investigation, will be forthcoming in the FSA.

# MULTI-SITE PREHISTORIC ARCHAEOLOGICAL RESOURCES

All 166 individual prehistoric resources are potential contributors to two previously identified and related CRHR-eligible archaeological districts (Bastian 2010), the PTNCL/District and the PQAD.

## Prehistoric Trails Network Cultural Landscape/District Elements and Characteristics

The PTNCL is an existing noncontiguous archaeological district that incorporates prehistoric archaeological sites associated with the Halchidhoma Trail (CA-Riv-0053T).

This landscape consists of important destinations in the Colorado Desert near Blythe, California, the network of trails that tie them together, and the features and sites associated with the trails. The boundaries of this archaeological district are defined as the length of the historically known route of the Halchidhoma Trail, from where it begins near Blythe at the Colorado River, continuing to the west through the Chuckwalla Valley towards modern Los Angeles, with a width of 10 m. Although the trail was likely used for thousands of years, the period of significance is defined as the Late Prehistoric Period (500 to 1900 AD). The thematic associations include travel, trade, and ceremony. Resource exploitation, particularly the collection of stone tool and ground stone raw materials, is also an important theme.

Characteristic site types can be divided into three categories: destinations, trails, and trail-associated sites or features. The following list is not comprehensive; it should be added to as needed as new patterns are discovered. Destinations primarily are water sources, but also include residential, religious, and resource-collection sites. Water-oriented destinations include natural features such as rivers, springs, lakes, and rainwater tanks, as well as man-made wells. Residential sites include villages and camps with evidence of a full range of activities. Religious sites include earth figures and petroglyphs. The importance of particular destinations is indicated by the web of multiple trails that converge on certain places, often mountain passes or water sources. Trails can either be created by the movement of traveling feet or formally constructed. They average 30 cm in width and can be traced for many miles, interrupted only by gullies and washes. Trails are usually the shortest and most convenient routes from one point on the landscape to another. Trail-associated sites or features could include: concentrations of ceramics/pot drops, cleared circles, rock rings, rock clusters, rock cairns, rock alignments, petroglyphs, and earth figures.

Previously identified contributors include: sites within the McCoy Spring National Register District (CA-Riv-0132); four water tanks (CA-Riv-0523, CA-Riv-3149, CA-Riv-4569, and CA-Riv-4699) along the Halchidhoma Trail at the base of the McCoy Mountains; and sites on the northern edge of Ford Dry Lake (CA-Riv-9072) (Bagwell and Bastian 2010).

**Evaluation of the CRHR Eligibility of the Prehistoric Trails Cultural Landscape/District**

The PTNCL is eligible for listing on the CRHR under Criteria 1 and 4. Under Criterion 1, a resource is eligible if it is associated with “events that have made a significant contribution to the broad patterns of our history.” In the context of a Native American site where its importance is not recorded in written form, the National Park Services’s National Register Bulletin 38 (NPS 1998:12–13) makes it clear that the word “our” refers to the group that finds the property significant and "history" includes both traditional oral and written history. Important events can include specific events, or repetitive trends. Places referred to in Native American oral histories and creation stories, therefore, are potentially eligible.

Native American groups in the Mojave Desert consistently accord mythological importance to springs, petroglyph sites, and, particularly, trail systems. Trails across the desert mark the locations of travels of ancestral groups as they migrated to where their descendents historically lived. Trails also facilitate dream travel to these places and the times when events mentioned in story and song occurred (Cleland 2005:132). The particular trail that forms the connecting link for this archaeological district, the Halchidhoma Trail (CA-Riv-0053T), is well known from multiple historical and ethnographic sources. It was an essential trade, transportation, and ceremonial route for Native American peoples and early European visitors in the Colorado Desert during prehistoric and historic-period times. This route was an essential connection between the Pacific Coast and the Southwestern deserts of Arizona and New Mexico.

Energy Commission staff considers the resources that make up the PTNCL to be significant under CRHR Criterion 1 for their ties to important events in American history. However, most property types associated with the PTNCL exist today as archaeological resources, such as petroglyphs, pot drops, cleared circles, and webs of intersecting trails. These sites are also considered CRHR-eligible under Criterion 4 for their ability to yield information important in history and prehistory.

### Impacts to the Prehistoric Trails Cultural Landscape/District

Staff has concluded that 41 sites are contributors to the PTNCL, a previously identified, assumed CRHR eligible, discontiguous archaeological and ethnographic district in the prehistoric archaeological PAA, and are therefore historical resources for the purposes of CEQA (**Cultural Resources Table 12**, above). All sites that include trail segments, cleared circles, rock rings, cairns, and pot drops are in this list, including 11 trail segments, 9 isolated pot drops, 7 extractive camps, 11 lithic quarry/workshops, 1 resource extraction/processing site, and 2 artifact scatters. Staff has identified 25 of these sites as requiring Phase II archaeological investigation in order to determine if buried resources are present or if these sites are also contributors to the PQAD, described below.

Construction activity on the Rio Mesa SEGF plant site and the proposed linear alignments may cause the destruction of these 41 historical resources. The destruction of these sites through the construction of the proposed project would cause a substantial adverse change in the significance of these historical resources under CRHR Criterion 4 (likely to yield information important to prehistory). Energy Commission staff can identify the destruction of the 41 resources as significantly reducing those aspects of their integrity that qualify them for the CRHR under Criterion 4 and can propose mitigation to reduce those impacts to a less-than-significant level. As contributors to the PTNCL, the 41 resources are also CRHR eligible under Criterion 1, and staff must consider the Rio Mesa SEGF project’s impacts on those aspects of the resources’ integrity that qualify them under Criterion 1 (associated with events that have made a significant contribution to the broad patterns of our history). In addition to its own assessment of the project’s impacts on the resources’ integrity of association, feeling, and setting, staff is seeking the collaboration of members of the community who value the resources culturally and/or spiritually, in this case, Native Americans. Staff is currently in the process of consulting with local Native American groups and others regarding Rio Mesa SEGF impacts and potential mitigation. Mitigation measures reflecting this consultation will be forthcoming in the FSA.

## Prehistoric Quarries Archaeological District Elements and Characteristics

The PQAD is a previously identified discontiguous archaeological district that is also one of the contributors to the larger PTNCL (Bastian 2010:C.3-43–C.3-44). This district represents one principal activity: prehistoric quarrying of raw materials for stone tool production. The boundaries of the district are defined as the Pleistocene terraces on Palo Verde Mesa along the west side of the Colorado River in the vicinity of Blythe, California. Previous research at other quarry sites suggests that quarries are often used continuously but not intensively over thousands of years. Therefore the period of significance is defined as the entire prehistoric and early historic periods. Thematic associations are narrowly focused on resource procurement and processing. Characteristic site types include: extractive camps, lithic reduction features, and hearths for heat treating chert (thermal features). Sites associated with the PQAD were first studied by BLM during the 1980s (Mitchell 1989), with additional sites and the archaeological district identified during the Energy Commission’s review of the Blythe Solar Power Project (Bastian 2010).

### Evaluation of the CRHR Eligibility of the Prehistoric Quarries Archaeological District

The resources that make up the PQAD are significant under CRHR Criterion 4, for their ability to yield information important to the prehistory and early history of Native American life in the Colorado Desert. The district retains particularly high degrees of integrity of location, design, materials, and association and is therefore well able to convey its significance. Staff has identified 104 prehistoric resources within the prehistoric archaeological PAA that may be contributors to the PQAD, including: 7 extractive camps, 84 lithic quarry/workshops, 2 ground stone workshops, 6 resource extraction/processing sites, and 5 lithic scatters. Staff has identified 103 of these sites that require Phase II archaeological investigation to determine if buried resources are present or to confirm that they are contributors to the PQAD.

### Impacts to the Prehistoric Quarries Archaeological District

The 104 possible contributors to the PQAD would be subject to direct impacts from the proposed Rio Mesa SEGF project. The destruction of these sites through the construction of the proposed project would cause a substantial adverse change in the significance of these historical resources, and on the PQAD and would, therefore, have a significant effect on the environment. The applicant has not conducted the Phase II archaeological excavation fieldwork required to gather data for site eligibility determinations for these prehistoric resources. Without the required primary field data staff cannot evaluate them to determine if they may have the potential to yield information important in prehistory. Therefore staff was unable to conclude if these 104 resources are eligible for the CRHR, assess the impacts of the proposed Rio Mesa SEGF project on them, or propose mitigation for the project’s significant impacts.

## ASSESSMENT OF PROJECT IMPACTS TO PREHISTORIC ARCHAEOLOGICAL RESOURCES AND RECOMMENDED MITIGATION

The prehistoric archaeological resources categorized by feature type in **Cultural Resources Table 12**, above, are a summary of the resources that staff has determined could be impacted by the proposed project. A full list is provided in **Cultural Resources Table A-4**, in the appendix. A complete discussion of each of these resources, a detailed rationale behind these recommendations, and recommended mitigation for project impacts on CRHR-eligible prehistoric archaeological resources will be forthcoming in the FSA. Although still under development, conditions of certification may include, but would not be limited to, a condition requiring the collection and analysis of diagnostic artifacts and a condition requiring a GIS map and associated spatial analysis of trails and features commonly associated with them.

CEQA advises a lead agency to make provisions for archaeological resources unexpectedly encountered during construction, and a project owner may be required to train workers to recognize cultural resources, fund mitigation, and delay construction in the area of the find (Pub. Resources Code, § 21083.2; Cal. Code Regs., tit. 14, §§ 15064.5(f) and 15126.4(b)). Consequently, staff recommends that procedures for identifying, evaluating, and possibly mitigating impacts to archaeological resources discovered during construction be put in place through conditions of certification to reduce those impacts to a less-than-significant level.

Proposed Conditions of Certification **CUL-3** through **CUL-5** and **CUL-11** through **CUL-15** are intended to ensure that all significant impacts to archaeological historical resources discovered during Rio Mesa SEGF project construction (including the potential project use of borrow and disposal sites) and operation are mitigated below the level of significance. Proposed **CUL-3** requires a Cultural Resources Specialist (CRS) to be retained and available during Rio Mesa SEGF construction-related ground disturbance to evaluate any discovered buried archaeological deposits and, if necessary, to conduct data recovery as mitigation for the project’s unavoidable impacts on them. **CUL-4** requires the project owner to provide the CRS with all relevant cultural resources information and maps. **CUL-5** requires the CRS to write and submit to the Energy Commission Compliance Project Manager (CPM) a Cultural Resources Monitoring and Mitigation Plan (CRMMP). **CUL-11** requires the project owner to train workers to recognize cultural resources and instruct them to halt construction if cultural resources are discovered. **CUL-12** prescribes the monitoring, by an archaeologist and Native Americans, intended to identify buried archaeological deposits during construction. **CUL-13** requires the project owner to halt ground-disturbing activities in the area of an archaeological discovery and to fund data recovery, if the discovery is evaluated as CRHR-eligible. **CUL-14** would cover the possibility that the proposed project would need to make use of a soil borrow site that had not been surveyed for cultural resources in the past five years. **CUL-15** requires the CRS to write and submit to the CPM a final report on all Rio Mesa SEGF cultural resources monitoring and mitigation activities.

# HISTORICAL ARCHAEOLOGICAL RESOURCE INVENTORY AND EVALUATION, IMPACT ASSESSMENT, AND MITIGATION RECOMMENDATIONS

## Context for Historical Archaeology[14]

### Desert Training Center/California-Arizona Maneuver Area (1942–1944)

Between 1942 and 1944, the U.S. Army used the deserts of California, Nevada, and Arizona for the training of personnel, the development of tactical doctrine, and the development and testing of equipment, preparation for war in Africa, and later in Europe and the Pacific. What came to be called the Desert Training Center/California-Arizona Maneuver Area (DTC[15]) was one of four specialized training camps set up by the War Department between March and September, 1942. Then Maj. Gen. George S. Patton, Jr., was assigned to choose a location for the DTC. Patton's chosen location, the eastern parts of the Mojave and Colorado Deserts, offered several advantages for the army's purposes. The unforgiving desert heat and rugged terrain simulated the conditions that the Army's men and machines would face in North Africa, already occupied by German Gen. Erwin Rommel and his Afrikakorps. The sparse population and undeveloped character ensured the least possible impacts to civilian persons and property from military activities. The Colorado River Aqueduct ensured a reliable water supply. The existing telephone system facilitated military communications. The established railroads and highways facilitated transportation of men, equipment, and supplies (Bischoff 2000).

Initially, more than 12,000 square miles of California and Nevada was acquired from the Department of the Interior for the DTC. The DTC was activated on April 7, 1942 at Camp Young, Patton's choice for the DTC headquarters, established near the small town of Desert Center. The DTC was expanded in 1943 to 18,000 square miles by the addition of land in southwest Arizona and Nevada. With the winding down of the campaign in North Africa in early 1943, the purpose of the enlarged DTC became generalized large-scale combat training and maneuvering, and the facility's name was changed to Desert Training Center/California-Arizona Maneuver Area (DTC/C-AMA) in October, 1943 (Bischoff 2000).

The great size of the DTC was ideally suited for the conduct of maneuvers of any size, including those combining aircraft and live fire exercises, and service units as well as combat units could be trained, including medical, signal corps, and engineering units. The DTC was the first time and place where the army could realistically simulate an entire theater of war. The training schedule for each division varied over time and circumstances, but ranged from five to thirteen weeks. To maximize the training's effects, everyone, even Headquarters personnel, lived under simulated war conditions. Camps contained only tents for combat personnel, so officers and men would experience the unrelieved discomfort of the harsh environment. The prolonged maneuvers were designed to push personnel and equipment to their limits and provided

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[14] See Historic-Period Built-Environment Context, below, for an account of non-military events in the project region.

[15] DTC/C-AMA was the army's official acronym for this unit, but for brevity's sake, here staff uses DTC.

exposure to realistic conditions of combat over a sustained period of time (Bischoff 2000).

Loss of service units, as they were shipped overseas, crippled the DTC by late 1943. Lacking any ready solution to this problem, the War Department ordered the closing of the DTC on April 30, 1944. Service units remained to close the camps, police the area, and salvage usable materiél left by the departing troops. After years of intermittent clearing of anything constituting a danger, the army turned the DTC land over to the Bureau of Land Management (Bischoff 2000).

The Rio Mesa SEGF project vicinity has generally been treated with either the aesthetic appreciation of the desert traveler, or, more often, with the contempt often directed at the “worthless” desert landscape, which could be abused with impunity and used as a convenient dumping ground. The more specialized DTC use is distinctive from the latter use. The Rio Mesa SEGF project site and vicinity was used intensively for DTC training, as is evident from historical accounts and the large number of archaeological sites containing remains from that period. Especially diagnostic artifactual remains include military ration and other food cans and weapons-related artifacts from the early 1940s. Archaeologists have recorded 133 sites associated with the DTC era in the Rio Mesa SEGF historical archaeological PAA. Although the majority of the artifacts relating to the DTC are food-related (C- and B-Ration cans, primarily), numerous other objects also mark these sites as related to the 1942–1944 DTC activities. Weapons-related artifacts, mainly rifle cartridges, are often marked, showing their place and year of manufacture, with most of the DTC finds dating to 1942 and 1943. Other items include utensils from mess kits and a soldier’s dog tag. A garrison cap pin bearing the motto, “Clear the Way,” of the 307$^{th}$ Infantry Regiment of the 77$^{th}$ Infantry Division was also found on the project site. In view of the analysis of historical information on the training and maneuvers of the 77$^{th}$ Infantry Division, at least one incident of the military use of the Rio Mesa SEGF was clarified, tying the DTC with the history of this highly decorated military unit.

The 307$^{th}$ Infantry Regiment had gained fame in World War I for its involvement with the saving of the “Lost Battalion” in the Meuse-Argonne Forest. It adopted an old Irish battle cry, Faugh-a-Ballaugh (Clear the Way) that was first used in 1798 by the Royal Irish Fusiliers and later during the American Civil War by the Irish 69th Regiment that fought for the Union. The term “Fighting Irish” was later taken up by the University of Notre Dame as their team name. In WWII the 307th saw action in the Pacific islands and finally in Okinawa. A medic of the regiment, Corp. Desmond T. Doss, was awarded the Congressional Medal of Honor for his heroic service in caring for troops on the Maeda Escarpment.

The 77$^{th}$ Division was assigned to Camp Hyder in Arizona for training at the DTC. Advance elements of the division arrived on April 1, 1943. Soon after Maj. Gen. Andrew D. Bruce assumed command in May, 1943. The division history (77$^{th}$ Infantry Division Association 1947:31) describes the following maneuver in the Rio Mesa project vicinity: “…[I]n June [1943] the [77$^{th}$] Division moved by motor convoy along sweltering, dusty desert roads to an assembly area, near Palo Verde, California. Here, among the mesquite trees at the edge of the California desert[,] it prepared for an advance to the north. The maneuvers were under the direction and control of the IX Corps. The 77th's teammates were the 7th Armored Division, the 4th cavalry, and several Tank Destroyer Battalions. The 'enemy,'—the 8th Motorized Division, heavily 'reinforced,' was on the defensive somewhere to the north."

An account of this maneuver is found in Bischoff et al. (2010:77). It was provided by a correspondent who described the combined arms used in the operation. Apparently, this correspondent was able to observe a part of this maneuver from the top of a 400-foot hill (Stokes 1943:1):

> Taking part in the attack were 54 Sherman tanks, batteries of 105-howitzer 'Priests,['] 34 pursuit and bomber planes, and large detachments of infantry. One memorable spectacle was that of 10 Douglas Dauntless A-24 dive bombers, peeling off one after another at a height of 10,000 feet and swooping down to launch live bombs at 1,000 feet. There were 14 Lockheed Lightnings, conspicuous for their dual tail structure, which hurled with phenomenal speed at the face of a mountain wall and pivoted away, on the tip of a wing, in the nick of time. There was one Airacobra. A band of six Douglas A-20 Bostons, which the British call the best plane in the world, made low-bombing sorties.

Staff contacted Lt. (later Col.) Theodore S. Bell, Commander of Company E of the 307$^{th}$ Regiment, by phone on August 14, 2012, and interviewed him as to his recollections of his time at the DTC. Bell remembered the maneuvers, but noted that he had been assigned the job of being an umpire in the war games and therefore was not leading his company during the course of the maneuvers (Bell 2012).

The little town of Palo Verde is only a couple of miles from the place where the 307$^{th}$ Infantry Regiment garrison cap pin was found at site PVM-MN-013. The latter site was probably an encampment or rendezvous point set up by a unit of the 307$^{th}$ very close to the still-visible tracks of armored vehicles that headed north toward Palen Pass. It would appear from the archaeological finds that the units engaged in local maneuvers a few miles north of where the garrison cap pin was found (T8S/R21E, Section 33), and the action was most intense in the area near the foot of the Mule Mountains. This observation is based on the numerous vehicle tracks fanning out from a central area (T8S R21E, Sections 16 and 21) that included a number of camp sites and dug-in positions.

On the way north, there was a camp site just off the main tracks where the pin of the 307$^{th}$ Regiment was found (T8S/R21E, Section 33). The division evidently engaged in various small-unit maneuvers on its way north toward Palen Pass, given the extensive debris, including battle-related ordnance and small arms ammunition, as well as various fortified positions found within the Rio Mesa SEGF in T8S/R21E, Sections 16 and 21. A description of the magnitude of the exercises is found in the division's history of that time (77$^{th}$ Div.1947:30):

> Previously, several armored divisions had trained in the American desert, but the 77th was the first infantry division to maneuver in that oppressive place. Still serving as a "guinea pig" outfit[,] it was called on to test desert formation wherein the entire Division would maneuver on a broad front as do ships at sea. For several days the desert was churned to clouds of

> rolling dust as 13,000 men and hundreds of vehicles advanced and wheeled and halted, guiding on colored captive balloon markers. The arroyos hindered and diverted, though they did not stop the movement of troops.

The 77th Division departed Camp Hyder in September, 1943, which gives a terminal date to their exercises in the DTC area.

Another personal item found in the project vicinity was a soldier's dog-tag (PVM-SM-ISO-089) that is of a type dating back to WWII, issued to an enlisted man named H. Harris, whose home address was Greensboro, North Carolina. This dog-tag has been identified as belonging to Howard J. Harris who enlisted in the army in 1942 and was discharged at Fort Bragg, North Carlolina, on November 5, 1945 (War Department 1945). Howard Harris did not appear on the 77th Division personnel list (77th Infantry Div. 1947:496). So he may have served with another military unit, which may provide leads to additional units involved in training in the Rio Mesa SEGF vicinity.

Another personal item found in the vicinity was a soldier's dog-tag that is of a type dating back to WWII, identifying an enlisted man named H. Harris, whose home address was Greensboro, North Carolina (PVM-SM-ISO-089). According to the 77th Division personnel list (77th Infantry Div. 1947:496) there were at least two enlisted men and one officer named Harris with the 307th Regiment whose names began with "H." So, he may have been a member of the 77th Division. However, he may also have been with another military unit, which may provide leads to additional units involved in training in the Rio Mesa SEGF vicinity.

Some of the units known to have trained at the DTC ended up in the Pacific Theatre, fighting on the islands, and finally in Okinawa in preparation for the final assault on the Japanese home territories. The dropping of atomic bombs on Hiroshima and Nagasaki brought a precipitate end to the war and so this assault was not needed. Portions of the 77th Division, including the 307th Regiment, were sent to the northern Japanese island of Hokkaido to perform occupation duties.

The remains of the DTC areas consist of rock features, faint roads, structural features, concertina wire, communications wire, tank tracks, foxholes and bivouacs, dug-in defensive positions, refuse, and trails. Another artifact was a metal sign on which had been written, "Latrine closed, Company A, 32nd Eng. Bn." (PVM-MN-ISO-143). Such a sign conforms to army manual directives regarding the closing of field facilities when they are no longer being used. This suggests the presence of a buried privy feature and likely other buried trash features, again in conformance with army regulations. A pre-war army manual on Field Sanitation (War Department 1940:133) directed that:

> Areas are kept policed at all times. Refuse and garbage are burned or buried. Upon the evacuation of a shelter area, fires are extinguished, latrines and kitchen pits filled and marked, and the site left in thorough police.

In a further statement about closing camps, the field manual (War Department 1940:135) states:

> *f. Closing camp. Prior* to leaving a camp site all sanitary installations should be closed. Latrines and kitchen soakage pits should be filled in and the spot indicated by a marker showing the organization, the nature of the installation, and the date it was closed. *Remember that today's camp may be tomorrow's line of communication.*

During the course of the war many lessons were learned to improve sanitation. The 1945 version of FM 21-10 on Military Sanitation was even more detailed in its directives (War Department 1945).

The fact that many cans and bottles related to the feeding of the troops are found on the surface today might suggest a breakdown in military discipline, which would seem incongruous in a training situation. The question remains whether the soldiers carried out the called-for burial of solid waste, or if it had become common practice to leave the ration cans on the desert floor rather than bury them per regulations. Considering the very large number of troops being trained at the facility, the number of cans and bottles found on the surface would seem to be a small fraction of what might have been. Apparently, clean-up crews were dispatched in later years to collect debris left from the activities of the training center. However, given the prevalence of discarded material found in the Rio Mesa SEGF historical archaeological PAA, it is uncertain how well the job was done. Perhaps the clean-up was limited to the major camp facilities.

### Operation Desert Strike

In 1964, the U.S. military staged a large-scale, two-week-long exercise called Desert Strike in a portion of the old DTC. The exercise pitted two antagonistic entities, one called Calonia and the other Nezona, who shared the Colorado River as their border. Each side was led by a Joint Task Force. Major tactical operations during the exercise included armored offensive forays striking deep into each other’s territory and defensive operations structured along natural barriers. There were also counterattacks that involved airmobile and airborne assaults, and the simulated use of nuclear weapons. The Air Force provided fighter, air defense, interdiction, counter-air reconnaissance, and troop carrier operations in support of both joint task forces (Allen et al. 2010:95).

It is not clear whether the Rio Mesa SEGF project site was part of this exercise, although it appears that some of the deposits of military food refuse were associated with pull-tab beverage cans, which were not developed until 1959. Further research may confirm or deny the association of some of the Rio Mesa SEGF historical archaeological sites with Desert Strike.

## Evaluations of CRHR Eligibility of, and Project Impacts on, Individual Historical Archaeological Resources Identified by Record Search and Pedestrian Survey

Historical archaeological sites in the Rio Mesa SEGF historical archaeological PAA were of two kinds, single-component and multi-component, with the single-component sites having only historic-period materials and the multi-component sites having both prehistoric and historic-period materials. Multi-component sites were frequent, demonstrating the frequent re-use of a given piece of land over time. Commonly, either the prehistoric or the historic-period component would form the overwhelming bulk of the site's artifacts and features. In many cases multi-component sites were quite extensive in size, covering as much as 2,241 acres in one case. Such sites were identified by the continuous extent of artifactual finds (e.g., having no separation in excess of 100 meters between artifacts, the latter distance being part of the applicant's mode of defining site boundaries). This protocol defied the splitting up of the mega-sites into smaller, individual sites. In such instances, the identification of features that are strictly prehistoric or historic-period better defined the actual size of the particular components. Staff developed a separate calculation of the numbers of various features, which usually indicate a specific activity area within the broader site. In any given site there may be anywhere from none to a large number of individual examples of a specific type of feature, so these numbers are instructive and help clarify the abundance or paucity of the features that exist in the Rio Mesa SEGF historical archaeological PAA. **Cultural Resources Table 13** show the types of features identified by staff from a review of the site records, both previously recorded (records search) and newly recorded (applicant's field surveys).

**Cultural Resources Table 13**
**Historical Archaeological Feature Types**
**in the Rio Mesa SEGF Historical Archaeological PAA**

| Feature Identifier | Number of Features Identified Among Historic-Period-Only and Multi-Component Sites |
|---|---|
| Historic-period refuse | 103 |
| Historic-period scatter | 8 |
| Excavated depressions* | 181 |
| Rock cairns/clusters | 14 |
| Thermal features | 12 |
| Tank tracks | 105 |
| Fence | 6 |
| Linear depression/Scrapes | 13 |
| Berm | 4 |
| Mapping feature | 12 |
| Mining/Prospecting | 7 |
| Rock ring/Alignment | 9 |
| Other | 17 |
| Total | 491 |

*Note: "excavated depressions" includes "foxholes," regarding which, see "DTC Maneuver Sites," below.

## Analysis of Historical Archaeological Resources

### *DTC Historical Archaeological Sites*

Patterns noted by staff include a predominance of sites related to past military usage, for the most part dated to the period of the DTC (1942–1944). The most notable artifacts were discarded ration cans ("C-Ration") and military munitions (typically .30 and .50 caliber rounds or cartridges.

In reviewing the historical archaeological finds in the Rio Mesa SEGF, the historical archaeological resources fell into two main categories, those related to the DTC activities and those that were non-military in nature. To guide archaeologists and historians recording DTC-related sites, three manuals have been developed for the Energy Commission (Allen et al. 2010; Baxter 2010; Bischoff et al. 2010). Based on these manuals, staff classified the majority of the DTC sites as either DTC Food-Related sites, defined by the presence of ration cans and bottles and the absence of indicators of site complexity, or as DTC Maneuver sites, such as munitions, excavated pits, built-up defensive positions, and communications wire. The non-military sites were primarily scatters of artifacts related to eating and drinking and vehicle maintenance at short-term camping spots on the terrain. In addition, there was evidence of dumping of household waste from nearby residential areas, as well as the random dumping of old vehicles or appliances. Other non-military sites included markers in the form of rock cairns and formal General Land Office (GLO) and U.S. Geological Survey (U.S.G.S.) brass-capped survey markers.

DTC Food-Related Sites

These are the most common type of DTC site, usually comprising a small number of ration cans and/or beverage containers that were discarded following a meal by one or more soldiers on the move. These troop nourishment locations could be seen as analogous to army post-battle field surveys, in which the placement of rifle cartridges on the landscape is noted to better comprehend the larger picture of the engagement. C-ration cans may be seen as a surrogate for faunal studies in analyses at other historical archaeological sites, used to record types and quantities of food consumed on the scene. In the case of the Rio Mesa SEGF historical archaeological PAA, there were also a large number of DTC-related isolated artifacts. As isolates, these artifacts are generally not accorded the same level of importance as a site; however, since they are mostly C-ration cans or munitions, they can add to the overall picture of the distribution and intensity of military activity. For example, certain items important to the identification of DTC participants appeared as isolates. In particular, a soldier’s dog-tag and a metal sign recording the formal closing of a latrine by a specific Engineer Battalion were recorded as isolates.

DTC Maneuver Sites

The other main category of DTC-related sites goes beyond the simple ration-related artifacts to include features on or in the ground that provide evidence of the military actions involved in the maneuvers. The DTC Maneuver sites include excavated features, built-up soil berms, rock walls to provide protection to ground troops, slit trenches for troop protection and concealment, scooped-out excavations and berms for vehicles (probably utilizing camouflage), wire fencing, communications wire, and other excavated features related to field sanitation. Of the 32 DTC Maneuver sites, 20 were multi-component and 12 were historic-period only.

Another kind of DTC Maneuver site consists of vehicle tracks of both the tracked and wheeled vehicles that would have been involved in these maneuvers. Nearly 70 years after the event, many of these tank tracks are still very much in evidence. Related to these vehicles, many sites show evidence of the necessary maintenance required, particularly in the form of oil cans. Since the military exercises stressed tactics involving travel overland, either as foot soldiers or as motorized troops, it is not surprising to find artifacts and vehicle tracks related to the DTC maneuvers in all parts of the landscape.

A final kind of DTC Maneuver site is marked by the presence of ordnance, such as cartridges, and may include possible unexploded ordnance (UXO) that would have been part of the maneuvers, from infantry, artillery, armored, or aircraft sources. These sites usually have artifacts lying on the surface like the food-related sites. However, at these sites, there is a greater possibility of sub-surface deposits that would be little time capsules of historic information that, due to their undisturbed nature, would be more valuable than surface deposits subject to weather disturbance, as well as random collecting by passers-by.

#### ***Desert Strike Historical Archaeological Sites***

Another site type whose presence would be reasonably inferred and that would be military in nature, but related to another major exercise in 1964 called “Desert Strike.” Although not yet 50 years old, this large-scale maneuver, undertaken during the Cold War, may also have passed through the Rio Mesa SEGF historical archaeological PAA. Although C-rations were still very much in use in 1964, thus clouding whether a given site might have been DTC- or Desert Strike-related, the presence of post-WWII artifacts such as pop-top cans, may help identify sites from this latter-day event. On the other hand, many sites were no doubt re-used by campers since WWII, who would have contributed their own artifacts to an existing refuse site.

#### ***Non-Military Historical Archaeological Sites***

The non-military historic-period sites are also wide spread in the project vicinity, but appear to be generally more random in nature, most of them in the form of refuse deposits. Although many of these sites are found along known roads and jeep trails, the availability of off-road vehicles has widened the range of access to all parts of the landscape, similar to the situation of the military, mentioned above.

##### Rock Cairns or Clusters

Rock cairns, or simply clusters of rock, are a classic form of location identification in a desert area and have been used since time immemorial. In addition to marking trails in the prehistoric and historic periods, rock cairns were also used as claim markers for prospectors or even for land claimants. The most easily defined claim markers have a can or bottle placed in the cairn with a note affirming the claimant’s right to the property. None of these marked cairns were found in the project vicinity, although it is possible that such markers were taken by relic collectors. Overall, many of the cairns or rock clusters found defy contextual identification and are as likely to be chance ephemeral markers as ones with a long-term application.

##### Historic-Period Refuse

The overwhelming majority of non-military historic-period refuse sites in the project vicinity fall under this category in one of three primary guises. First are the temporary camp sites of travelers or visitors to the desert and those of the work crews sent out to construct transmission and utility lines that pass through the project vicinity. The brief nature of these camps decreases the likelihood of the need to bury artifacts, so the sites are mainly surface in nature unless covered by natural events like blowing sand or flash-floods.

The second type of historic-period refuse site would be associated with a long-term habitation; however, few, if any such habitations were identified in the historical archaeological PAA. The main such site would be that of the defunct town of Rannells (discussed below under “Historic-Period Built-Environment Context”), of which no evidence remains above ground.

The third form of historic-period refuse site includes those representing the dumping of refuse generated elsewhere and hauled out to the desert for disposal. The anonymous nature of such trash dumping has generally diminished the value of these sites as being historically relevant, despite the quantity and variety of the artifacts found there. It is even uncertain whether they come from single households—once a trash depository was established, melded disposal was likely from multiple families’ repeated dumping events. Since there is little or no hope of stratification in such desert dumpsites, the resulting collections of artifacts are not amenable to meaningful analysis.

#### Historic-Period Survey/Mapping Features

There is a possibility that some of the stone cairns, discussed above, were used as mapping features and so may have some antiquity, perhaps going back to the first GLO surveys in the 1850s. This has not been independently verified, in part because an attempt to associate the cairns with formal U.S.G.S section lines has not been successful. On the other hand, there are at least four instances of brass-capped markers, marked GLO 1917, that are clearly related to the formal mapping of the region (CA-RIV-10007, P33-018069, P33-018071, and P33-019712). Another brass-capped U.S.G.S. benchmark was also located in the surveys, although it is no longer in the historical archaeological PAA due to the modification of the Rio Mesa SEGF project boundaries. The fact that such markers have been duly recorded in the archaeological survey provides critical data to allow them to be recognized and flagged for protection as directed under 18 USC 1858.

### Evaluations of CRHR Eligibility of Historical Archaeological Resources by Site Type

The non-military historical archaeological refuse sites are ineligible for the CRHR due to the difficulty of making any particular associations with people or events important in history (Criteria 1 and 2), their lack of relationship to creative endeavors (Criterion 3), and the absence of information important in history (Criterion 4). They are not contributors to the Desert Training Center Cultural Landscape (DTCCL, see “Desert Training Center Cultural Landscape/District,” below).

The government survey markers are not considered eligible under Criterion 1 of the CRHR they are not related to individuals important in history under Criterion 2 of the CRHR; and they do not represent a distinct or unique construction style, type, or design (CRHR Criterion 3). Further, they are not likely to yield data important to history under Criterion 4, and they are not contributors to the DTCCL. The fact that such markers have been duly recorded in the archaeological survey provides critical data to allow them to be recognized and flagged for protection, as directed under 18 USC 1858.

The DTC Food-Related sites are not contributors to events or associated with persons important in history (CRHR Criteria 1 and 2). They are not distinct or unique for their design or construction (CRHR Criterion 3), and they do not hold data important to history (Criterion 4). Thus they are not eligible for the CRHR under any criterion. They are contributors to the DTCCL.

Staff has concluded that the DTC Maneuver sites and the DTC Food-Related sites are contributors to the DTCCL and are therefore historical resources for the purposes of CEQA.

### Identification and Assessment of Project Impacts and Recommended Mitigation

Staff has determined that within the areas of the Rio Mesa SEGF solar plant sites themselves (Rio Mesa I and Rio Mesa II), as a result of the combined activities of site clearance and construction of the solar towers and support facilities, most, if not all of the surface artifacts and features related to the historical archaeological sites and isolates would be either destroyed or moved from their current locations. The area of the gen-tie line has a better potential for more selective impacts, whereby the flagging of sites may permit construction to avoid at least some of the sites. However, the expected future traffic of maintenance vehicles and crews along roads constructed in association with the gen-tie line would continue to be a danger to the integrity of the historical archaeological sites there.

The project cannot have a significant impact, requiring mitigation, on cultural resources that are not eligible for the CRHR. Consequently, no mitigation is proposed for impacts to the non-military historical archaeological refuse sites and the government survey markers. The applicant’s survey of historical archaeological sites in the historical archaeological PAA included the detailed cataloguing of the surface finds at these sites. For the DTC Food-Related sites, which are historical resources for the purposes of CEQA, staff concludes that the existing data recovery is adequate and proposes no additional mitigation for project impacts to the DTC Food-Related sites.

No historical archaeological resources were identified in the historical archaeological PAA that correspond with certainty to activities associated with the 1964 Desert Strike exercise, and such resources, if identified with certainty, are not yet old enough to be evaluated as historical resources under CEQA. Project impacts to such sites would not be significant and would therefore not require mitigation.

Staff has concluded that 32 DTC Maneuver sites (see below) are contributors to the DTCCL, making them historical resources for the purposes of CEQA. The project would have significant impacts on the 19 CRHR-eligible DTC Maneuver sites that are located on the Rio Mesa SEGF plant sites, and could have significant impacts on 13 additional DTC Maneuver sites that are located in the project’s gen-tie corridor. If the impacts to these sites cannot be avoided, staff proposes data recovery from these sites as mitigation for these impacts. Staff believes these sites may have subsurface deposits from which data could be recovered, so the extant recordation of surface data is not adequate mitigation. Consequently, staff is proposing as a condition of certification (**CUL-8**) that remote sensing and follow-up excavation by a historical archaeologist be conducted on these 32 sites to recover data from any subsurface deposits that would be added to the currently available surface-find information and incorporated into the site records.

### *CRHR-Eligible DTC Maneuver Sites to Which CUL-8 Applies*

Sites in the Rio Mesa SEGF Gen-Tie Transmission Line Corridor

Judicious placement of transmission line support foundations, and of any other ground disturbance, in the gen-tie corridor, to avoid the following 13 DTC Maneuver sites could eliminate project impacts to these historical resources and relieve the applicant of a requirement under proposed **CUL-8** to conduct remote sensing and possible data recovery at these sites.

*CA-RIV-5533/5534/6616*

This multi-component site is very large at 101 acres, most of which, however, is occupied by the prehistoric component. The DTC aspect of this site is composed of six “foxholes” or depressions, indicating some sort of tactical element to the site. The site extends over Sections 2 and 11 of T8S/R21E.

*CA-RIV-6533/5531*

This multi-component site comprising 6.3 acres is predominantly prehistoric, but it does include a DTC-related feature, a circular depression with a raised berm. This site is located in Section 35 of T7S/R21E.

*CA-RIV-9005*

This site comprises 3.6 acres and is characterized as a possible DTC camp site. It is located in Section 6, T7S/R21E.

*CA-RIV-10008*

A .50-caliber belt clip was found at this small historic site indicative of DTC maneuver activity. The site is located in Section 8, T7S/R21E.

*CA-RIV-10025*

This small (0.4 acre) multi-component site features a partially filled WWII-era excavation. This site is also located in Section 8, T8S/R21E.

*CA-RIV-10031*

This small camp site is part of a multi-component site of less than 0.1 acre that features two excavated “foxhole” features. The site is located in Section 7, T8S/R21E.

*CA-RIV-10042*

This 3.4-acre multi-component site features a rectangular pit feature. This feature has been characterized as a possible multi-person foxhole. The site is located in Section 8, T7S/R21E.

*CA-RIV-10061*

This site is less than 0.1 acre, with a circular berm and “foxhole” feature. This site is located in Section 9, T8S/R21E.

*CA-RIV-10071*

This site measures about 0.2 acre and has five excavation features. The site is located in Section 9, T7S/R21E.

*PVM-DK-003*

This enormous, multi-component site touches on five contiguous sections of land (Sections 9, 10, 14, 15 and 16, T8S/R21/E. The site includes 29 historic features, including 18 excavated depressions, 4 berms, 1 55-gallon drum, 1 fence, and 1 rock alignment.

*PVM-MK-103*

This multi-component site comprising 6.2 acres has tank tracks and two historic-period thermal features that may indicate a camping event. This site is located in Section 35, T7S/R21E.

*PVM-PM-138*

This multi-component site of only 0.4 acre included munitions as well as ration cans. The site is located in Section 26, R8S/R21E. PVM-SM-109

*PVM-SM-109*

This multi-component site covers 35.8 acres and features 7 excavated pits. In addition, it has a very large scatter of food cans from the DTC era as well as numerous tank tracks and wheeled vehicle tracks, indicating that it may have been a sizeable camp site. The site is located in Section 35, T7S/R21E.

Sites Within the Rio Mesa I and II Project Boundaries

Unless project redesign makes avoidance of the following 19 CRHR-eligible DTC Maneuver sites possible, the applicant would be required under proposed **CUL-8** to conduct remote sensing and possible data recovery at these sites.

*CA-RIV-1095*

This multi-component site is of broad dimensions, covering 66 acres. The site includes 17 excavated depressions, 1 tent pad, 1 tank maneuver area, tank tracks, roads, and 3 food refuse features. This site is located in Section 33, T8S/R21E. Implementation of **CUL-8** would mitigate the project’s impacts to the historic-period part of this site to a level below the threshold of significance.

*CA-RIV-1746*

This large multi-component site covers 39 acres. The portion judged to be associated with the DTC features nine cleared circles. The site lies in Section 20 of T8S/R21S. Implementation of **CUL-8** would mitigate the project’s impacts to the historic-period part of this site to a level below the threshold of significance.

*CA-RIV-1748*

This very large, multi-component site, comprising 2,241 acres, is characterized by extensive features including, tank tracks, bulldozer scrapes, rock rings and trenches. The site spreads over parts of four sections of land: Sections 19, 20, 29 and 30 in T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-DT-003*

This site is made up of nine alignments of linear depressions ranging from 79 to 1,594 feet in length. It is located in Section 29 of T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to this site to a level below the threshold of significance.

*PVM-EK-040*

This multi-component site covers a total of 5.2 acres; however, the DTC-related portion focuses on three sets of tank tracks. The site lies in Sections 20 and 21 of T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-JR-012*

This multi-component site covers 23 acres. The DTC portion of the site is characterized as being affected by tank maneuver training and associated constructed features, along with moderate amounts of artifactual remains associated with the tank maneuvers. The site lies in Section 21 of T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-MK-095*

This site is recorded as being 1.7 acres in extent. It has two berm features believed to be associated with the DTC. The site lies in Section 23 of T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts this site to a level below the threshold of significance.

*PVM-MN-013*

This multi-component site covers 20.3 acres. The historic aspect of the site includes a garrison cap pin of the 307$^{th}$ Infantry Regiment, 77$^{th}$ Division, known to have been part of a maneuver that took place in the Rio Mesa SEGF in June, 1943. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-MN-017*

This site lies on 6 acres and is comprised of 278 surface artifacts related to the DTC use of the area. The site is also in Section 33, T8S. Implementation of **CUL-8** would mitigate the project's impacts to this site to a level below the threshold of significance.

*PVM-MN-031*

This 4-acre multi-component site was characterized by a variety of artifacts including blank ammunition and a variety of cans. It is located in Sections 27 and 28 of T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-MN-059*

This site covers 1.6 acres. It has a "foxhole" feature. The site lies in Section 16, T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to this site to a level below the threshold of significance.

*PVM-MN-060*

This is a multi-component site covering 0.4 acre that is characterized by a pit depression, a trench, and some cleared areas. This site is in Section 16, T8S. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-MN-067*

This multi-component site is on 2.4 acres, with the historic component characterized by 34 WWII features. This site lies in Section 16 of T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-MN-083*

This site is of only 0.3 acre; the main features present are eight excavated "foxhole" features. This site is in Section 16, 8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to this site to a level below the threshold of significance.

*PVM-MN-121*

This historic site covers 10.1 acres and is marked by six DTC maneuver features. This site lies in Section 16, T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to this site to a level below the threshold of significance.

*PVM-PM-014*

This is a multi-component site on 0.6 acre; this site has three depression features, possibly back-filled "foxholes" from a small-unit defensive action. It is located in Section 34, T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

*PVM-SM-001*

This is a site of 0.3 acre characterized by ammunition found on the surface. The site lies in Section 33, T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to this site to a level below the threshold of significance.

*PVM-SM-051*

This site covers 0.4 acre with four pit features and numerous ration cans. The site is in Section 21, T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to this site to a level below the threshold of significance.

*PVM-SM-060*

This is a large multi-component site covering 63.3 acres, marked by nine maneuver features including "foxholes," upright buried cans, a bulldozed trench, and defensive positions. This site is also in Section 21, T8S/R21E. Implementation of **CUL-8** would mitigate the project's impacts to the historic-period part of this site to a level below the threshold of significance.

## Multi-Site Historical Archaeological Resources

### Desert Training Center Cultural Landscape/District

Historical archaeological resources representing the WWII U.S. Army training exercises known as the DTC predominate in the historical archaeological PAA. DTC historical archaeological resources were also previously identified in the project areas of the Blythe Solar Power Project, the Genesis Solar Energy Project, the Palen Solar Power Project, and the Rice Solar Energy Project, during staff's CEQA review of these projects, with the result that staff identified a region-wide cultural landscape/district, the Desert Training Center Cultural Landscape/District (DTCCL), that staff assumed to be eligible for the CRHR. The Period of Significance for the DTCCL is 1942–1944, the period in which the facility was active. The historical boundaries of the DTC are known, but the DTC historical archaeological resources are spread out across vast areas such that a resource of the size enclosed within the historical boundaries would be unmanageable. The DTCCL/District is thus best perceived as a discontiguous district, with the boundaries being those of contributors, established as the contributors are identified through historical and archaeological research.

### District Elements and Characteristics

DTCCL contributing resource types include:

- Tank tracks
- Food-related refuse (primarily food can) scatter
- Other military refuse (other activities, e.g., vehicle-related; ± food) scatter
- Excavated depressions, foxhole, or temporary defensive position
- Temporary camp-related (cleared areas for tents)
- Features (hearths, thermal features)
- Linear depression/Scrapes
- Berms
- Rock rings/Alignments

### Evaluation of CRHR Eligibility of the DTCCL District

The DTCCL consists of the archaeological remains of the DTC training activities. No built-environment remains are present. The resource is eligible for the CRHR under Criterion 1, as the largest training facility, both in size and in the number of men trained, ever used by the U.S. Army; as a unique training facility where for the first time multiple branches of the military (infantry, armor, air, engineers, etc.) trained together to coordinate their efforts on the battlefield; and as an important factor in the defeat of German forces in North Africa. It is also eligible for the CRHR under Criterion 4; as a unique repository of archaeological data on WWII training doctrine and practice.

## Assessment of Project Impacts to Multi-Site Historical Archaeological Resources and Recommended Mitigation

Staff has concluded that the DTC Maneuver sites and the DTC Food-Related sites (but not the isolated artifacts) located on and near the Rio Mesa SEGF project site are contributors to the DTCCL and therefore are also assumed to be eligible for the CRHR. Staff has also concluded that data recovery from the DTC Food-Related sites is sufficient to mitigate for Rio Mesa SEGF's significant direct impacts to those sites. But staff has also concluded that the Rio Mesa SEGF project's direct and cumulative impacts to the DTCCL and to 32 DTCCL contributing resources would be significant. Staff proposes conditions of certification to mitigate these impacts to the extent feasible. **CUL-2** would require the project owner to contribute to an existing fund dedicated to the documentation and nomination of the DTCCL (see "DTCCL Documentation and Possible NRHP Nomination Program," below). **CUL-8** provides for possible data recovery at 32 DTC Maneuver sites.

**CUL-9** provides for the preparation of a film documentary focused on the infantry in the DTC. The destruction of the surface evidence of the DTC maneuvers on the Rio Mesa SEGF project site calls for a more publically available recordation than that found simply in the archaeological site records. A documentary film on the Infantry in the DTC would capture the character of the landscape and the DTC activities, with a focus on the infantry, engineer, and armor elements who learned the tactical lessons there that would be applied later in their overseas wartime experiences. The purpose of this documentary would be to highlight the role of the Palo Verde Mesa landscape in the training efforts undertaken by the Desert Training Center as a whole in a way that would coalesce the applicant's archaeological and historical findings, accomplished as part of **CUL-8**.

The training of the 307$^{th}$ Infantry Regiment of the 77$^{th}$ Infantry Division at the DTC is known from the historical record, but also through an artifactual find. A garrison cap pin bearing the motto, "Clear the Way," of the 307$^{th}$ Infantry Regiment of the 77$^{th}$ Infantry Division, was found on the project site.

The 77$^{th}$ Division was assigned to Camp Hyder in Arizona for training at the DTC. Advance elements of the division arrived on April 1, 1943. The 77$^{th}$ Division departed Camp Hyder in September, 1943 (77$^{th}$ Infantry Division Association 1947).

In WWII the 307th saw action in the Pacific islands and finally in Okinawa. A medic of the regiment, Corp. Desmond T. Doss, was awarded the Congressional Medal of Honor for his heroic service in caring for troops on the Maeda Escarpment. Some of the units known to have trained at the DTC ended up in the Pacific Theatre, fighting on the islands, and finally in Okinawa in preparation for the final assault on the Japanese home territories. The dropping of atomic bombs on Hiroshima and Nagasaki brought a precipitate end to the war, and so this assault was not needed. Portions of the 77$^{th}$ Division, including the 307$^{th}$ Regiment, were sent to the northern Japanese island of Hokkaido to perform occupation duties.

A film on the DTC infantry would be valuable not only to the Patton Museum, but also to the Infantry School at Fort Benning, Georgia, and perhaps other military schools such as The Citadel, from which Theodore Bell graduated in 1942. As we see the last of the Greatest Generation passing from the scene, this opportunity to bring to life the training experiences of the infantry and armored troops, especially the 77th Infantry Division and its various regiments, presents itself. The story of how this division, which derived most of its enlisted men from the New York area but was staffed by many officers from South Carolina (according to Bell), would make a compelling story of the coming together of antagonistic Civil War foes to pursue victory in the world war against Hitler, Mussolini, and Tojo.

## Summary of Historical Archaeological Resources Subject to Significant Project Impacts, Eligibility, and Recommended Mitigation

**Cultural Resources Table 14** displays the historical archaeological resources subject to significant Rio Mesa SEGF impacts, the resources' CRHR eligibility, and staff's proposed mitigation for the impacts.

**Cultural Resources Table 14**
**Summary of Historical Archaeological Resources, with CRHR Eligibility and Proposed Mitigation Measures, in the Rio Mesa SEGF Historical Archaeological PAA**

| | **Eligible as Contributor to DTCCL** | **Not Eligible** | **Proposed Mitigation** | **Total** |
|---|---|---|---|---|
| DTCCL | Yes | | **CUL-2** **CUL-9** | - |
| DTC Food-Related sites | 48 | 2 | None | 50 |
| DTC Maneuver sites | 39 | 2 | **CUL-8** | 41 |
| Historical-period non-military refuse | 0 | 21 | None | 21 |
| Mid-20th-century refuse | 0 | 8 | None | 8 |
| Rock boulders | 0 | 1 | None | 1 |
| Government survey marker | 0 | 1 | None; LORS apply | 1 |
| Cairn | 2 | 0 | None | 2 |
| Isolated historic-period artifacts | 0 | 3 | None | 3 |
| Total | 89 | 38 | - | 127 |

# ETHNOGRAPHIC RESOURCE INVENTORY AND EVALUATION, IMPACT ASSESSMENT, AND MITIGATION RECOMMENDATIONS

## ETHNOGRAPHIC CONTEXT

### Patayan

The Pai groups that inhabit the Lower Colorado River Valley and the surrounding region maintain a collective cultural understanding. These groups, the Mohave, the Walapai, the Havasupai, the Yavapai, the Maricopa, the Quechan, the Cocopah, the Paipai, the Kiliwa, and the Kumiai understand that they were created at the sacred mountain Avikwame (see below), and migrated from the mountain south to their respective ancestral homelands (except the Mohave who stayed near Avikwame) (Johnson 2003:161). Additionally, these groups share the Yuman language, although they speak different dialects. The term Patayan has been used to denote these Pai groups as the prehistoric peoples who occupied the Lower Colorado River Valley and nearby areas (Johnson 2003:160, Colton 1945:119). The term Patayan is defined by the material archaeological record, specifically the pottery style, but also other similar material culture attributes that are indicative of this region (Jones and Klar 2007:252-253; Colton 1945:114). **Cultural Resources Figure 7** displays the general area in which the Patayan cultural tradition is located.

The area around the Rio Mesa SEGF is an area that it appears was occupied by several different Tribes at different times. During the protohistoric period, accounts from European explorers indicate that at different times the Halchidhoma, Quechan, and Chemehuevi Tribes each settled in the Palo Verde Valley near the Rio Mesa SEGF project vicinity. Most of the Tribes of the Lower Colorado River were involved in amity-enmity relationships with one another; the Mohave, Quechan, Chemehuevi, Yavapai, and Kamia were allied against the Halchidhoma, Maricopa, Pima, Papago, and Cocopah in the east, and the Cahuilla, Diegueño, and Serrano in the west (Dobyns et al. 1963:109–111; Bean and Toenjes 2012:8). These inter-Tribal relationships were sustained by the east-west- and north-south-running trails that connected the Tribes along and slightly away from the Lower Colorado River. These trails were used for resource acquisition, trade, ceremony, and warfare. Frequent warfare was documented in the nineteenth century and was a major reason for the transitive nature of occupation in the Palo Verde Valley. It has been suggested that frequent warfare may not have been typical throughout the prehistoric past, but was exacerbated by the desiccation of Lake Cahuilla in the late eighteenth century (Stone 1981:37), and the presence of Euro-Americans (i.e., a demand for slaves by the Spanish and Americans and increased competition for resources between Tribal groups as newcomers settled on vital Tribal subsistence and agricultural lands).

**Cultural Resources Figures 6, 7, 8, and 9** show generally where Tribes are thought to have resided over the last several hundred years. The Halchidhoma originally moved from the Gila River-Colorado east-bank confluence up to the Palo Verde Valley in the seventeenth century to avoid the enmity relationship with the cross-river Quechan. Some ethnographic literature suggests that the Halchidhoma extricated themselves from the Palo Verde area or were forcibly removed by the Quechan and Mohave between the spring of 1827 and 1829 (Dobyns et al. 1963:125). Historic records suggest that the Mohave and Quechan feared that the Mexican government, intent on establishing a direct and standard transportation route from New Mexico to the California missions, would form an alliance with the Halchidhoma/Pima-Maricopa. With the exodus of the Halchidhoma, Chemehuevi groups settled into the northern portion of the area (with or without the permission of the Mohave) (Roth 1977). Roth, (citing Carobeth Laird) suggests that there is some evidence that the Chemehuevi, being allies of the Halchidhoma, were settled in the northern Palo Verde Valley prior to the Halchidhoma leaving it. The Halchidhoma, sufficiently bruised by the Mohave and Quechan, first moved to Mexico and then eventually to the Gila River Bend area where they assimilated into the culture of their long-term allies, the Maricopa. After the Halchidhoma left the Palo Verde area, some Mohave migrated down the Colorado and established themselves in Parker Valley. By 1850, some Quechan, attempting to avoid increasing American militarism in the Yuma area, migrated north and settled into the southern portion of the Palo Verde Valley. Some information suggests that, *circa* 1890, the Quechan, who had migrated north and more specifically to the village of *Avi'kwotapai*, returned to the Yuma area and settled in the western end of the Fort Yuma Reservation (Bee 1963:208).

### Present Tribal Governments

Tribes were invited to participate in the ethnographic study, based upon a list of nine affiliated Tribes provided by the NAHC. The nine invited Tribal governments represent six different cultural affiliations. From north to south in the Lower Colorado River Valley, these affiliations are: Chemehuevi (Southern Paiute) and Mohave; Serrano; Desert Cahuilla; Quechan; and Cocopah (Bean 1978:575, fig. 1; Bean and Smith 1978:570, fig. 1; Bee 1983:86, fig. 1; Heizer and Whipple 1971:map 1; Kelly and Fowler 1986:368, fig. 1; Stewart 1983a:55, fig. 1; Williams 1983:99, fig. 1).

Of the nine Tribal governments, five are participating in this study (**Cultural Resources Table 15**).

**Cultural Resources Table 15**
**Summary of Tribal Participation**
**in the Energy Commission Rio Mesa SEGF Ethnographic Study**

| Tribe | Cultural Affiliation | Study Participation |
|---|---|---|
| Chemehuevi Reservation | Chemehuevi (Southern Paiute) | Yes |
| Colorado River Indian Tribes | Mohave, Chemehuevi (Southern Paiute) | Yes |
| Fort Mojave Indian Tribe | Mojave | Yes |
| Fort Yuma Quechan Indian Nation | Quechan | Yes |
| Cocopah Indian Tribe | Cocopah | Yes |
| Morongo Band of Mission Indians | Cahuilla, Serrano | No |
| San Manuel Band of Mission Indians | Serrano | No |
| Twenty-Nine Palms Band of Mission Indians | Chemehuevi (Southern Paiute) | No |
| Agua Caliente Band of Cahuilla Indians | Cahuilla | No |

## Southern Paiute

The Southern Paiute are an Indian population that resided within an expansive portion of the Great Basin. Their territory can be described as a crescent extending northwest from the vicinity of present-day Blythe, California along the Colorado River to the Amargosa Range. From the Amargosa Range, Southern Paiute territory extended northeast into southern Nevada, generally between the White River and Virgin River watersheds. The northern boundary of Southern Paiute territory encompasses the southern third of present-day Utah. This group also held land in northern Arizona, north of and including the northern bank of the Colorado River. The eastern boundary of Southern Paiute territory was marked by the southeastern flank of the Rocky Mountains, just east of the Colorado-San Juan River confluence. The Chemehuevi are the only subgroup of Southern Paiute that resided in the project vicinity, along the lower Colorado River between Needles and Blythe (Kelly and Fowler 1986:fig. 1).

### Chemehuevi Indian Tribe

Chemehuevi Indians today are affiliated with the Fort Mojave Indian Tribe, Chemehuevi Indian Tribe, Colorado River Indian Tribes, Twenty-Nine Palms Band of Mission Indians, and the Cabazon Band of Mission Indians (Kroeber 1925:594–595). The Fort Mojave Indian Tribe is discussed in more detail, below, under the heading Mohave—Colorado River Indian Tribes. The Twenty-Nine Palms and Cabazon bands are not discussed in this analysis since these tribes currently are not participating in the ethnographic study. This subsection, therefore, addresses only the Chemehuevi Indian Tribe.

The Chemehuevi Tribe is a federally recognized Tribe and is officially named the Chemehuevi Indian Tribe of the Chemehuevi Reservation (BIA 2010:60810). Rather than remain on the Fort Mojave Indian Reservation, the Chemehuevi requested that the federal government establish their home in their traditional area, the Chemehuevi Valley. In 1885, the Chemehuevi requested to leave the Colorado River Reservation and go back to Chemehuevi Valley. They remained there and at Beaver Lake and Cottonwood Island until dam construction forced them out in 1929. The Chemehuevi Reservation was founded on the Colorado River in Chemehuevi Valley north of Parker, Arizona (Kelly and Fowler 1986:388–389).

Clemmer and Stewart (1986:table 3) report that the Chemehuevi Reservation was “alienated” in 1912 and inundated by Lake Havasu. In 1935, Congress authorized Mohave Water District to obtain as much reservation land as needed to create Parker Dam, which ultimately caused the inundation of 8,000 acres of Tribal lands in 1940. In the 1960s, some Chemehuevi members from the Colorado River Indian Reservation joined with off-reservation Tribal members in reorganizing the Chemehuevi Tribe and reactivating the Chemehuevi Reservation. The date of election of the Chemehuevi Indian Tribe’s constitution was February 14, 1970. Approval was obtained on June 5, 1970 (Rusco and Rusco 1978:565, table 1).

The current reservation contains 32,000 acres of trust land with 30 miles of Colorado River frontage (Chemehuevi Indian Tribe 2012a). The Tribe is based in Havasu Lake, California (BIA 2011:116). An Executive Committee comprising a chairperson, vice-chairpersons, and secretary treasurer oversees daily Tribal operations and enterprises. The Tribe also has a nine-person Tribal council and a Tribal court (active since 1996).

The Tribe's Cultural Center seeks to educate its younger generations about contemporary and traditional Chemehuevi life. The Tribe operates the Havasu Landing Resort & Casino (Chemehuevi Indian Tribe 2012b, 2012c, 2012d, 2012e).

## Mohave

Currently, the Mohave Indians are members of one of two Tribes: 1) former residents of the Fort Mojave Reservation in Arizona, now residing in Needles, California, since the 1930s; and 2) Mohaves of the Colorado River Reservation, part of the Colorado River Indian Tribes (Stewart 1983a:55).

### Colorado River Indian Tribes

The Colorado River Indian Tribes constitute a federally recognized Tribe headquartered in Parker, Arizona, and consists of Mohave, Chemehuevi, Hopi, and Navajo Indians (BIA 2011:116; Colorado River Indian Reservation 2009a). The Colorado River Indian Reservation was originally established in 1865 for the Mohave; land was added in 1874 to settle Chemehuevi Indians on the reservation (Kelly and Fowler 1986:388–389; Stewart 1983a:55). Hopi and Navajo were later settled on the reservation as well (Colorado River Indian Reservation 2009a).

The Colorado River Indian Reservation encompasses 300,000 acres on the Colorado River. The mainstay of the Colorado River Indian Tribes' economy has historically been agriculture and the Tribe presently grows cotton, sorghum, and alfalfa. The Colorado River Indian Tribes also run businesses in sand and gravel quarrying, real estate development, and retail, and operate the Blue Water Resort and Casino in Parker (Colorado River Indian Reservation 2009a). The Tribal government is administered by a nine-person Tribal council, which consists of a chairman, vice-chairman, treasurer, secretary, and five council members. All Tribal council members are elected to office by Tribal members (Colorado River Indian Reservation 2009b).

### Fort Mojave Indian Tribe

The Fort Mojave Indian Tribe is a federally recognized Tribe with its governmental seat in Needles, California (BIA 2011:117). The Fort Mojave Reservation covers almost 42,000 acres in Arizona, California, and Nevada. The land is divided into three major segments: 23,669 acres in Mojave County, Arizona; 12,633 acres next to Needles; and 5,582 acres in Clark County, Nevada. The Tribe operates the Avi Resort and Casino, containing a casino, hotel, restaurants, movie theater, and other recreation and entertainment. The Tribe also hosts an annual Pow Wow every February to celebrate native culture, hold dances, and have musical competitions (Fort Mohave Indian Tribe n.d.).

## Cahuilla

### Agua Caliente Band of Cahuilla Indians

Reservations were established of the Cahuilla beginning in 1875, totaling 10 by 1891 (Bean 1978:table 3). The Agua Caliente Band of Cahuilla Indians was granted land at Tahquitz Canyon, Riverside County, on May 15, 1876 (Agua Caliente Band of Cahuilla Indians 2012a; Bean et al. 1978:5-14, 5-16.) From 1891 until the 1930s, Indian Service (Bureau of Indian Affairs) personnel lived on-reservation and closely controlled Tribal politics. The Indian Reorganization Act of 1934 gave more political autonomy to the Cahuilla, permitting, among other rights, the authority to reestablish Tribal governments (Bean 1978:584; Castillo 1978:121).

Today, the Tribe and its members constitute the largest single landowner in Palm Springs. The Agua Caliente Band is governed by a Tribal council consisting of a chairman, vice chairman, secretary/treasurer, and two council members. The council members are elected by the Tribe, and the elected members appoint four proxy members (Agua Caliente Band of Cahuilla Indians 2012b).

## Quechan

### Fort Yuma Quechan Indian Nation (Quechan Tribe)

The Quechan Tribe is a federally recognized Tribe with its governmental office in Yuma, Arizona (BIA 2011:119). The United States government established the Fort Yuma-Quechan Reservation on the California side of the Colorado River in 1884, although much of the land was shortly afterward appropriated by Euro-Americans. Reservation lands were further broken up by allotment to individual Quechans in 1912. The Tribe ratified a constitution and elected a seven-person Tribal council in 1936. In 1978, the Tribe had 25,000 acres of land restored to them (Bee 1983:94–96).

Today, the Quechan Tribe's reservation spans the Arizona-California border at the Colorado River near the confluence with the Gila River and contains 45,000 acres of land. The Tribal government is headed by a president and vice president, as well as five council members. Business enterprises include a 700-acre agricultural lease to a non-Tribal farmer and a sand-and-gravel lease that employs Tribal members. The Tribe also manages trailer and recreational vehicle parks, a museum, bingo hall, two casinos, utility company, and fish and game department (Inter-Tribal Council of Arizona 2011).

## Cocopah

### Cocopah Indian Tribe

The Cocopah Indian Tribe is a federally recognized Tribe with its seat in Somerton, Arizona (BIA 2011:116; Federal Register 75(190):60810). The Cocopah originally resided north of their historically documented territory and are believed to have been displaced by the Mohave and Quechan *circa* A.D. 1400–1500 (Williams 1983:99–100).

Today there are two branches of Cocopah, one in the United States ("American Cocopah") and one in Mexico ("Mexican Cocopah"). This division resulted from the actions of the United States and Mexican governments concerning Indians residing within the boundaries of these two dominant nations. For instance, in 1917, the United States gave the "American Cocopah" title to three small land areas under the jurisdiction of the Bureau of Indian Affairs's Yuma agency (Williams 1983:102). Increased border enforcement in 1930 exacerbated the separation of the two groups (Kelly 1977:13).

The Arizona Cocopah began to organize in 1961, beginning with a revision of the Tribal constitution and bringing electricity to Tribal lands. The Cocopah have three reservations: Cocopah West Reservation, Cocopah East Reservation, and Cocopah Lots 5 and 6. These lands total 1,800 acres (Williams 1983:102). In 1964, the Cocopah

Indian Tribe formed its first constitution and a five-person Tribal council. In 1985, the Cocopah obtained an additional 4,200 acres of reservation land, including the North Reservation, via the Cocopah Land Acquisition Bill. The Tribe is currently led by a chairperson, vice-chairperson, and three council members (Cocopah Indian Tribe n.d.).

## EVALUATIONS OF CRHR ELIGIBILITY OF, AND PROJECT IMPACTS ON, ETHNOGRAPHIC RESOURCES IDENTIFIED BY RECORD SEARCH AND FIELD INVESTIGATION

### Ethnographic Landscapes

An ethnographic landscape is defined generally as a landscape containing a variety of natural and cultural resources that associated people define as heritage resources. Ethnographic landscapes can have considerable overlap with what are called traditional cultural properties. Traditional cultural properties are synonymous with the term “place.” Places and areas are types of historical resources that can be synonymous with traditional cultural properties and ethnographic landscapes. The term ethnographic landscape will be used to generally refer to the types of resources that are considered in this analysis; however, staff, by using the term ethnographic landscape, also intends that usage to mean an “area” or “place,” per the definition of historical resources, for the purposes of CEQA.

There are three ethnographic landscapes that, with varying proximity, are in the vicinity of the project:

1. Salt Song Trail Landscape

2. Keruk Trail/Xam Kwatcan/Earth Figures Landscape

3. Palo Verde Mesa Ethnographic Landscape

#### Salt Song Trail Landscape

The Salt Song Trail is a Southern Paiute sacred trail corridor that crosses several states and makes a circuit between the Mohave Desert and the southern portions of the Wasatch Range. It closely follows the Colorado River past the project vicinity. It is a trail system that is traveled by the deceased with the aid of traditional practitioners who, through song, story, and prayer, usher the deceased along the path to assist them on their post-burial journey to the afterlife and to alleviate the grief of their family and friends. The trail consists of physical marks on the land, both trail marks and natural land patterns, wayside locations where specific songs and other ceremonies are sung or conducted, and a corridor along the trail system.

#### Keruk Trail/Xam Kwatcan/Earth Figures Landscape

The Keruk Xam Kwatcan/Earth Figures Landscape is a Yuman sacred trail corridor that parallels the Colorado River between Spirit Mountain in the north (near Laughlin, Nevada) and Pilot Knob in the south (near Yuma, Arizona). A significant third sacred mountain located in the approximate mid-portion of the trail corridor is Palo Verde Peak. It is a trail system that the deceased follow, after the cremation ceremony, as they make their way to the afterlife, and that living people travel to assist in the departure of their deceased ancestors. It is also a trail that traditionally-minded Yumans take as a pilgrimage of return to the place of creation. For those who have trained, the trail can be travelled, as well, in dreams. The trail is a physical mark on the land (in some places consisting of parallel trails and trails on both sides of the river) with numerous wayside locations, including many of the earth figures. The earth figures also have many contributing features such as cleared circles, rock cairns, altars, cul-de-sac trails, altars and lithics including shattered quartz. The Mule Mountains and immediate surrounding environs are considered one place where souls might go to wait out the year of mourning between the cremation ceremony and the final journey to the afterlife. The project vicinity is one place where grieving families go to petition the deceased to move on.

### Palo Verde Mesa Ethnographic Landscape

The Palo Verde floodplain is one of approximately seven broad valleys that define the western edge of New World agriculture. To the west of the Colorado River, hunting and gathering subsistence strategies predominate. To the north of the Colorado River, the cultivation of plants is better described as horticulture, and the indigenous peoples of those areas relied heavily upon hunting and gathering. The Tribes of the lower Colorado practiced a unique mixture of agriculture and hunting, fishing, and gathering. The Palo Verde area is a place where at least four distinct Tribal groups over time vied for prime agricultural and hunting and gathering areas. The landscape where these practices played out for millennia consists of four zones: the river, the floodplain, the mesa, and the mountains.

#### *Landscape CRHR Eligibility*

Staff applied the four eligibility criteria of the CRHR to the three ethnographic landscapes. Recommendations and discussion are below.

Salt Song Trail Landscape Eligibility

This landscape in its entirety is eligible under Criterion 1 at the regional level for its broad contributions to the unique historic events that shaped the Southern Paiute understanding of the landscape through the repeated affirmation of the landscape through song and movement, and the conveyance of deep oral tradition through the generations, for the unborn, living, and deceased. Additionally, the particular segment that is within the viewshed of the proposed Rio Mesa SEGF is eligible under Criterion 1 at the local level.

This landscape is also eligible under Criterion 3 for its contributions to the production of the salt songs, whose high artistic value would be degraded without the landscape—songs sung during a ceremony that moves a group of living people and the deceased through a landscape are most aesthetic and culturally appropriate when sung in the landscape, in contrast to being sung for a studio recording or transcribed into musical notation and then heard, read, or duplicated by others. The landscape provides an auditory quality to the aesthetics of the songs.

Keruk Trail/Xam Kwatcan/Earth Figures Landscape Eligibility

This landscape in its entirety is eligible for the CRHR under Criterion 1 at the regional level for its broad contributions to the unique historic events that shaped the Yuman understanding of the landscape and of the place and role of the creator in the Yuman origin stories; and for the ability of the trail system, in physical and dream travel, to allow the dreamer to return to the place of origin as a means to regain the power that ensues from connecting to the place of origins; and for the power that boosts the deceased, through the cultural behaviors of the living, on to the afterlife; and for its mapping and conveyance, through song and movement, of deep oral tradition through the generations for the unborn, living and deceased.

In addition, the various earth figures that are contributing elements to the landscape convey a great aesthetic expression as power images etched in the desert pavements of the mesas and bajadas of the lower Colorado River corridor. These earth figures are sufficiently significant to be considered world heritage sites, although efforts to achieve this designation have yet to be undertaken. These earth figures, as contributing elements to the Keruk Trail/Xam Kwatcan landscape, make the landscape eligible under CRHR Criterion 3 as great artistic expressions.

The particular segment of the landscape that passes by the Rio Mesa SEGF project vicinity, which the project's access roads would cross and which is visually within the viewshed of the proposed Rio Mesa SEGF, is also eligible under CRHR Criteria 1 and 3 at the local level of significance for the same reasons stated above.

This landscape is also eligible for the CRHR under Criterion 3 for its contributions to the production of the Keruk and Xam Kwatcan songs, whose high artistic value would have been degraded without the landscape. Songs sung during a ceremony that moves a group of living people and the deceased through a landscape are most aesthetic and culturally appropriate when the songs are sung in the landscape, as contrasted with being sung for a studio recording or transcribed into musical notation and then heard, read or duplicated by others. The landscape provides an auditory quality to the aesthetics of the song.

Palo Verde Mesa Ethnographic Landscape Eligibility

This landscape is eligible for the CRHR under Criterion 1 at a local level for its broad contributions to the unique historic events associated with the development of agriculture in the New World. The Palo Verde Valley, and particularly its southern portion was one of approximately seven valleys in the Lower Colorado River corridor that were the cradle of a subsistence strategy that relied partially on the cultivation of agricultural crops and partially on hunting, gathering, and fishing. This hybrid system, evolving on the geographic fringe of New World agriculture, provided the basis for a vibrant series of cultures that combined the use of variable subsistence sources, unique storage strategies, a clan system, leisure time that allowed the perfection of the role of dreaming in human culture and consciousness, and intensive trading and warfare along one of the most extensive aboriginal trail transportation networks in North America.

This landscape is also eligible for the CRHR under Criterion 4 at a regional level for the information potential of its archaeological contributing elements, including Village Site "I," the long term occupation area surrounding Clapp Spring, and the various and numerous archaeological sites scattered across the mesa and the project vicinity that provide centuries of occupational evidence showing the difference between summer floodplain and winter mesa occupation by Native Americans. Various archaeological sites located throughout the Palo Verde Mesa and the Palo Verde and Mule Mountains show the relationship between long term occupational camps and overnight camps, and those camps' relationships to lithic reduction, quarrying, and subsistence hunting and gathering.

### *Landscape Contributing Attributes, Elements, or Features*

The National Park Service Cultural Landscape guidelines provide various terms for the smallest units that collectively define any landscape. Synonymously, these units are called "attributes," "elements," or "features."

The following tables (**Cultural Resources Tables 16**, **17**, and **18**) provide an attributes listing, description, and other relevant information[16] for understanding the natural and cultural make-up of the three landscapes discussed in this study.

**Cultural Resources Table 16**
**Contributing Features of the Salt Song Trail Landscape**
**Related to the Rio Mesa SEGF Project Vicinity**

| **Feature** | **Description** | **Additional Information** |
|---|---|---|
| Water | Pu ha (power), spirits, springs, creeks, washes, river | The trail follows the river in the project vicinity. Refer to the Water subsection of the soon-to-be-published Energy Commission Rio Mesa SEGF Ethnographic Report |
| Plants | Pu ha (power) plants along the trail and in the project vicinity | Refer to Table 4, Appendix 3 in the soon-to-be-published Energy Commission Rio Mesa SEGF Ethnographic Report |
| Agriculture | Floodplain | Agriculture is a secondary aspect to the floodplain, which is created by past flooding of the river. |
| Animals | Pu ha (power) animals along the trail and in the project vicinity | Refer to Table 8, Appendix 4, in the soon-to-be-published Energy Commission Rio Mesa SEGF Ethnographic Report |
| Trails | Pu ha (power) spirits, human, animals | All Southern Paiute, living and deceased, participate in the Salt Song Trail. The trail is a path on the ground, a corridor on and above the ground, and an auditory sound-scape. Further information will be provided in the FSA. |
| Ceremony | Pu ha (power) | Refer to subsection 4.8, Chemehuevi Mortuary Practices, in the soon-to-be-published Energy Commission Rio Mesa SEGF Ethnographic Report. |

[16] The "other relevant information" column will be further populated once Native American oral histories are completed prior to publication of the FSA.

## Cultural Resources Table 17
## Contributing Features of the
## Keruk Trail/Xam Kwatcan/Earth Figures Landscape
## Related to the Rio Mesa SEGF Project Vicinity

| Feature | Description | Additional Information |
|---|---|---|
| Water | Colorado River; washes | |
| Plants | A portion of the trail on the eastern side is used for gathering medicinal plants | |
| Agriculture | Keruk ceremonies require that participants are feed traditional foods | |
| Animals | Dreamers have guardian spirits some of which are animals | |
| Trails and associated sites | Trails documented as linear archaeological sites; cairns, cleared circles, cleared rings, rock rings, pot drop sherds, associated lithics; earth figures | |
| Landforms | Pilot Knob, Palo Verde Peak, Spirit Mountain, Mule Mountains, Colorado River | There are many landforms associated with the trail. The first three listed mountain landforms and the river generally define the trail. The Mule Mountains are associated with the trail and Palo Verde Peak |
| Mortuary Treatment | Cremation; cremation sites in the project vicinity | A ceremony for separating the spirit from the corpse and introducing a period of mourning for the living. |
| Ceremony and Sacred Trails | Keruk Ceremony<br>Cultural pattern dreaming | |

## Cultural Resources Table 18
## Contributing Features of the Palo Verde Mesa Ethnographic Landscape Related to the Rio Mesa SEGF Project Vicinity

| Feature | Description | Additional Information |
|---|---|---|
| Water | Colorado River, sloughs, lagoons, Clapp Spring, Mule Spring | |
| Plants | Wild and semi-wild plants used for subsistence, the preparation and cultivation of foods, the preparation and hunting of animals, and for building summer and winter houses | |
| Agriculture | Garden varietals | |
| Animals | Fish, Rabbits, Birds | |
| Trails | Trails among the river, floodplain, and mesa and through and around the Palo Verde and Mule Mountains | |
| Archaeological Sites | Camp Sites, Village I, | |

| Feature | Description | Additional Information |
|---|---|---|
| Landforms | Colorado River, Palo Verde Valley, floodplain, Palo Verde Mesa, Palo Verde Mountains and Peak, Mule Mountains. | |
| Ceremony | Mesquite and Harvest Festival | |

### *Landscape Boundary Justifications*

Salt Song Trail Landscape Boundary

A precise delineation and boundary justification for the Salt Song Trail Landscape is not necessary for this project because the landscape, extending over a large swath of the Southwest and California, far exceeds the area of the project. Energy Commission project review time constraints also prohibit such a robust delineation. **Cultural Resources Figure 5** provides the general parameters of the Salt Song Trail Landscape. Viewsheds and soundscapes are essential features for traditional Salt Song practitioners. In the vicinity of the Rio Mesa SEGF, the Salt Song Trail Landscape boundaries encompass the Palo Verde Valley, Palo Verde Mesa, Palo Verde Mountains, and Mule Mountains. The Salt Song Trail Landscape is ubiquitous throughout and exceeds the Rio Mesa SEGF project site.

Keruk Trail/Xam Kwatcan/Earth Figures Landscape Boundary

A precise delineation and boundary justification for the Keruk Trail/Xam Kwatcan/Earth Figures Landscape is not necessary for this project because the landscape, extending along the Colorado River, far exceeds the area of the project. Energy Commission project review time constraints also prohibit such a robust delineation. **Cultural Resources Figure 6** provides the general parameters of the Keruk/Xam Kwatcan/Earth Figures Landscape. Viewsheds, soundscapes, and dreamscapes are essential features for traditional Keruk and Xam Kwatcan practitioners. In the vicinity of the Rio Mesa SEGF, the Keruk/Xam Kwatcan/Earth Figures Landscape boundaries encompass the Palo Verde Valley, Palo Verde Mesa, and eastern sides of the Palo Verde Mountains and the Mule Mountains. The Keruk Trail/Xam Kwatcan/earth Figures Landscape is ubiquitous throughout and exceeds the Rio Mesa SEGF project site.

Palo Verde Mesa Ethnographic Landscape Boundary

The boundary of the Palo Verde Mesa Ethnographic Landscape exceeds the limits of the Rio Mesa SEGF project site. Conservatively, it includes part of the Colorado River floodplain and mesa of the southern Palo Verde Valley and Mesa, and the Palo Verde and Mule Mountains, as follows:

The area is drawn from the middle of the Colorado River and going south follows a secondary river channel that cuts just south of Davis Lake. The boundary follows Highway 78 for a few miles to where the highway intersects with Milpitas Wash. The boundary then forms the southern end of the landscape by following the Milpitas Wash for approximately a 10-mile length to where the main branch of the Milpitas Wash takes a significant bend to the west. The boundary departs the main branch of the wash and heads due north between the west side of the Palo Verde and Mule Mountains. The boundary intersects Coon Hollow Camp Ground and Wiley's Well Campground. North of Wiley's Well Campground the boundary follows the Wiley's Well Road for several miles before departing the road and following a number of parallel washes toward the northeast and Highway 10. Approximately two miles south of the highway the boundary runs east. After two miles, the boundary runs in a southeast direction back to the Colorado River and intersects the town of Ripley. **Cultural Resources Figure 12** provides the general parameters of the Palo Verde Mesa Ethnographic Landscape.

### ***Periods of Significance***

#### Salt Song Trail Period of Significance

The period of significance for the Salt Song Trail Landscape spans from the time of primordial instruction, just after the great flood and Coyote's creation of Paiute, up to the present. Technically, the end of period of significance is 45 years ago, or 1967. However, the landscape is actively used today by traditional practitioners and those participating in the Salt Song ceremony.

#### Keruk Trail/Xam Kwatcan/Earth Figures Landscape Period of Significance

The period of significance for the Keruk/Xam Kwatcan/Earth Figures Landscape spans from the time of primordial instruction, just after the creator *Mastamho* sent forth Pai people in migratory waves down the Colorado River and instructed them in how to conduct the Keruk Ceremony, up to the present. For the sake of historic preservation parlance, the end period of significance is 45 years ago or 1967. However the landscape is actively used today by traditional practitioners, those participating in the Keruk ceremony, and those making pilgrimages along the Xam Kwatcan Trail.

#### Palo Verde Mesa Ethnographic Landscape Period of Significance

The period of significance for the Palo Verde Mesa Ethnographic Landscape has been defined as the period between 1829, after the Halchidhoma left the Palo Verde Valley and Mesa, and 1905, when the Palo Verde Land and Water Company completed the first modern irrigation system that facilitated a new form of agriculture in the Palo Verde Valley. **Cultural Resources Table 19** provides a time sequence that further delineates the Palo Verde Mesa Ethnographic Landscape's period of significance. The entries between bold lines show significant events that support the ethnographic landscape.

**Cultural Resources Table 19**
**Palo Verde Mesa Ethnographic Landscape**
**Timetable for the Period of Significance, 1829–1905**

| | |
|---|---|
| 1827–1829 | Mohave – Quechan – Halchidhoma Wars |
| 1828 | Jedediah Smith crosses the Colorado River and skirmishes with Mohave |
| 1829 | Halchidhoma exit the Palo Verde Valley |
| 1830 | Chemehuevi move into north western edge of Palo Verde Mesa |
| 1850 | Quechan move into Southern Palo Verde Valley |
| 1858–1859 | Mohave attack American wagon train and U.S. army retaliates, killing many Mohave warriors |
| 1865 | Mohave Chief Irrateba moves some Mohave to the Colorado River Indian Reservation located in Parker Valley and to the northeastern part of Palo Verde Valley |
| 1865–1867 | Chemehuevi-Mohave War |

| | |
|---|---|
| 1867–1871 | Blythe Grant; Dent Irrigation Canal established for irrigating Colorado River Indian Tribes' lands. Individual Indian families begin switch from traditional subsistence patterns to reservation allotment, cash labor, and land-leasing incomes. |
| 1870–1890 | Time of abject misery, poverty, disease, and rapid indigenous population decline |
| 1864–1884 | Thomas Blythe, Callaway and Irish attempt to establish the first irrigation canal in Northern Palo Verde Valley; Blythe dies; Callaway is killed by Chemehuevi during an argument that partially involves Indian wage labor opportunities. |
| 1890 | Palo Verde Valley Quechan move back to the western portion of the Yuma Reservation. |
| 1890 | Boarding schools established to deny Indian culture and language to Indian children |
| 1890s | Some Chemehuevi, Mohave, and Quechan continue traditional farming methods and migratory lifestyles, including construction of summer houses near gardens in floodplains and winter houses along the mesas. |
| 1890–1905 | Chemehuevi and Mohave engage in cash labor for Americans interested in developing the Palo Verde Valley by attempting to control the river through dams, levees, and irrigation canals. |
| 1890–Present | Reservation lands along the Lower Colorado River corridor are converted to modern agriculture and are farmed by Chemehuevi, Mohave, and Quechan, or are leased out to non-Indian farmers |
| 1894? | The Colorado River Indian Tribes requests that a levee be built along the river where it passes through the southern end of the reservation (Northern Palo Verde Valley) in order to improve their agricultural lands. The Tribe requests a 1,500-foot floodplain be maintained to preserve some of the habitat along the river for traditional subsistence activities. |
| 1904 | Blythe Irrigation System completed |
| 1905 | Euro-American irrigation agriculture takes root in the Palo Verde Valley |
| 1905–1915 | The Lacuna Dam is built below Yuma, and a related irrigation canal breaches, diverting the Colorado River into the Salton Sea and forcing the Cocopah farmers to relocate their traditional farms from the Colorado River Delta to the New River near the southern end of the Salton Sea. |

### *Landscape Integrity*

#### Salt Song Trail Integrity

The Southern Paiute Salt Song Trail Landscape along the portion of the Colorado River near the Rio Mesa SEGF project vicinity has been visually and physically compromised by some modern developments, such as the presence of Blythe, modern river controls such as levees and dams that prevent natural flooding, modern-day agriculture, and other infrastructure, such as vehicle transportation (I-10 corridor), airplane transportation (Blythe Airport) and electrical transmission (Palo Verde-Devers transmission line). In addition, auditory and olfactory characteristics and nightscapes have been compromised by vehicles, farm equipment, and dust from extensive and intensive farming activities, and industrial-scale renewable energy projects. In the northern Palo Verde Valley, the city of Blythe casts a modest amount of light into the night sky. However, the general landscape of the Palo Verde Valley retains a rural feeling and is relatively unmarred by development.

In addition, Southern Paiute traditional singers must continue the singing and funerary tradition, lest they void their obligations to the deceased, to themselves, to their unborn descendents, and to the very identity and continuance of the Southern Paiute as a people. No amount of landscape alteration can prevent them from continuing this tradition. However, increased infrastructural intrusions increase the burden and challenges to traditional practitioners to continue traditions vital to their community and heritage. Their landscape remains aesthetically pleasing to them despite intrusions, due to the beauty, balance, and sustenance by which they are provided a unique identity, handed down through generations and originally provided to them in a pact with their creator.

The Salt Song Trail Landscape maintains, particularly from the perspective of traditional practitioners, integrity of association, feeling, setting, and location.

Keruk Trail/XamKwatcan/Earth Figures Landscape Integrity

The Keruk Trail/XamKwatcan/Earth Figures Landscape, along the portion of the Colorado River near the Rio Mesa SEGF project vicinity, has been visually and physically compromised by some modern developments, such as the presence of the city of Blythe, modern river controls, such as levees and dams that prevent natural flooding, modern-day agriculture, and infrastructure, such as vehicle transportation (I-10 corridor), airplane transportation (Blythe Airport) and electrical transmission (Palo Verde-Devers transmission line). Some segments of the physical Keruk/Xam Kwatcan/Earth Figures Landscape Trail have been damaged or completely removed from the land by modern-day activities, mostly related to road construction, and, on the Palo Verde Mesa, by activities related to the WWII DTC presence. In addition, auditory and olfactory characteristics and nightscapes have been compromised by vehicles, farm equipment, and dust from extensive and intensive farming activities and large utility scale renewable energy projects that result in dust storms. To the north, the city of Blythe casts a modest amount of light into the night sky. However, the general landscape of the Palo Verde Valley retains a rural feeling and is relatively unmarred by development.

Several of the earth figures in the vicinity of the Palo Verde Valley, Mesa, and surrounding mountains are intact, but some have incurred damage from off-road vehicles. Some of this activity has been curtailed by the erection of fences and by public interpretation bringing awareness of the uniqueness of the earth figures. However, the fences, while fulfilling a necessary function, may also reduce the earth figures' integrity.

But, despite landscape alterations, Yuman traditional practitioners, grieving families, and those making pilgrimages to Spirit Mountain, physically by walking (or driving), or by dreaming, must continue these traditions lest they void their obligations to the deceased, to themselves, to their unborn descendents, and to their very identity and continuance as a people. No amount of landscape alteration can prevent them from continuing this tradition. However, increased infrastructural intrusions increase the burden and challenges to traditional practitioners to continue traditions vital to their community and heritage. Their landscape remains aesthetically pleasing to them despite intrusions, due to the beauty, balance, and sustenance by which they are provided a unique identity, handed down through generations and originally provided to them in a pact with their creator.

The Keruk Trail/XamKwatcan/Earth Figures Landscape maintains, particularly from the perspective of traditional practitioners, integrity of association, feeling, setting, and location.

### Palo Verde Mesa Ethnographic Landscape Integrity

Integrity of the Palo Verde Mesa Ethnographic Landscape is best considered by evaluating the integrity of each of its four constituent landforms or zones: river, floodplain, mesa, and mountains.

#### *River Integrity*

The river over the last 200 years has struck many different courses through its floodplain. Historic maps suggest three separate channels that either represent older river channels, channels that were formed separately from the main course that accommodated overflowing river water, or a combination of both. While flooding was a yearly event, from time to time, the river changed from its channelized course in part, or in entirety as it incised its way through the prior depositions of flood-delivered sediments. That the Palo Verde Valley has flooded on several occasions since 1905 (with the 1922 event being noteworthy as flooding happened in May and again in June of that year) attests to the river's staying power, despite human efforts to control its flow, directional course, and siltation periodicity.

The twentieth-century stabilization of the Lower Colorado River by means of dams and levees characterizes the later years of the Palo Verde Mesa Ethnographic Landscape. The river is no longer a free-flowing river. However, the flanking levees on both sides have a setback from the actual river banks, allowing the river to meander within the broader confines of the levees. Thus, the river has integrity of location, feeling, association, and setting.

#### *Floodplain Integrity*

At the lower end of the Palo Verde Valley, the floodplain consists of a bed of silt at least 100 feet deep. Modern agriculture is a viable mainstay of the Palo Verde Valley because of the rich bed of sediments and the shallow aquifer that supplies farms with crop water. While the river has breached the levees on several occasions since their construction in 1905, spreading silt where it inundated the Valley, for the most part the river has remained along the eastern side of the valley, and siltation has not occurred regularly since the construction of the 1935 Hoover Dam and the 1938 Parker Dam.

The floodplain during the period of significance was a quilted pattern of inundated sloughs, lagoons, and backwater ponds amidst lush thickets of native grasses, reeds, arrow weed, willows, and cottonwoods. Within the floodplain, and particularly along the sloughs, native agricultural patches were cleared and maintained in a mosaic of gardens. During the period of significance, it is unlikely that more than 50 percent of the floodplain was in managed garden plots. During the era of disease and poverty and at the beginning of reservation establishment (*circa* 1865–1890), Tribal populations generally declined by 50 percent, resulting in a cultivation area that was less than 25 percent of the floodplain. However, due to the absence of the Halchidhoma allowing other Tribal groups to take advantage of the open and fertile area while attempting to escape the impacts of the American presence, the cultivated area percentage of the Palo Verde Valley may have been slightly higher than the rest of the Colorado River valleys. Today approximately 90 percent of the Palo Verde floodplain is dedicated to agricultural production.

The floodplain maintains integrity of location, setting, and association.

*Mesa Integrity*

The mesa bore the brunt of the wide-scale WWII DTC military training activities. Tracks, surface gouging, and refuse disposal, some of which are considered historic in their own right, are abundant across the mesa. In addition several mines dot the lower flanks of the Mule Mountains, with tailings, leveled bench mining, and shafts, and related mining equipment, infrastructure, and refuse, which may also be considered historic. Roads that accommodated early transportation between the Palo Verde Valley and the Salton Sea and lower Coachella Valley, and that also accommodated the various defunct mining activities, cross the mesa in several places. In more recent years, the area has accommodated off-road vehicle enthusiasts accessing desert backcountry and wilderness areas. A transmission line traverses and crosses over the mesa near the project vicinity. A mesa area of approximately 5 acres in size has been used as a borrow pit. Many modern transportation routes and transmission lines obscure or cross traditional indigenous trails that accommodated Yuman travelers. Nonetheless, traditional plants and animals continue to thrive on the mesa and continue to provide subsistence benefits (whether or not those benefits are presently utilized by Native Americans), as they did for Yuman hunters and gatherers of more than a hundred years ago. Despite the visual intrusion, as seen from close-up, of these various activities related to modern culture and society, from a distance they are not visually intrusive.

The mesa maintains integrity of location, setting, association, and feeling.

*Mountain Integrity*

The Mountains are partially marred with mining activity along the flanks in several places. Roads cut through the Mule and Palo Verde Mountains in three places. Roads also encircle the two mountains, allowing travelers to circumnavigate the two-mountain complex. However, due to the designation of the Palo Verde Mountains and Palo Verde Peak as wilderness areas and the BLM's designation of the northwest portion of the Mule Mountains as an Area of Critical Environmental Concern, the Mountains are remarkably intact.

The Mule and Palo Verde Mountains maintain integrity of location, setting, association, and feeling.

## ASSESSMENT OF PROJECT IMPACTS TO CRHR-ELIGIBLE ETHNOGRAPHIC RESOURCES AND RECOMMENDED MITIGATION

### Direct Impacts to the Salt Song Trail Landscape

The Salt Song Trail Landscape and associated Southern Paiute traditional practices require a specific landscape, and that landscape, a linear corridor, totally encompasses the proposed project site. The cultural practices associated with this landscape have endured for at least a millennium and are so ancient that most Southern Paiute do not know of its specific historical origins except to say that the practices, and places where the practices are conducted, were provided to Southern Paiute at the time of creation. The project is proposed for construction in the midst of this corridor. Siting the project in its proposed location would result in a physical impact to the Salt Song Trail Landscape

Trail and its contributing features. The project footprint and infrastructure would blemish, mar, and otherwise damage, destroy, and alter the trail corridor. In the course of project construction some natural waterways would be removed, damaged, or altered. New water flow patterns, with newly introduced water sources, would be created. The project would also damage, remove, and otherwise destroy plants and animals that are contributing features to the landscape in the vicinity of the trail corridor. Unprecedented and continuous human activity would occur in a place otherwise considered to be comparatively tranquil.

Many of the impacts that would start during construction would endure for the operational life of the project. The washing of heliostat mirrors and establishment of project roads would cause further alteration to the natural course of ground and surface water flow. Dew would accumulate in differential amounts depending on the extent of project infrastructure. Alteration to water accumulation and flow would change surviving plant characteristics. Landscape-contributing-feature plants and animals would be removed and fenced out from the project footprint, potentially subject to harm up to and including death. The heliostat mirrors would not only cause alteration of the water flow and plant and animal life, but traditional cultural and religious practitioners believe that the Rio Mesa SEGF heliostats would also diminish the power of the songs and confuse the souls on their journey to the afterlife, given the large number of heliostats that would be utilized.

## Indirect Impacts to the Salt Song Trail Landscape

Construction would also have indirect impacts for the deceased who travel the Salt Song Trail, to the traditional practitioners that guide the deceased along the trail, and to the surviving relatives. Funeral ceremonies have occurred adjacent to the proposed project site. At least one, if not several, cremation burial sites have been identified by archaeologists in the project vicinity. At the time of publication of this PSA, staff does not know the date of the cremations that have occurred in the project vicinity, but they probably did not occur within the last century. However, numerous Yuman cremations happen on a yearly basis, up to the present, and will continue in the future to require an intact Keruk Trail/Xam Kwatcan/Earth Figures Landscape for as long as Yuman people continue their cultural traditions along the Lower Colorado River.

As the uncertainty of Salt Song singers to fulfill their obligations is increased, so also is there a correlated increased impact to grieving families of the deceased. Grieving families would be uncertain if their deceased have been properly ushered to the place of afterlife. Additionally, although the Salt Song Trail is a Southern Paiute institution, the segment that runs through Chemehuevi ancestral territory within the Palo Verde Valley is, therefore, under the watch of the Chemehuevi. Should this segment of the trail be impacted, it would have an additional adverse effect on the Chemehuevi, in that they would be perceived by other Southern Paiute as having allowed the impact to occur. Some of these impacts may be more categorically placed within the context of mental health impacts, or environmental justice and social justice frameworks, than as impacts to historical resources. But there are indirect cause-and-effect links between impacts to ethnographic landscapes and impacts to people whose lifeways and related sense of cultural well-being rely upon and ensue from such landscapes.

## Mitigation for Impacts to the Salt Song Trail Landscape

The direct and indirect adverse impacts of the proposed project on the Salt Song Trail Landscape are significant and unavoidable if the project is constructed as designed and in the proposed location. Given the extended period of both the proposed project's operation (a minimum of at least 30 years) and the physical presence of the proposed facilities, including the heliostats and power towers, the impact of the project's presence on the landscape must be considered permanent. Staff is unaware of any suite of mitigation measures that would reduce the loss of a substantial portion of the Salt Song Trail Landscape's integrity and spiritual context, particularly one that provides the means by which the Southern Paiute deceased travel from their places of birth and death to an afterlife. The applicant has provided no information or analysis on this or any of the other ethnographic landscapes, and has proposed no mitigation to date to reduce the project's impacts on these significant resources.

Staff is consulting with the Chemehuevi Tribe to explore the possibility of compensatory mitigation measures that would at least 1) partially mitigate the loss of this landscape's ability to convey its associative values and 2) compensate for the impacts to those who pass away, those responsible for facilitating the passage of the dead, and those who grieve during a time of transition. There is not another resource that can replace the Salt Song Trail Landscape. By Southern Paiute reckoning, the creator provided a specific set of instructions in relation to a particular landscape, and the transference of knowledge from the creator to the Southern Paiute, including the Chemehuevi, concerning matters of life and death is non-negotiable. There are no rules by which Tribal religious leaders can modify, delete, or add to the religious prescriptions provided them in a solemn pact with the creator. To do otherwise is to invite chaos, particularly as the rules and practices at hand are those pertaining to relations between the living and the deceased. However, compensatory actions may provide some token signs of goodwill to minimize the impact. Such mitigation, were it acceptable to the Chemehuevi Tribe on behalf of its Salt Song practicing membership, would be done within the framework of historic preservation as well as environmental justice.

The U.S. Environmental Protection Agency encourages including outreach to community-based organizations and Tribal governments early in the screening process to identify the presence of distinct minority communities residing both within, and in close proximity to, a proposed project, and to identify those minority groups that utilize or are dependent upon resources that could be potentially affected by the proposed action (USEPA 1998).

If compensation is considered, then it should be done in direct consultation with the traditional practitioners and Tribal communities associated with the Salt Song Trail. Direct consultation for possible compensatory mitigation should be conducted with a wider group of practitioners than just the Tribe consulted to date regarding this proposed project. Staff is proposing no conditions of certification to address impacts to this resource at this time. Staff will further consider mitigation prior to the publication of the FSA.

## Direct Impacts to the Keruk Trail/Xam Kwatcan/Earth Figures Landscape

The Keruk Trail/Xam Kwatcan/Earth Figures Landscape and associated practices require a specific landscape, and that landscape, a linear corridor, totally encompasses the proposed project site. The cultural practices associated with this landscape have endured for at least a millennium and are so ancient that most Yumans do not know their specific historical origins except to say that the practices, and places where the practices are conducted were provided to Yuman people at the time of creation and the subsequent migrations from Spirit Mountain (the Big House) down the Colorado River corridor to the second Big House at Pilot Knob. The project is proposed to be placed in the midst of this corridor and adjacent to the third Big House, Palo Verde Peak. Act to the Keruk Trail/Xam Kwatcan/Earth Figures Landscape Trail and its contributing features, among them the Mule Mountains—the place of the Wandering Souls.

Additionally, the project is proposed to be placed directly between the earth figures on the shoulders of Palo Verde Peak and the Mule Mountains. The viewshed between the earth figures and the Mule Mountains is the viewshed that grieving Yuman people, and particularly the Quechan, use to encourage their deceased ancestors to move on to the afterlife. In addition, Quechan dreamers who travel the Xam Kwatcan (Dream Trail) to the place of the origin, Spirit Mountain, strengthen and otherwise assist their dreaming by physically walking, driving, and contemplating the landscape in and around the project site. Should the project be placed directly amidst this viewshed, traditional dreamers would be required to incorporate this non-traditional element into their visions' physical, and subsequently dreamed, migratory and originating pilgrimage back to Spirit Mountain. This forced incorporation would significantly degrade dreamers' clear visions of their origin pilgrimage and therefore their ability to convey culturally patterned good or bad omens for the rest of their people.

The project footprint and infrastructure would blemish, mar, and otherwise damage, destroy, and alter the Keruk Trail/XamKwatcan/Earth Figures Landscape's trail corridor integrity. In the course of project construction some natural waterways would be removed, damaged, or altered. New water flow patterns, with newly introduced water sources, would be created. The project would also damage, remove, and otherwise destroy plants and animals that are contributing features to the landscape in the vicinity of the trail corridor. Unprecedented and continuous human activity would occur in a place otherwise considered to be comparatively tranquil.

Many of the impacts that would start during construction would endure for the operational life of the project. The washing of heliostat mirrors and establishment of project roads would cause further alteration to the natural course of ground and surface water flow. Dew would accumulate in differential amounts depending on project extent of infrastructure. Alteration to water accumulation and flow would change surviving plant characteristics. Landscape-contributing-feature plants and animals would be removed and fenced out from the project footprint, potentially subject to harm up to and including death. The heliostat mirrors would not only cause alteration of the water flow and plant and animal life, but traditional cultural and religious practitioners believe that the heliostats would also diminish the power of the songs and add confusion to the songs and souls on their journey to the afterlife, given the large number of heliostats, approximately 170,000, that would be utilized in Solar Plant 1 and Solar Plant 2.

Project access roads on the eastern portion of the mesa may cross over the Dream Trail in several places. Further trail studies will investigate this possibility and will be addressed in the FSA.

## Indirect Impacts to the Keruk Trail/Xam Kwatcan/Earth Figures Landscape

Construction would also have indirect impacts for the deceased who travel the Salt Song Trail, to the traditional practitioners that guide the deceased along the trail, and to the surviving relatives. Funeral ceremonies have occurred adjacent to the proposed project site. At least one, if not several, cremation burial sites have been identified by archaeologists in the project vicinity. At the time of publication of this PSA, staff does not know the date of the cremations that have occurred in the project vicinity, but they probably did not occur within the last century. However, in the present, Yuman cremations happen yearly and will continue in the future to require an intact Keruk Trail/Xam Kwat can/Earth figures landscape for as long as Yuman people continue their cultural traditions along the Lower Colorado River.

A year after burial, traditional practitioners, in conjunction with grieving relatives, may undertake the Keruk/Xam Kwatcan pilgrimage, some of which occurs in specific adjacent areas within 1–5 miles of the proposed project site. The project would introduce visual intrusions, with its glint and glare, solar power towers, and the flux that would be emitted from such towers. The project would become a physical, visual, and mental barrier to those who travel the Keruk Trail/Xam Kwatcan Trail. In addition, the construction of the project would irreparably damage and alter, through physical, visual, and auditory impacts, the ability of the traditional practitioners to fulfill their spiritual obligations to the deceased to move them from their places of death through the landscape and on to the afterlife.

As the uncertainty of Keruk/Xam Kwatcan practitioners to fulfill their obligations is increased, so also is there a correlating increased impact to grieving families of the deceased. Grieving families would be uncertain if their deceased have been properly ushered to the place of afterlife. Some of these impacts may be more categorically placed within the context of mental health impacts or environmental and social justice frameworks than as impacts to historical resources. But there are indirect cause-and-effect links between impacts to ethnographic landscapes and impacts to people whose lifeways and related sense of cultural well-being rely upon and ensue from such landscapes.

## Mitigation for Impacts to the Keruk Trail/Xam Kwatcan/Earth Figures Landscape

The direct and indirect impacts of the proposed project on the Keruk Trail/Xam Kwatcan/Earth Figures Landscape are significant and unavoidable if the project is constructed as designed and in the proposed location. Given the extended period of both the proposed project's operation (a minimum of at least 30 years) and the physical presence of the proposed facilities, including the heliostats and power towers, the impact of the project's presence on the landscape must be considered permanent. Staff is unaware of any suite of mitigation measures that would reduce the loss of a substantial portion of the Keruk Trail/Xam Kwatcan/Earth Figures Landscape's integrity and spiritual context, particularly one that provides the means by which the Yuman deceased travel from their places of birth and death to an afterlife, and Quechan dreamers undergo physical and dreamed pilgrimages to the place or Yuman origins. The applicant has provided no information or analysis on this or any of the other ethnographic landscapes, and has proposed no mitigation to date to reduce the project's impacts on these significant resources.

Staff is consulting with the Lower Colorado River Yuman-affiliated Tribes to explore the possibility of compensatory mitigation measures that would 1) at least partially mitigate the loss of this landscape's ability to convey its associative values and 2) compensate for the impacts to those who pass away, those responsible for facilitating the passage of death, and those who grieve during a time of transition. There is not another resource that can replace the Keruk Trail/Xam Kwatcan/Earth Figures Landscape. By Yuman reckoning, the creator provided a specific set of instructions in relation to a particular landscape and the transference of knowledge from the creator to the Yuman concerning matters of life and death is non-negotiable. There are no rules by which Tribal religious leaders can modify, delete, or add to the religious prescriptions provided them in a solemn pact with the creator. To do otherwise is to invite chaos, particularly as the rules and practices at hand are those pertaining to relations between the living and the deceased. However, compensatory actions may minimize the impact. Such mitigation, were it acceptable to the Cocopah, Mojave, Colorado River Indian Tribes, and Quechan Tribe, on behalf of its practicing Keruk Trail/Xam Kwatcan membership, would be done within the framework of historic preservation as well as environmental justice.

*Final Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses* (US EPA 1998) also encourages including outreach to community-based organizations and Tribal governments early in the screening process to identify the presence of distinct minority communities residing both within, and in close proximity to the proposed project, and to identify those minority groups that utilize or are dependent upon resources that could be potentially affected by the proposed action.

If compensation is considered, then it should be done in direct consultation with the traditional practitioners and Tribal communities associated with the Keruk Trail/Xam Kwatcan/Earth Figures landscape. No conditions of certification to address impacts to this resource are proposed at this time. Further consideration of this type of mitigation is deferred to the FSA.

## Direct Impacts to the Palo Verde Mesa Ethnographic Landscape

The Palo Verde Mesa Ethnographic Landscape is comprised of four zones: river, floodplain, mesa, and mountains. The project site is wholly within the boundaries of the Palo Verde Mesa Ethnographic Landscape, specifically the Mesa Zone. Direct impacts to the Mesa Zone of the larger landscape would include the loss of hunting and gathering subsistence interpretive opportunities equal to the project acreage. Additional impacts would be to the loss of contributing elements that are archaeological by definition, but that are better understood as trails, lithics, cleared circles, rock rings, cairns, and pottery sherds. While many of these sites may not be individually eligible for the CRHR, staff has identified them as contributing elements to the CRHR-eligible Palo Verde Mesa Ethnographic landscape, so the destruction of the archaeological contributing elements would constitute a direct impact to the Palo Verde Mesa Ethnographic Landscape.

## Indirect Impacts to the Palo Verde Mesa Ethnographic Landscape

The Palo Verde Mesa Ethnographic Landscape is comprised of four zones: river, floodplain, mesa, and mountains. The project footprint would significantly compromise the Mesa Zone. With this zone's diminishment, the ability of the rest of the landscape to convey its significance would likewise be diminished. The views of the landscape's Mesa Zone from the other landscape zones, particularly the Mountain and Floodplain Zones would be impacted to the extent that the entire landscape would no longer convey significance. The significance that would no longer be conveyed would be a significance that provides interpretive values for showing how the rise and spread of New World agriculture was arrested at its margins (the Lower Colorado River Corridor, specifically the Palo Verde Valley) by the intrusion of the Spanish, Mexican, and American cultures. At the margins, the rise and expansion of New World agriculture consisted of a hybrid subsistence strategy of agriculture and hunting, gathering, and fishing. The Mesa Zone particularly provided a respite from the annual Colorado River floods. The Mesa Zone was a place where families could store agricultural food, including seed stock for the upcoming year's planting, hunt and gather while waiting for the flood potential to abate, and supplement food sources while crops were planted and growing in the floodplain. Local trails provided means of indigenous travel between the floodplain and the mesa. Regional trails, some of which are being researched through the PTNCL program, link the local indigenous travel network with a regional network that allowed for long-distance trade of plant and animal products, the trade and barter of agricultural seed stock, and the dissemination of localized agricultural knowledge to distant cultures throughout the Southwest, southern California, and the southern Central Valley.

## Mitigation for Impacts to the Palo Verde Mesa Ethnographic Landscape

It is possible to avoid or reduce the adverse direct and indirect impacts this project, as proposed, would cause to this resource, to a less-than-significant level. Staff proposes Condition of Certification **CUL-7**, which would require that the Rio Mesa SEGF project owner monetarily compensate each of the Tribes for their losses of subsistence knowledge, as that knowledge is informed by the landscape, and the long-term opportunity that would otherwise be available within the lands currently proposed for permanent Rio Mesa SEGF project-related land use. Each Tribe is affiliated with an existing interpretive center, preserve, or museum as follows.

- Chemehuevi Indian Tribe Cultural Center, Havasu Lake, CA
- A hak hav Tribal Preserve (Colorado River Indian Tribes), Parker, AZ
- Colorado River Indian Tribes Museum, Parker, AZ
- Aha Makav Cultural Society (Fort Mojave Indian Tribe), Mohave Valley, AZ
- Fort Yuma Quechan Tribal Museum, Yuma, AZ

Staff proposes that each center receive an endowment for the purpose of incorporating traditional subsistence educational, demonstration, and utilization programs that would contribute to the continuance of Chemehuevi and Yuman-affiliated understanding and practice of subsistence patterns that combine agriculture and hunting and gathering activities.

Specific loss of trail segments in the project vicinity (still being researched) would remove the information potential that these segments retain and convey. If the project is approved, minimal trail study will have been completed on these segments. This loss of information potential can be reduced to less than significant by implementation of **CUL-1**.

Conditions of Certification **CUL-1** and **CUL-7** would reduce the impacts of the Rio Mesa SEGF project on the Palo Verde Mesa Ethnographic Landscape to less than significant.

## SUMMARY OF RECOMMENDED MITIGATION OF IMPACTS TO ETHNOGRAPHIC RESOURCES IDENTIFIED BY RECORD SEARCH AND FIELD INVESTIGATIONS

Staff has assessed the impacts of the proposed Rio Mesa SEGF project on the three ethnographic landscapes as significant, but it is anticipated that proposed mitigation measures would reduce some of these impacts to a less-than-significant level.

Because the Salt Song Trail Landscape corridor, where traditional singers visualize the landscape as they sing their deceased ancestors to the other side, would be visually impacted should the project be constructed, and because this would create spiritual, emotional, and physical imbalance among the living, in not being assured that their deceased relatives have been transported to the afterlife, and would raise doubts for the living as to their own spiritual passage upon death, staff's conclusion that the Salt Song Trail Landscape is CRHR-eligible is based on the evidence of continuous ancestral use, the continued investment of Tribal lives in the use of this landscape, and its integrity. While Energy Commission staff cannot propose any mitigation that would ameliorate project impacts to the Salt Song Trail Landscape, staff continues to seek ways to lessen impacts in consultation with Native American Tribes affiliated with the proposed project vicinity and the surrounding landscapes. At the time of the publication of the PSA, staff and affiliated Tribes remain at an impasse on how to mitigate impacts to this historical resource and associated environmental justice concerns.

Because the Keruk Trail/Xam Kwatcan/Earth Figures Landscape corridor, where traditional practitioners physically visualize and dream the landscape as they usher their deceased ancestors to the other side, would be visually impacted should the project be constructed, and further, because the project would directly and indirectly affect the home of wandering Yuman souls located in the Mule Mountains and surrounding Palo Verde Mesa, and because these impacts would create spiritual, emotional, and physical imbalance among the living in not being assured that their deceased relatives have been transported to the afterlife, and would raise doubts for the living as to their own spiritual passage upon death, staff's conclusion that the Keruk Trail/Xam Kwatcan/Earth Figures Landscape is CRHR-eligible is based on the evidence of continuous ancestral use, the continued investment of Tribal lives in the use of this landscape, and its integrity. While Energy Commission staff cannot propose any mitigation that would ameliorate project impacts to the Keruk Trail/Xam Kwatcan/Earth Figures Landscape, staff continues to seek ways to lessen impacts in consultation with Native American Tribes affiliated with the proposed project vicinity and the surrounding landscapes. At the time of the publication of the PSA, staff and affiliated Tribes remain at an impasse on how to mitigate impacts to this historical resource and associated environmental justice concerns.

The construction of the proposed project would cause a substantial adverse change in the significance of the Palo Verde Mesa Ethnographic Landscape. The presence of the heliostat fields and the 750-foot-tall solar power towers would be a stark visual intrusion that would profoundly and irreparably degrade the ability of the landscape to convey historical significance under CRHR Criterion 1. In particular, the mass of the towers, in combination with the operational glare from the solar receiver steam generators atop each one, and the complete alteration of the mesa floor and related biota and the area's remaining cultural ecology would compromise the setting, feeling, and association aspects of the Palo Verde Mesa Ethnographic Landscape's integrity, aspects critical to the resource's abilities to convey associative values under Criterion 1. Subsequent to the construction of the facility, one would no longer be able to experience the sense of the landscape and the inter-relatedness of the landscape's zones as it was during its period of significance.

Intense ground disturbance would remove the information potential of the archaeological contributing elements' ability to convey specific information related to subsistence, both agricultural and hunting and gathering practices. The remnants of a trail system would be removed and no longer be available for conveying the mesa zone's local transportation association with the nearby river zone and related summer and winter habitation sites, as well as the regional transportation association north and south along the Colorado River, and east and west along the Chuckwalla Valley and Coca-Maricopa-Halchidhoma trail system that linked the Pacific Coast with the interior upper reaches of the Colorado River and Gila River Basin.

Staff proposes Condition of Certification **CUL-7**, which would require that the Rio Mesa SEGF project owner monetarily compensate each of the Tribes for their losses of subsistence knowledge as that knowledge is informed by the landscape, and the long-term opportunity that would otherwise be available within the lands currently proposed for permanent Rio Mesa SEGF project-related land use. Each Tribe is affiliated with an existing interpretive center, preserve, or museum as follows:

- Chemehuevi Indian Tribe Cultural Center, Havasu Lake, CA
- A hak hav Tribal Preserve (Colorado River Indian Tribes), Parker, AZ
- Colorado River Indian Tribes Museum, Parker, AZ
- Aha Makav Cultural Society (Fort Mojave Indian Tribe), Mohave Valley, AZ
- Fort Yuma Quechan Tribal Museum, Yuma, AZ

Staff proposes that each center receive an endowment for the purpose of incorporating traditional subsistence educational, demonstration, and utilization programs that would contribute to the continuance of Chemehuevi and Yuman-affiliated understanding and practice of subsistence patterns that combine agriculture and hunting and gathering activities.

Specific loss of trail segments in the project vicinity (subject to on-going research) would remove the information potential that these segments retain and convey. If the project is approved, minimal trail study will have been completed on these segments. This loss of information potential can be reduced to less than significant by implementation of **CUL-1**.

Conditions of Certification **CUL-1** and **CUL-7** would reduce the impacts of the Rio Mesa SEGF project on the Palo Verde Mesa Ethnographic Landscape to less than significant.

# HISTORIC-PERIOD BUILT-ENVIRONMENT RESOURCE INVENTORY AND EVALUATION, IMPACT ASSESSMENT, AND MITIGATION RECOMMENDATIONS

## HISTORIC-PERIOD BUILT-ENVIRONMENT CONTEXT

The Colorado Desert region, in which the proposed site for the Rio Mesa SEGF is located, is one of the more sparsely populated regions of the American West. The harsh arid environment and paucity of natural water supply have presented a challenge to the development of trans-desert routes for the movement of people and goods, the exploitation of resources in the area, and the establishment of permanent settlement. However, the project site is located on the Palo Verde Mesa, an ancient upper terrace of the Colorado River. This proximity to the river has been a benefit to the peoples who have occupied this area. Despite harsh conditions, the area has long been used as a passageway for prehistoric as well as historic peoples across the eastern edge of the Colorado Desert.

The earliest recorded history of the lower Colorado River region began with the expeditions of Spanish explorers, who were lured by rumors of a rich northern Indian civilization. However, due to the Spaniards' failure to find the fabled northern treasures and the remoteness of the region, the Colorado Desert was seldom visited during the Spanish and Mexican periods. In the Rio Mesa SEGF built-environment PAA, the earliest incidents of exploration date back to the mid-nineteenth-century land surveys by the Surveyor General of California, starting in 1855.

The major historical themes for the Colorado Desert region, and the Rio Mesa SEGF area in southeastern Riverside County in particular, are centered on the establishment of transportation routes, mineral exploitation, access to water for irrigation, and military uses. In addition, the mapping of the public lands is also reflected in land survey markers left by the General Land Office surveyors who began mapping this area as early as 1855.

### Early Historical Exploration and Settlement

The project site is located along the western edge of the Colorado River Basin, which spans seven states (Wyoming, Nevada, Utah, Colorado, California, Arizona, and New Mexico) following the Colorado River and its tributaries. Beginning in the mid-1500s

Spanish explorers entered the Colorado River Basin. However, there is no evidence that they passed anywhere in the vicinity of the Rio Mesa SEGF project site at that time. Travel overland across the desert passed mainly through the area of Imperial County to the south, with the route often dipping into northern Baja California, on the route pioneered by Juan Bautista de Anza in the 1770s, or to the north, on the “Old Spanish Trail” that passed through the Mohave Indian villages. Following an Indian uprising that ended with the destruction of two nascent mission establishments on the Colorado River in 1781 and the consequent deaths of a number of Spaniards, the Anza trail closed down for over four decades. Travel across the desert increased somewhat during the period of Mexican rule of California, following some exploratory trips made by Captain José Romero in the period of 1823–1826, especially between the settlements in Sonora and those in San Diego and Los Angeles (Bean and Mason 1962:11-80). In the late 1830s the governor of Sonora sought to solidify a route across the Colorado Desert by appointing a number of Indian “*capitans*” at strategic locations on the route (Gurcke and Farris 2004:94). Antonio Coronel wrote in his memoirs of a trip to Sonora he made in February, 1839 (Coronel 1994:66–69), and his interaction with various Tribes and their chiefs along the way.

## Gold Fever and the Path to La Paz

The lure of finding riches brought numerous prospectors to the desert region to search for gold and silver. Later, mining activities played a significant role in stimulating early occupation and travel across the arid desert. With the American takeover of California, culminating in the Treaty of Guadalupe Hidalgo in 1848 and the subsequent California Gold Rush of 1849, a flood of gold-seeking immigrants began to pour into California, some choosing the southern overland route through the desert.

In addition to the rich gold fields of the Sierra Nevada, prospectors explored other areas in the 1850s and 1860s. The town of La Paz in the Arizona territory was one of the boomtowns that developed in that period. A mountain man named Powell Weaver is credited with finding gold in the Arroyo de la Tinaja on January 12, 1862. Since that date was the feast day of Nuestra Señora de La Paz (Our Lady of Peace), the town that grew up was name La Paz. Weaver’s name was rendered as Paulino by the largely Spanish-speaking population of the area and was, ironically, translated back into English as “Pauline,” to the confusion of later generations (Ross 1992:21).

In the 1850s camels were imported to the Colorado Desert in a scheme to improve transportation of goods across the inhospitable land that was so hard on horses and mules (Thompson 1983:103–123). A herd of camels that had been landed in Indianola, Texas, was brought to southern California by Lt. Edward F. Beale. Lt. Beale had been tasked to open a road from Fort Defiance, New Mexico, to California. Some of these animals ended up in the Palo Verde Valley and were still roaming around when the first settlers arrived there (Irish 1922:589–590).

The Bradshaw Trail was a key route until the construction and expansion of the Southern Pacific Railroad into the desert in the late 1870s. The railroad was a major factor in facilitating travel and transport of supplies to the remote areas of eastern Riverside County, enabling further development of mines, irrigation, and settlement in the area.

The 1880s and 1890s were years of relative prosperity for the mining regions of eastern Riverside County. Intermittent mining activity has occurred in the area since that time; however, in the Palo Verde Valley area, mining has remained a relatively small part of the local economy. While no mines or significant prospects exist within the Rio Mesa SEGF built-environment PAA, there are several active mines in the Mule Mountains that abut the built-environment PAA to the west where a number of mines produced gold, copper, and uranium, among other valuable ores. The Hodges and Roosevelt Mines were two of the more notable ones; other mines included the Green Hornet, Granddaddy, Grubstake, Hidden Treasure (or American Flag), Rainbow, and Stone House mines (Saul et al. 1968). Unimproved roads leading to these mines cross the Rio Mesa SEGF built-environment PAA.

Archaeological evidence of prospecting pits, collections of food trash and other debris, and a handful of prospect claim markers in the form of wooden stakes, small stone cairns, and metal cans, which may have originally contained claim papers are to be found in the region.

Automobile travel across and within the Colorado Desert area initially developed using existing wagon roads like the Bradshaw Trail or by following railroad rights-of-way. By the early twentieth century, the automobile became the preferred mode of transportation. In 1914, Riverside County established the route from Mecca to Blythe as an official County road, which served as a main route across the desert. County officials dug wells and erected signposts along this road to serve its few travelers. In the early 1920s, Highway 60 was built to the south of the original route through Shavers Valley and Chuckwalla Valley. In the 1960s, the current Interstate Highway 10 was constructed along the old route of Highway 60. With the arrival of roads, settlement patterns changed from occasional miner’s camps to roadside businesses serving travelers. The Bradshaw Trail remains in use as a popular route for back-country four-wheel-drive vehicles. Its popularity spawned a book by Delmer Ross (1992) providing details to look for along the route as well as a number of historical notes. Today the Bureau of Land Management manages the Bradshaw Trail for people with four-wheel-drive vehicles looking for adventure. Starting just east of the Salton Sea the trail passes between the Chocolate Mountains Aerial Gunnery Range and the Chuckwalla Mountains ending at the little community of Ripley, California.

## Mapping the West and Town Development

In order to provide for orderly ownership and transfer of lands, the General Land Office (GLO) was created in 1812 to map the public lands of the United States. It was the GLO’s task:

to survey the land, ideally before settlement and mark it into mile-square sections that could be easily subdivided for land sales. Hard at the heels of the pioneers and just ahead of the permanent settlers, local surveyors who were paid by the mile captured the essence of the topography (rivers, forest, swamps, roads, and trails, but not relief) on manuscript maps of townships and forwarded copies to Washington and to local land offices where land sales would be recorded” (Robert Karnow, quoted in Cohen 2002:194).

Under the direction of the Surveyor General, these local surveyors were directed to perform surveys to grid the land into Townships, Ranges, and Sections. Congress passed an act for the survey of California in 1853, and soon after the surveys began. Each Township and Range division was numbered relative to a specific Base and Meridian, with three of these established for California: the Humboldt, the Mount Diablo, and the San Bernardino (Robinson 1979:208–209). This latter is the point from which the land in southern California was mapped. The Rio Mesa SEGF project site falls mainly in Townships 7 and 8 South and Range 21 East on the San Bernardino Base and Meridian.

The project vicinity was surveyed first in 1855 by R. C. Matthewson to establish the south boundary of the Townships. This survey was followed up in May, 1856, by a more detailed survey of the specific Townships, Ranges, and Sections by H. M. C. Brown. In 1879, a resurvey of the east boundary of the township was accomplished by W. F. Benson, and in 1916–1917, D. J. Wolf and L. Sechrist resurveyed the north boundary. Next came B. W. Capell who resurveyed the west boundary of the township in 1955–1961. Finally, in 1985, another survey was executed by Roger J. Mercer and Douglas J. Jacobson to verify the accuracy of earlier surveys. There had also been three previous investigations of survey markers in 1914 by W. J. Lightfoot; in 1924 by W. B. Kimmel, and in 1956 by E. D. Lewis. The consensus of these investigations, to include the 1985 resurvey, is summarized by Mercer and Jacobson (1987 (vol. R 583):182)) as follows:

> Topographic calls indicate the original 1855, 1856, and 1857 surveys by Matthewson, Brown and Washburn in these townships may have been performed as indicated in the Palo Verde Valley portion of the T[ownshi]ps. There is, however, no positive evidence of any original corners from those surveys east of the line between R[anges]s. 20 and 21 E. J. T. Crawford, LS 3967 in Riverside County Record of Survey filed in 1985, in Book 74, Pages 90-102 (Riv. Co. RS 74/90-102), claims to have found many Matthewson, Brown and Washburn corners which were never found by any government investigations or by local and county surveyors. Each of these Crawford corners were thoroughly investigated and each was rejected as lacking any evidence of authenticity.
>
> The 1879 W.F. Benson corners, and corners established from them, have been exclusively utilized to define all developed patented lands in the townships as indicated by the existing land patterns. All Records of Survey (RS) recorded in Riverside and Imperial Counties (Riv. Co., Imp. Co.) are based on the Benson resurvey except the one recorded in 1985 by J.T. Crawford.…
>
> In Township 8 South, Range 21 East, a Record of Survey (Riv. Co. RS 67/8-10) by W. Frazier, in 1980 was based on the Benson survey, agreed with other records of Survey and corners re-monumented by Palo Verde Irrigation District (PVID), correlated with the present patterns of land ownership and was accepted in its entirety.…
>
> Preliminary to the resurvey, the lines of the prior surveys were retraced and search was made for all corners and other calls of record. Identified corners were remonumented in their original positions; lost corners were

> reestablished and monumented at proportionate positions based on the original record. The retracement data were thoroughly verified and only the true line field notes are given herein.

In a number of instances during the various archaeological surveys in the Rio Mesa SEGF project vicinity, rock cairns were discovered, some of which were thought to be related to the original mapping of the area. However, the records of the actual surveyor, H. M. C. Brown (1856), indicate that the markers he used were: “charred post(s) in mounds of earth, with trench and pits,” with no mention of rock cairns being erected. In a number of cases, the archaeological records also note that the rock cairns found did not relate to any known section markers.

In the course of archaeological surveys undertaken in the Rio Mesa SEGF project vicinity, at least six brass-capped survey markers from the 1917 survey have been found and recorded, as well as one brass-capped benchmark installed by the U.S. Geological Survey. (Note that this benchmark was located in the area of the Rio Mesa III Plant that has been eliminated from the Rio Mesa SEGF project.)

Virtually from the beginning of field survey, markers laid out by the surveyors have been subject to removal, often by people who feared the repercussions of the survey activity. In particular, we find in the notes of surveyor H. M. C. Brown (1856:426) this telling commentary of his problems with surveying near an Indian village on the Colorado River:

> The Indians were perfectly peaceable…until I commenced trespassing on their [garden] patches with my survey, and immediately upon this (as they have a holy horror for the compass, believing it to be the fore coming of the ”white man” to drive them away) they objected to my further progress as a trespasser, as they please [to] term me. Not being able to have my own way in a “Military point of view” and proceed with my survey, I therefore concluded to compromise the matter with them by agreeing not to survey along the river immediately where their villages and patches were situated, but only to run my township lines as my field notes show. Finding that the Indians were becoming more troublesome every day, and believing that if I extended my survey beyond the “Compromise” I would most probably have a difficulty, I, therefore under the circumstances most respectfully withdrew further proceedings.

Legal protection for survey markers was first enacted in 1896, and this protection has been re-enacted at various times in the intervening years (Penry 2007:4). The latest version states (18 USC 1858):

> Whoever willfully destroys, defaces, changes, or removes to another place any section corner, quarter-section corner, or meander post, on any Government line of survey, or willfully cuts down any witness tree or any tree blazed to mark the line of a Government survey, or willfully defaces, changes, or removes any monument or bench mark of any Government survey, shall be fined under this title or imprisoned not more than six months, or both.

The only town site within the built-environment PAA was the short-lived town of Rannells. The center of this town site was located 0.2 miles south of the junction of the Bradshaw Trail and Highway 78. In early 1908, brothers Samuel D. and John W. Rannells obtained 480 acres of land and set themselves up as the “Rannells Land Company.” At its height, the town was comprised of a hotel, a school, two brick stores, a post office, and the Palo Verde Brick Manufacturing Company, as well as a number of dwellings. The failure of the railroad to reach the town of Rannells spelled the town’s demise, which can be dated to 1933 when the Post Office closed and the few remaining buildings were torn down or moved. The brick company moved to Blythe (Ross 1992:205–206).

Farming continues to be a commercial industry in the vicinity of Blythe. On the Palo Verde Mesa, in the vicinity of the Rio Mesa SEGF, it was found that the land actually sloped off to the west, which was below the level of the Colorado River. It was therefore feasible to channel water from the Colorado to irrigate parts of the mesa through gravity-feed irrigation channels. As late as the 1970s and early 1980s, there was an attempt to grow jojoba beans on the mesa, but it eventually failed (Ross 1992:191).

## The Bradshaw Trail

Mining activities played a significant role in stimulating early occupation and travel across the arid desert, and that was the case for the Bradshaw Trail. To get to the boomtown of La Paz in the Arizona territory, early miners sailed around Baja California and then traveled up the Colorado River. An overland route was developed in 1862 called the Bradshaw Trail. It followed traditional Indian trails based on information provided to William Bradshaw by Chief Cabazon of the Desert Cahuilla people. Whereas on some maps the Bradshaw Trail is also called the Butterfield Trail, alluding to the famous Butterfield Stage Lines, Delmer Ross (1992:40) asserted that the Butterfield “was one stage line whose coaches were never scheduled over the Bradshaw Trail.” According to Ross, it was mainly freight lines that used the Bradshaw Trail, including the La Paz Express and Saddle Train and the Curtis Freight Line. The Bradshaw Trail was a key freight route between the town of San Bernardino and the gold mines of La Paz (later Ehrenburg, Arizona) until the construction and expansion of the Southern Pacific Railroad through the desert in 1877, after which it declined in use. The railroad was a major factor in facilitating travel and transport of supplies to the remote areas of eastern Riverside County, enabling further development of mines, irrigation, and settlement in the area.

Today the Bureau of Land Management manages the Bradshaw Trail for people with four-wheel-drive vehicles looking for adventure. Starting just east of the Salton Sea the trail passes between the Chocolate Mountains Aerial Gunnery Range and the Chuckwalla Mountains ending at the little community of Ripley, California. On at least one map (1953 U.S.G.S. Palo Verde Mts. 15’ quadrangle), it is called the Niland-Rannells Road, named for the town of Niland, near the southeast corner of the Salton Sea, and the defunct town of Rannells, located at the eastern edge of the Rio Mesa SEGF at the junction of the Bradshaw Trail and State Highway 78.

## Agriculture, Flood Control, and the Palo Verde Irrigation District

With the passage of the Homestead Act in 1862, vast areas of public land were opened up to private citizens at little or no cost, and agriculture became an economically important industry in California. Although much of the desert lands were poorly suited to farming, the Palo Verde Valley of the lower Colorado River was an exception. Thomas H. Blythe, who is known as “the father of the Palo Verde Valley,” was the first to develop large tracts of land along the west bank of the Colorado River, across from the established portage point at Ehrenberg, Arizona, near the present-day town of Blythe. Blythe died in 1883 before his development could be fully completed, but agriculture continued to grow in the area.

The town of Blythe was incorporated in 1916. By the late 1920s, the Palo Verde Irrigation District Act was passed, and the region’s irrigation and drainage needs were consolidated into one district (see discussion below). Farming continues to be a commercial industry in the Palo Verde Valley. On the Palo Verde Mesa, however, agriculture was never a significant pursuit due to the poor soils and lack of readily accessible water.

The canals and ditches of the Palo Verde Irrigation District (PVID) are a common feature of the Palo Verde Valley and parts of the mesa. The agricultural development of the valley would not have been possible without the diversion of Colorado River water to the Palo Verde Drain and the creation of the canal-and-ditch water conveyance system. PVID water rights date back to 1877, when Thomas H. Blythe secured land in the Palo Verde Valley and diverted water from the river to irrigate farm land that covered roughly one-third of the Valley. The original intake from the Colorado River was located approximately six miles north of Blythe. The intake diverted river water into a canal and ultimately to Olive Lake and yet another canal leading to Thomas Blythe’s farmland (BS 2011a:5.3-33). Blythe’s death in 1883 brought the grand development plans for the valley to a halt.

After years of decline, and a devastating flood in 1905 (JRP 2000) that destroyed much of the Blythe irrigation system, the Palo Verde Mutual Water Company (alternatively known as the Palo Verde Land and Water Company (Bickell 1999:4)) was formed in 1908 (BS 2011a:5.3-34). Another flood in 1922 again wrought havoc on the system. In 1923, there were three water companies operating in the area when the California State Legislature approved the formation of a new water district, the Palo Verde Irrigation District (PVID). The PVID incorporated the responsibilities of the Palo Verde Joint Levee District and Palo Verde Drainage District, as well as the properties and water rights of the Palo Verde Mutual Water Company. In 1944–1945, a rock weir was constructed to raise the river water level and provide a more reliable flow to the PVID system. This was the result of changes in the flow of the river and the military’s need for a steady supply of produce during the WWII effort.

A new Palo Verde Diversion Dam was authorized by Congress in 1953. PVID received federally guaranteed loans to construct the diversion dam and spillway and modify the existing canal system (Bickell 1999:7). The new dam was completed and work accepted by the Bureau of Reclamation on December 17, 1957. The dam is 1,850 feet in length and includes a gated concrete spillway. The legislation also was responsible for the creation of some 30 miles of levees. The levees are located along the boundary of the

Colorado River Indian Reservation at Parker, Arizona, set back approximately 1,300 feet from the river itself.

The PVID has nearly 245 miles of main and lateral canals. These canals are supported by approximately 2,550 structures. Structures include canal headings, checks, siphons, bridges, flumes, deliveries pumping plants, and moss racks. PVID currently has 56 miles of lined canals. It is estimated by PVID that there are approximately 315 miles of concrete-lined farm ditches in the valley, the majority being privately owned. The drainage system is composed of approximately 141.4 miles of open drainage channels that return groundwater drainage and canal operational spill water to the river. There are over 250 siphons (submerged culverts) as part of this system.

## Hydroelectric Power and the Colorado River

"In the 1940s hydropower provided about 75 percent of all the electricity consumed in the West and Pacific Northwest, and about one[-]third of the total United States' electrical energy"( USBR 2009a). California has nearly 400 hydroelectric plants with a capacity of about 14,000 MW (CEC n.d.).

The U. S. Bureau of Reclamation describes the Colorado River as follows (USBR 2009a):

> Historically, the Mighty Colorado River sent its boiling, silt-red waters to Baja, California. Now it is a shimmering, beautiful clear blue. The River [sic] no longer sporadically carves new river beds and its famous silt load settles behind Glen Canyon Dam. The once tempestuous Colorado has been brought under control through a system of dams, beginning with Glen Canyon in Utah and Arizona and ending with Laguna Dam in the South.

The engineering of the Colorado River has had four purposes: generating electricity, flood control, water supply, and recreation.

The Parker-Davis Project includes the Parker Dam and Powerplant, the Davis Dam and Powerplant, 32 substations, and more than 1,500 miles of high-voltage transmission lines (USBR 2012), including two, the Pilot Knob-to-Blythe 161-kV Transmission Line and the Niland-to-Blythe 161-kV Transmission Line, located on the project site.

Parker and Davis dams are both downstream from, and would not have been possible without, the Hoover Dam. The primary purpose of Parker Dam is to provide electrical energy to Arizona and southern California, while Davis Dam primarily re-regulates Hoover Dam water releases to facilitate water delivery to Mexico (USBR 2012). The Parker Dam Power Project and Davis Dam Project began as separate undertakings in 1935 and 1941, respectively.

Authorization for the Parker Dam Power Project came under the Rivers and Harbors Act of August 20, 1935 (USBR 2012). Lake Havasu was formed as a result of the dam. With a total structural height of 320 feet, with only 85 feet extending above the river bed, Parker Dam has been called the "deepest dam" in the world (Linenberger 1997:10).

Authorization of the Davis Dam Project came on April 26, 1941 under the Reclamation Project Act of 1939 (USBR 2012). Lake Mohave Reservoir was formed as a result of the dam.

## State Route 78

State Route 78 (SR 78) is a state highway that currently extends from Oceanside, California, to Blythe, California. It is also known as the Ronald Packard Parkway between I-5 in Oceanside and I-15 in Escondido, and as the Ben Hulse Highway from SR 86 near Brawley to I-10 near Blythe. The segment between SR 86 in Brawley to County Route S3 (CR S3) near Anza-Borrego Desert State Park is designated as part of the Juan Bautista de Anza National Historic Trail. The segment from the western junction of SR 79 to the western junction with SR 86 is eligible for listing as a State Scenic Highway; however, only the segment in Anza Borrego Desert State Park has officially been designated a State Scenic Highway by the California Department of Transportation. In 1934, SR 78 was formed, along with the originally signed state highways in California. The connection from Brawley to Palo Verde, a distance of approximately 68 miles, was added in 1959, and the segment from Palo Verde to Blythe, a distance of approximately 21 miles, was completed by by 1965. It was not complete as it is known today until 1971.

## EVALUATIONS OF CRHR ELIGIBILITY OF, AND PROJECT IMPACTS ON, INDIVIDUAL HISTORIC-PERIOD BUILT-ENVIRONMENT RESOURCES IDENTIFIED BY RECORD SEARCH AND PEDESTRIAN SURVEY

Staff evaluated seven historic-period built-environment, or architectural, resources for CRHR eligibility:

- The Bradshaw Trail (RMS-ML-003/CA-RIV-5191/P-33-5119);
- Pilot Knob-to Blythe 161-kV Transmission Line (RMS-ML-001/P-33-011110);
- Niland-to-Blythe 161-kV Transmission Line (RMS-ML-002/CA-RIV-7127H/P33-012532);
- Palo Verde Irrigation District elements:
    - Portion of PVID Hodges Drain (RMS-ML-009);
    - Portions of PVID C-03 Canal (RMS-ML-010);
    - Portion of PVID Palo Verde Drain (RMS-ML-011);
    - Portion of PVID Estes Drain (RMS-ML-012); and
    - Portion of PVID Private Drain No. 1 (RMS-ML-013);
- Opal Hill Mine Access Road (RMS-ML-006);
- Bradshaw Trail Borrow Pit (RMS-ML-008); and
- State Route 78 (PVM-ML-007).

Below are brief descriptions of these resources and of the potential project impacts on them. The Pilot Knob–to-Blythe 161-kV and the Niland-to-Blythe 161-kV Transmission Lines are discussed together, as they are two elements of the Parker-Davis Project.

Staff has concluded that three of these are CRHR eligible: the Bradshaw Trail, the Pilot Knob-to-Blythe 161-kV Transmission Line, and the Niland-to-Blythe 161-kV Transmission Line. Staff has also concluded that one additional resource, the Palo Verde Irrigation District, is potentially eligible for the CRHR. Elements of the Palo Verde Irrigation District are in the built-environment PAA, and analysis is ongoing as to eligibility and potential impacts.

#### *The Bradshaw Trail (RMS-ML-003/CA-RIV-5191/P-33-5119)*

The Bradshaw Trail has been determined eligible for the NRHP under status code 2S2. It was recorded in 1994 by Western Cultural Resource Management, then again in 2000/2001 by KEA Environmental Inc., and finally in 2004 by EDAW, Inc. (BS 2011a:2-62). Resources determined eligible for the NRHP are automatically eligible for the CRHR, so the Bradshaw Trail is a historical resource under CEQA.

A small portion of the trail is in the Rio Mesa SEGF built-environment PAA, where it is crossed by the gen-tie line (see **Cultural Resources Figure 13**). The major Rio Mesa SEGF project impact on this historic road would be due to increased construction traffic accessing the Rio Mesa SEGF. The applicant intends to use a portion of the trail as a major access into the site area (See Transportation Setting of the Local Project Area and Affected Roads. Rio Mesa Solar Electric Generating Facility, Riverside County, California, Fig. 5.12-2.6 (Rev.)). The details of these road improvements are being investigated and any impacts to the Bradshaw Trail will be discussed in the FSA.

#### *Parker-Davis Project (Pilot Knob-to-Blythe 161-kV Transmission Line (RMS-ML-001/P-33-011110) and Niland-to-Blythe 161-kV Transmission Line (RMS-ML-002/CA-RIV-7127H/P33-012532)*

The Parker-Davis Project includes 31 substations and 51 transmission lines with a total length of 1,609.2 miles servicing central and southern Arizona, southern Nevada, and southern California (USBR 2012). The Pilot Knob-to-Blythe and Niland-to-Blythe Transmission Lines were constructed as part of the Parker-Davis project in 1949–1950 and 1955, respectively, and traverse the Rio Mesa SEGF built-environment PAA (see **Cultural Resources Figure 14**). The Pilot Knob-to-Blythe Transmission Line is approximately 64.4 miles long and originally built on wood H-structures (Schweigert 2004). It runs between the Blythe Substation to the north of the project site and the Knob Substation to the south of the project site. The Niland-to-Blythe Transmission Line is approximately 65 miles long running generally east-west between the Blythe substation in Riverside County and the Niland substation in Imperial County. The Niland-to-Blythe Transmission Line was also constructed on wood H-structures. The Blythe, Knob, and Niland Substations were all constructed as part of the Parker-Davis Project in the 1950s.

Staff agrees with the applicant that the Parker-Davis Project is eligible for the CRHR for its association with events that have made a significant contribution to the broad patterns of our history (Criterion 1). The Parker-Davis Project spurred development in central and southern Arizona, southern Nevada, and southern California by providing power as well as water to these areas. It is a significant piece of the hydroelectric power system on the Colorado River. As discussed above, the Parker-Davis Project was made possible by the construction of Hoover Dam. Like Hoover Dam, the Parker and Davis dams are unique and significant engineering accomplishments.

Staff also proposes that both the Pilot Knob-to-Blythe 161-kV Transmission Line and Niland-to-Blythe 161-kV Transmission Line are eligible for the CRHR as contributors to the larger Parker-Davis Project. As such, they are historical resources under CEQA.

The proposed project would not physically alter the transmission lines. The majority of the project (e.g., the power towers and heliostats) would be constructed on the west side of the transmission lines. New lines would be constructed as part of the project in the same right of way as the Pilot Knob-to-Blythe and Niland-to-Blythe Transmission Lines for as much as 7–8 miles. Considering that these 7–8 miles represent a small portion of the Pilot Knob-to-Blythe and Niland-to-Blythe Transmission Lines, and an even smaller portion of the 1,609.2 miles of transmission lines associated with the Parker-Davis Project, the impacts from the proposed project to the transmission lines and the Parker-Davis Project are minimal. Moreover, any impacts would be visual impacts to the setting of these transmission lines. Consequently, staff has determined that the impacts from the proposed project on these historical resources would be less than significant.

***Palo Verde Irrigation District (Five Elements)***

- Portion of Hodges Drain (RMS-ML-009);
- Portions of C-03 Canal (RMS-ML-010);
- Portion of Palo Verde Drain (RMS-ML-011);
- Portion of Estes Drain (RMS-ML-012);
- Portion of Private Drain No. 1 (RMS-ML-013);

Palo Verde Irrigation District (PVID) as it exists today occupies about 189 square miles of territory in Riverside and Imperial Counties, California. The district contains approximately 131,298 acres, 26,798 acres of which are on the Palo Verde Mesa (see **Cultural Resources Figures 15** and **16**). Colorado River water, supplied through PVID canals, is lifted onto the mesa by private pumps to irrigate a portion of the acreage in the district. The remaining irrigated acreage on the mesa is irrigated from deep wells developed by the landowners. The area of the mesa that is in agricultural production is not in the vicinity of the proposed Rio Mesa SEGF project, but rather, west and north of Blythe.

The delivery of reliable, high-quality Colorado River water to the Palo Verde Valley and the associated system of canals, ditches, and levees for flood control are at once both unique to the region and emblematic of a larger pattern of agricultural development. Irrigation and flood control projects similar to this one have proliferated in California. For comparison, an example of another such district is Reclamation District 1000 (RD 1000) in the Central Valley of northern California. Located in Sacramento and Sutter Counties, RD 1000 was designed to provide flood control and reclamation of farmland. While

PVID and RD 1000 had different objectives, PVID to deliver water and RD 1000 to control water, their impact on the landscape is similar. Both include a connected series of canals, ditches, and other structures designed to move and control water. RD 1000 was considered eligible for listing on the NRHP as a rural historic landscape in 1996, with a Period of Significance of 1911–1938, under Criterion A: association with events that have made a significant contribution to the broad patterns of our history. RD 1000 was found to have a high level of integrity, including setting, design, materials, workmanship, feeling, and association (Dames & Moore 1996).

Similarly, the Turlock Irrigation District (TID) conveys irrigation water in the San Joaquin Valley in both Merced and Stanislaus Counties. TID was one of the earliest irrigation districts created following the passage of the Wright Act in 1887. The period of significance for TID is from 1893 to 1920. Like the PVID, the contributing elements of the district are canals, laterals, drains, ditches, associated roads and structures, diversion features, and other infrastructure. Recent evaluation of TID's Almond 2 Power Plant by the California Energy Commission concludes that the district is eligible for listing on the CRHR under Criterion 1 for its association with the development of irrigation agriculture in California (CEC 2010:13). It was found that even though some changes in materials have occurred over time, i.e., lining of earthen laterals with concrete beginning in 1920, the district retains its integrity of location, design, and association. It was further determined that individual resources such as laterals and drains would not be eligible for listing as they do not convey a clear association with trends in agriculture (Criterion 1).

**Cultural Resources Figure 15** shows that the Rio Mesa SEGF project site would be outside the boundaries of the PVID, but portions of the proposed Rio Mesa SEGF transmission line route would be within the PVID. The built-environment PAA and proposed construction traffic routes touch on or border five PVID-related resources. **Cultural Resources Table 20**, below, identifies the PVID resources, their relationship to the built-environment PAA, and their CRHR eligibility, as recommended by the applicant.

**Cultural Resources Table 20**
**Palo Verde Irrigation District Resources**
**Within the Rio Mesa SEGF Built-Environment PAA**

| Resource Identifier | Resource Description | Relative Location | Applicant Integrity & Significance Evaluations |
|---|---|---|---|
| RMS-ML-009<br>Hodges Drain | Unlined drainage ditch, *circa* 1952-1965. | Intersects Bradshaw Trail and 34th Ave, inside built-environment PAA | Not eligible: Lacks integrity of setting, feeling, and association due to introduction of non-historic elements. |
| RMS-ML-010<br>C-03 Canal | Unlined and lined canal, prior to 1923. | Intersects 34th Avenue, outside built-environment PAA | Not eligible: Lacks integrity of materials due to the introduction of non-historic elements. |

| Resource Identifier | Resource Description | Relative Location | Applicant Integrity & Significance Evaluations |
|---|---|---|---|
| RMS-ML-011<br>Palo Verde Drain | Unlined drain, prior to 1949. | Intersects Bradshaw Trail, outside built-environment PAA | Not eligible: Lacks integrity of setting, feeling, and association due to introduction of non-historic elements. |
| RMS-ML-012<br>Estes Drain | Unlined drain, *circa* 1949-1965. | Intersects Bradshaw Trail and SR 78, outside built-environment PAA | Not eligible: Lacks integrity of setting, feeling, and association due to the introduction of non-historic elements. Drain appears unaltered. |
| RMS-ML-013<br>Private Drain No. 1 | Unlined drain, *circa* 1920s. | Near intersection of Bradshaw Trail and SR 78, outside built-environment PAA | Not eligible: Lacks integrity of design, setting, materials, feeling, and association. |

Significance

The period of significance for the PVID as a whole dates from 1877, when Thomas Blythe first acquired land in the Palo Verde Valley, to the present. The initial diversion of water and irrigation of farmland by Thomas Blythe set the stage for what is the larger irrigation district that drove the successful agricultural development of the valley. While staff has not at this time identified any extant features, such as canals and ditches, from Blythe's initial development, staff feels that should further research emerge to identify resources from Blythe's era, then the PVID may qualify for the NRHP as a historic district under Criterion A, and for the CRHR under Criterion 1. The PVID may also qualify under a later period of significance, from the formation of the PVID in 1925 through the present day. While there have been changes over time in materials and design, the location, setting, feeling, and association are largely intact. Where the challenge to assessing integrity comes is in the changes in workmanship and in materials in use over time.

The applicant identified and recorded the five resources in **Cultural Resources Table 20**, above, due to their proximity to the project site or the potential for impacts from project-related activity, such as transportation routes. In each case, the applicant found the resources to be both individually ineligible for listing on the NRHP or CRHR and ineligible as contributors to a larger resource or historic property. The table identifies the integrity aspects under which these determinations were made.

Staff takes a broader view of the PVID, and as stated above, finds that, if considered as a whole, the district retains integrity in location, setting, feeling, and association. These five resources might then be considered contributing elements to a CRHR-eligible district. Noting that changes in materials and workmanship have likely altered most of the structures in the PVID, with PVID's aggressive lining of canals and ditches with concrete and upgrades to gates and other structures, nevertheless, the original intent remains, the original alignments remain, and some of the improvements themselves have taken on significance as character-defining features in their own right. The design and function of the 1957 Palo Verde Diversion Dam is significant in its relationship to the entire system and as an example of mid-twentieth-century dam design and construction techniques.

In addressing the issue of integrity of materials and workmanship, the example of TID, described earlier, is informative. TID was determined by the Energy Commission to be eligible for listing on the CRHR, in spite of the addition of new materials to the elements of the district. It was determined to have retained its historical location, setting, and design. As summarized above, it was also determined that the individual resources would not be considered eligible outside of a district nomination.

Further research would be required for staff to make an independent determination of eligibility on the PVID. Staff intends to address this further for the FSA. However, even if the PVID were determined eligible as a district, the Rio Mesa SEGF project as proposed would not affect the integrity of the PVID in terms of location, design, setting, feeling, or association. However, the Rio Mesa SEGF project has the potential to impact the five individual resources listed in **Cultural Resources Table 20**, above, that would be considered contributors to the district, if project-related road improvements or overcrossing improvements are required. It is not clear at this time what those improvements might be. The revised AFC describes 30th Avenue/Bradshaw Trail as the primary access route for construction and 34th Avenue as the secondary access route. The revised section states that the “Bradshaw Trail will be improved as a paved, two lane undivided roadway from west of State Route 78 to the project site, a distance of 2.96 miles” (BS 2011a:5.12-4). It further states that “the west leg of 34th Avenue will be improved for 1.02 miles west from State Route 78 to the project site.” The roadway would be an unpaved, two-lane undivided roadway. Staff has submitted to the applicant a set of Data Requests (CEC 2012az : Data Request #s186,187) seeking specific information about proposed project access road improvements. When received, this information will assist staff in determining the potential for impacts on the identified PVID resources in the PAA.

### *Opal Hill Mine Access Road (RMS-ML-006)*

Figure DR 99 shows the locations of various historic-period features and sites in the Rio Mesa SEGF project vicinity (URS 2012b). Northwest of the project, in the foothills of the Mule Mountains, are the Mine/Jet Black Mine and Roosevelt Mine/Senate Mine. West of the project is the Opal Hill Mine.

The Opal Hill Mine Access Road originates at the outskirts of the town of Palo Verde, in Imperial County, and crosses into Riverside County just east of the Western Area Power Administration 116-kV transmission line. A four-wheel-drive vehicle trail or road, the Opal Hill Mine Access Road, splits off from the mine access road and traverses the project site in a northerly direction toward the Bradshaw Trail and the Bradshaw Trail Borrow Pit (see **Cultural Resources Figure 17**).

A 1922 U.S. Department of Agriculture Soil Survey Map of the Palo Verde area shows a portion of the current Opal Hill Mine Access Road as the Niland to Palo Verde Road (USDA 1922). The Opal Hill Mine Access Road appears to have been established in 1952 or 1953 (BS 2011a:DPR 523 for RMS-ML-006), possibly earlier. A 1953 U.S.G.S.

Palo Verde Mountains topographic map depicts a Jeep Trail that originated at Palo Verde and proceeded to the Mule Mountains, south of Coon Hollow and the current location of Opal Mine, eventually connecting with what is Wiley's Well Road today (known as Army Road in 1953)(USGS 1953). Staff was unable to locate a 1952 map for the Palo Verde Mountains Quadrangle but did locate a 1952 Palo Verde Quadrangle map, which is the quadrangle due east (USGS 1952). The 1952 Palo Verde map does not show a trail or road originating at the town of Palo Verde. While this is not conclusive evidence, it does indicate that the dating of the road to *circa* 1953 is reasonable, making this resource old enough to be considered for potential eligibility for the CRHR. It is described on the DPR form as a fifteen-foot-wide dirt and gravel pathway. Its original purpose is not known. By 1983, a spur road from the Jeep Trail led to the Opal Hill Mine and Coon Hollow (USGS 1983). This spur is outside the built-environment PAA. The original alignment of the Jeep Trail appears to be extant, as seen on a recent map (NGIA 2005). The Opal Hill mine was, and is now, quarried for fire agate. It is open to the public for a daily fee, October through April. A website describes the mine "as a claim established on a hillside which overlooks a valley. The mine consists of rock outcroppings and holes where agate has been extracted" (Rhoads 2012). Public access to the mine is now from Wiley's Well Road to the west. The Opal Hill Mine itself is not yet 50 years of age and so cannot be considered for eligibility for the CRHR.

Since the project was revised in July, 2012, project boundaries have shifted. **Cultural Resources Figure 4**, based on the applicant's Figure 5-4 (revised on August 23, 2012), shows the fenceline that is associated with the actual project footprint and area of disturbance and the half-mile buffer zone. The Opal Hill Mine Road traverses the leased land from Palo Verde in Imperial County (the original Jeep Trail) and enters the project fenceline boundary about halfway into the project site. It then leaves the project site and proceeds to the mine, which is located outside the built-environment PAA. The original Jeep Trail is old enough for consideration of its eligibility for the CRHR.

Significance

The Jeep Trail appears to be intact and in the same alignment as shown on the 1953 map. It retains its association with the broader landscape and setting. It is not known whether there have been changes in the design, materials, or workmanship of the road over time. Generally, the Jeep Trail appears to have retained a high degree of integrity. The spur leading to the Opal Hill Mine dates to the 1980s and is therefore not being evaluated as a potential historical resource because it is not old enough.

The Jeep Trail/Opal Hill Mine Access Road that traverses the proposed Rio Mesa SEGF project site does not appear to be associated with any events that have made a significant contribution to the broad patterns of our history (CRHR Criterion 1), nor is it associated with the lives of significant persons in the past (CRHR Criterion 2). The resource does not embody the distinctive characteristics of a type, period, method of construction or represent the work of a master (CRHR Criterion 3), and it is not likely to yield information important in history or prehistory (CRHR Criterion 4). Staff concurs with the applicant that the Jeep Trail/Opal Hill Mine Access Road does not appear to be eligible for listing on the CRHR.

### *Bradshaw Trail Borrow Pit (RMS-ML-008)*

Located adjacent to the roadbed of the Bradshaw Trail, the Bradshaw Trail Borrow Pit (Borrow Pit) is not known to be a potential historical resource. According to County of Riverside Department of Transportation staff, the Borrow Pit is 30–40 years old (Donovan 2012). It does not appear on the 1953 U.S.G.S. map, but is labeled and shown clearly on the 1983 U.S.G.S. map (USGS 1953; USGS 1983). **Cultural Resources Figure 13** locates the borrow pit as outside the project fenceline boundary on private land, but within the built-environment PAA. The legend on the applicant's revised Figure 5-4 indicates that "right of entry" has been "obtained" to the property. This is understood to mean that right of entry is granted for the purposes of surveying the property. The Borrow Pit is located on a land parcel owned by the County of Riverside, APN 879-230-021. The Borrow Pit is identified as a mining operation by the State of California, Department of Conservation Office of Mine Reclamation (OMR). It appears as the "Bradshaw Pit" on the annual AB3098 list maintained by the OMR and lists Riverside County Department of Transportation as the Operator and Riverside County as the Lead Agency. The mine ID is 91-33-0046. The AB3098 list is the result of legislation of the same name passed in 1992. The listed mines must meet the following qualifications: 1) has an approved reclamation plan; 2) has approved financial assistance; 3) has filed its annual report; paid its reporting fee; and 4) has had its annual inspection by the lead agency.

Riverside County staff states that the Borrow Pit was established for sand and gravel extraction for road building within the county. It is not used very often due to its remote location. The county makes use of the more accessible Midland Gravel Pit, which was established later than the Borrow Pit. County staff indicated that the Borrow Pit may be called into more use for road-building activities in 2012–2013 due to recent flood damage to roads in the vicinity.

Based on the available information about the borrow pit and its history, no determination of eligibility or significance can be made at this time. It is unlikely that it is of sufficient age to require evaluation. Staff is continuing to research this issue and more information will be provided in the FSA.

### *State Route 78 (PVM-ML-007)*

The segment of SR 78 between SR 86 in Brawley and County Route S3 (CR S3) near Anza-Borrego Desert State Park is designated as part of the Juan Bautista de Anza National Historic Trail. The segment from the western junction of SR 79 to the western junction with SR 86 is eligible for listing as a State Scenic Highway; however, only the segment in Anza Borrego Desert State Park has officially been designated a State Scenic Highway by the California Department of Transportation. While SR 78 was formed in1934, along with the originally signed state highways in California, the connection from Brawley to Palo Verde was added in 1959, and the segment from Palo Verde to Blythe was completed by 1965.

In the Rio Mesa SEGF built-environment PAA and the general vicinity, SR 78 appears to be intact and in the same alignment as shown on the historic maps. It retains its association with the broader landscape and setting. It is not known whether there have been changes in the design, materials, or workmanship of the road over time, although it can be assumed that some regular maintenance has occurred. Generally, SR 78 appears to have retained a high degree of integrity. However, the portion in the built-environment PAA and vicinity was not part of the original construction of the road.

The SR 78 that traverses the built-environment PAA does not appear to be associated with any events that have made a significant contribution to the broad patterns of our history (CRHR Criterion 1), nor is it associated with the lives of significant persons in the past (CRHR Criterion 2). The resource does not embody the distinctive characteristics of a type, period, method of construction or represent the work of a master (CRHR Criterion 3), and it is not likely to yield information important in history or prehistory (CRHR Criterion 4). Staff has concluded that SR 78 in the built-environment PAA does not appear to be eligible for listing on the CRHR. Additionally the Rio Mesa SEGF project site is over 60 miles away from Brawley and over 100 miles away from the Anza Borrego Desert State Park. Therefore, the National Historic Trail and State Scenic Highway segments of SR 78 are located far to the west of the project site and could not be impacted by the proposed project.

## Summary of Recommended Mitigation of Significant Rio Mesa SEGF Impacts to Individual CRHR-Eligible Historic-Period Built-Environment Resources Identified by Record Search and Windshield Survey

Road improvements proposed for the Rio Mesa SEGF project have the potential to affect the structure and integrity of CRHR-eligible and potentially CRHR-eligible built-environment resources, including the Bradshaw Trail and the PVID’s Hodges Drain, C-03 Canal, Palo Verde Drain, Estes Drain, and Private Drain No. 1 (**Cultural Resources Table 20**). Depending on further staff evaluation of the PVID resources and the applicant’s response to staff data requests (CEC 2012az:#s 186-187) for specific information about proposed project access road improvements, mitigation for impacts may be required. When received, the access road information will assist staff in determining the potential for Rio Mesa SEGF project impacts on the PVID resources and on the Bradshaw Trail. If staff determines that the project would significantly impact the PVID resources, staff may propose a condition of certification in the FSA, **CUL-10**, to ensure that the Rio Mesa SEGF’s road improvements do not affect the potential contribution of these five resources to a CRHR-eligible historic district.

## SUMMARY OF ALL HISTORICAL RESOURCES SUBJECT TO SIGNIFICANT RIO MESA SEGF IMPACTS

**Cultural Resources Table 21** lists, by resource type, the historical resources that would potentially be impacted by the project. Fuller descriptions, justifications for CRHR-eligibility recommendations, a finalized discussion of Rio Mesa SEGF project impacts to these resources, and staff's proposed mitigation for these impacts will be included in the FSA.

**Cultural Resources Table 21**
**Historical Resources Potentially Subject to Significant Impacts from the Rio Mesa SEGF Project**

| Resource Type, Designation | Resource Identifier |
|---|---|
| Prehistoric Archaeological Resources | |
| | Prehistoric Trails Network Cultural Landscape/District |
| | Prehistoric Quarries Archaeological District |
| | A full list of prehistoric sites will be included in the FSA, once the applicant has completed the requested Phase II archaeological investigations and staff can reach conclusions on CRHR eligibility. |
| Historical Archaeological Resources | |
| | Desert Training Center Cultural Landscape/District |
| | DTC Maneuver sites |
| Ethnographic Resources | |
| | Salt Song Trail Landscape |
| | Keruk Trail/Xam Kwatcan/Earth Figures Landscape |
| | Palo Verde Mesa Ethnographic Landscape |
| Built-Environment Resources | |
| | The Bradshaw Trail (RMS-ML-003/CA-RIV-5191/P-33-5119) |
| | Pilot Knob-to-Blythe 161-kV Transmission Line (RMS-ML-001/P-33-011110) |
| | Niland-to-Blythe 161-kV Transmission Line (RMS-ML-002/CA-RIV-7127H/P33-012532) |

# CUMULATIVE IMPACTS AND MITIGATION

## CUMULATIVE IMPACTS TO ARCHAEOLOGICAL RESOURCES

### Geographic Scope of the Analysis

This subsection evaluates the potential for Rio Mesa SEGF, and other solar and development projects within the vicinity, to have cumulative impacts to archaeological resources. As discussed previously, individually minor but collectively significant actions (usually in the form of ground disturbance) may have a cumulatively considerable impact on archaeological resources. These impacts may result in a substantially adverse change in the significance of a resource, potentially jeopardizing its eligibility for listing on the CRHR.

For the archaeological resources cumulative analysis, the regional scope was defined at two levels: local and regional. At the local level, the geographic area considered for cumulative impacts on archaeological resources is a loosely defined area on either side of I-10 between the intersection of Red Cloud Mine Road and I-10 (10 miles west of Desert Center) in eastern Riverside County, and the intersection of I-10 with Highway 60 (10 miles east of Quartzsite) in western Arizona, hereafter referred to as the I-10 Corridor (Corridor). This Corridor overlaps to a large extent with BLM's California Desert Conservation Area. The Corridor does not have strictly defined boundaries and therefore does not have an area. However, the area is broadly equivalent to a strip 10 miles wide (5 miles to either side of I-10) and 100 miles long. The area of this strip is 1,000 square miles (640,000 acres).

Although the total number of archaeological resources present in this area is unknown, a rough order of magnitude estimate can be derived (see **Cultural Resources Table 22**), based on recent surveys related to Rio Mesa SEGF and five additional proposed solar power projects in the Southern California desert region (Genesis Solar Energy Project, Palen Solar Power Project, Blythe Solar Power Project, Desert Harvest, and Desert Sunlight). A total of 38,325 acres were surveyed for the six projects. These projects recorded 1,162 sites, indicating an average site density of 0.030 archaeological resources per acre in the desert region. This density suggests that the Corridor could contain approximately 19,200 archaeological resources.

## Cultural Resources Table 22
## Cumulative Analysis Results
## Estimated Number of Cultural Resources Per Acre, Rio Mesa SEGF Vicinity

| Location | Acres | Number of Known Archaeological Resources |
|---|---|---|
| Genesis Solar Energy Project<br>Blythe Solar Power Project<br>Palen Solar Power Project<br>Rio Mesa SEGF<br>Desert Sunlight PV<br>Desert Harvest PV (solar field only) | 38,325 | 1,162 = Average Density of 0.030 sites per acre |
| | | Estimated Number of Archaeological Resources (Acres x 0.030) |
| I-10 Corridor | 640,000 | 19,200 |
| Southern California Desert Region | 11,000,000 | 330,000 |
| Existing Projects<br>I-10 Corridor | | |
| Chuckwalla Valley Prison and Ironwood Prison | 1,720 | 52 |
| I-10 Freeway | 2,424 | 73 |
| Devers-Palo Verde No. 1 Transmission Line | 133 | 4 |
| Southern California Gas Company Pipeline | 133 | 2 |
| Blythe Energy Project Transmission Line | 163 | 5 |
| Blythe Energy Project (encompasses Blythe Energy Project II site) | 76 | 2 |
| Blythe PV Project | 200 | 6 |
| Subtotal | 4,849 | 146 |
| Reasonably Foreseeable Future Projects<br>I-10 Corridor | | |
| 15 Solar Projects: EnXco, Mule Mountain, Mule Mountain III, Palo Verde Mesa, Desert Quartzite, Blythe Airport Solar I, Blythe Mesa, Nextlight Quartzsite, Nextera (FPL) McCoy, Genesis, Chuckwalla Solar I, Palen, Desert Harvest, Desert Lily Soleil, Blythe Solar Power Generation Station I | 67,943* | 2,038 |
| Desert Southwest Transmission Line | 133 | 4 |

| Location | Acres | Number of Known Archaeological Resources |
|---|---|---|
| Devers-Palo Verde No. 2 Transmission Line | 133 | 4 |
| North Baja Pipeline Expansion Project | 40 | 1 |
| SCE Colorado River Substation and Expansion | 212 | 6 |
| Subtotal | 68,461 | 2,053 |
| Reasonably Foreseeable Future Projects<br>Southern California Desert Region | | |
| 36 Solar Projects | 96,975** | 2,909 |
| 3 Wind Projects | 50,349 | 1,510 |
| Subtotal | 147,324 | 4,419 |

*The majority of these solar projects fall within the Corridor. However, this 67,943 acres includes the total acreage of each project, including some portions that are located outside of the Corridor. The estimated number of archaeological resources impacted by these projects within the Corridor itself is therefore likely to be lower than the 2,038 resources calculated above.

** For solar projects without given acreages, an acreage 10 times the projected MW was assumed.

At the regional level, the geographic area considered for cumulative impacts on archaeological resources is defined as the desert areas of southeastern California, southern Nevada, and western Arizona, as shown on **Executive Summary Figure 1** (Area Map). In broad terms, the area covered in this analysis includes the 25-million-acre California Desert Conservation Area. Unlike other parts of California that were more densely occupied in prehistory, little is known about the archaeological resources of the desert region examined for this cumulative study. According to the CHRIS, only 20 percent of Riverside and San Bernardino Counties have been surveyed for archaeological resources. These studies have resulted in the identification and documentation of more than 20,000 archaeological resources. These results suggest that there is a high potential to discover previously unknown archaeological resources within the cumulative study region.

## Impacts of Existing Projects

Staff's analysis of cumulative impacts of existing projects emphasized those projects and developments listed in **Executive Summary Table 1** that are expansive and have disturbed the most acreage. Some of these projects, particularly the construction of the I-10 freeway, were completed prior to the existence or regular enforcement of state and federal cultural resource laws. The actual number of archaeological resources within each project site and the number of resources destroyed by each project are unknown. The following calculations are estimates.

### I-10 Corridor

At the regional level, the construction of Chuckwalla Valley and Ironwood State Prisons probably caused the most disturbance in the Corridor. Together these projects have disturbed approximately 1,720 acres of culturally sensitive desert. This cumulative analysis suggests that 52 sites were destroyed during this project.

The construction of I-10, a four-lane divided highway, with associated bridges, off-ramps, and berm system, also resulted in significant ground disturbance in the Corridor. Assuming a width of a minimum of 200 feet and a length of 100 miles, within the Corridor this project disturbed approximately 105,600,000 square feet (2,424 acres). This analysis suggests that 73 sites were destroyed

Another linear project within the Corridor was the Devers-Palo Verde No. 1 Transmission Line, a 500-kV line paralleling I-10. The disturbance caused by the construction of transmission lines is generally less than the disturbance caused by freeway construction. However, each line has an associated access road. Based on the construction of the access road and excluding the transmission tower pads, a width of 20 feet for each project and a length of 55 miles was assumed for this analysis. A similar calculation was made for the Southern California Gas Company's natural gas pipeline, which was also constructed parallel to I-10. In addition, approximately 67.4 miles of the transmission lines for the Blythe Energy Project are located within the Corridor. This analysis estimates that during the construction of these three linear projects, approximately 429 acres were disturbed, and 13 archaeological resources were destroyed.

Finally, the Blythe Energy Project (which encompasses the Blythe Energy Project II project site) and the Blythe PV Project have disturbed 76 acres and 200 acres, respectively. An estimated eight archaeological resources were destroyed.

In total, the larger of the ground-disturbing projects within the Corridor have disturbed at least 4,849 acres, or 0.7 percent of the Corridor. Of the estimated 19,200 archaeological resources, 146 were likely destroyed by these projects. Overall, previous projects in the Corridor do not appear to have had an effect on the archaeological resources. However, certain site types, particularly those associated with dry lakes, may have been disproportionately affected. A more detailed cumulative analysis would be needed to determine if this was the case.

### Southern California Desert Region

Within the larger Southern California Desert Region, the most intensive use of the desert and concomitant disturbance of archaeological resources has been on designated military installations, present (e.g., Edwards Air Force Base, Fort Irwin, Twentynine Palms Marine Corps Base, Chocolate Mountain Naval Aerial Gunnery Range) (**Executive Summary Figure 1**) and past (the Desert Training Center between 1942 and 1944, Desert Strike in May, 1964).

Archaeological resources in the Southern California Desert Region have been primarily impacted by past and currently approved projects through the ground disturbance that is required for construction of buildings, facilities, roads, and other infrastructure. Military training operations have been the most destructive, particularly at bombing ranges.

In the case of present-day military installations and maneuvers, however, avoidance of substantial adverse changes to CRHR-eligible archaeological resources has been accomplished through deliberate project planning. Likewise, the severity of impacts to previously unknown archaeological resources has been reduced to less-than-significant by implementing mitigation measures requiring construction monitoring, evaluation of resources discovered during monitoring, and avoidance or data recovery for resources evaluated to be historical resources under CEQA.

At the regional level, historic-period archaeological resources associated with the DTCCL, described in detail in previous subsections, are themselves at least 50 years old and are therefore potential historical resources. The use of heavy equipment and vehicles and the construction of camps, emplacements, and other features throughout the desert undoubtedly destroyed a number of prehistoric sites. In their place is a potential DTC historic district, with many individual resources that are known to be, or have the potential to be, historical resources. Previous development within the region has already destroyed a number of DTCCL sites.

## Impacts of Reasonably Foreseeable Future Projects

Archaeological resources are also expected to be affected by the following reasonably foreseeable future projects. As detailed in **Executive Summary Table 1** and shown in **Executive Summary Figure 1**, the future construction of residences and infrastructure in the local and regional cumulative analysis study areas would undoubtedly result in impacts to archaeological resources. Undoubtedly, too, some of the projects included in this analysis will not be built. This analysis estimates the maximum number of archaeological resources that may be destroyed.

### I-10 Corridor

Numerous other projects are proposed and under consideration along the Corridor. Staff assumes that the 15 proposed solar projects would destroy all of the archaeological resources within the proposed project limits for the purposes of this cumulative analysis. As discussed above, transmission lines are considered to have a smaller effect on archaeological resources. Using the same conservative figures used previously, the two new transmission lines proposed for the Corridor would affect an area 20 feet wide and a combined length of 110 miles. In total these linear projects would disturb 263 acres. In addition, the expansion of the North Baja Pipeline and Colorado River Substation would have impacts on 40 and 212 acres, respectively.

Together these reasonably foreseeable future projects would disturb at least 68,641 acres, or 10 percent of the total Corridor. This cumulative analysis suggests that these projects would destroy over 2,053 archaeological resources. The estimated number of archaeological resources that would be destroyed is likely to be lower, however, as the 68,461 acres of disturbance includes portions of solar and wind projects that are located outside of the Corridor.

### Southern California Desert Region

Much of the Southern California desert region analyzed for this cumulative analysis consists of the California Desert Conservation Area (CDCA). Eleven million acres of the 25-million-acre CDCA is managed by the BLM. Although there are undoubtedly other projects that have been proposed for this region, the projects proposed for construction within the BLM California Desert District make a reasonable proxy for patterns across the large area. Solar projects occupying 96,975 acres and wind projects occupying 50,349 acres have been proposed for this region, consisting of 0.6 percent of the CDCA.

Although the archaeological resources density per acre is unknown for this entire region, the density proposed for the Corridor serves as a reasonable minimum. The disturbance of 147,324 acres would result in the destruction of at least 4,419 archaeological resources. If all of this construction took place, the majority of the projects would undergo CEQA and/or NEPA review. Archaeological resources that could not be avoided would be tested to evaluate significance, and significant sites would be subject to historical documentation or data recovery excavations to mitigate impacts. Although these measures would reduce most individual project impacts to less-than-significant levels, archaeological excavation and analysis cannot recover all the scientific values of a site. Based on the above, the cumulative loss of approximately 4,400 archaeological resources is considered a significant impact that cannot be mitigated to a less-than-significant level.

Construction of the solar and wind projects proposed throughout this region would result in substantial changes in the setting, feeling, and association aspects of integrity in the areas in which they are constructed. These kinds of damages may be especially severe for traditional use areas and traditional cultural properties (TCPs). Potential impacts would include direct impacts in the form of physical disturbance or alteration as a result of construction activity, or indirect impacts in the form of diminished visual character of traditional use areas due to the presence of industrial structures.

## Contribution of the Rio Mesa SEGF to Cumulative Impacts

The development of Rio Mesa SEGF is expected to result in permanent adverse impacts to archaeological resources from construction activities. However, these impacts would be expected to contribute only a small amount to the possible permanent cumulative impacts to archaeological resources because relatively few resources would be eligible for the CRHR. Rio Mesa SEGF would have significant direct impacts to 41 prehistoric-to-historic-period Native American archaeological sites that are contributing elements of the PTNCL and to 104 sites that are contributing elements to the PQAD. Rio Mesa SEGF would also have significant direct impacts to 32 sites that are contributing elements of the DTCCL. No mitigation measures, individually or cumulatively, for any of these historical resources, would reduce the impacts of the proposed project to a less-than-significant level.

Rio Mesa SEGF construction impacts, when combined with impacts from past, present, and reasonably foreseeable projects, contribute in a small but significant way to the cumulatively considerable adverse impacts for archaeological resources at both the local Corridor and Southern California Desert Region levels. This analysis estimates that 2,200 sites in the Corridor and over 4,400 sites in the Southern California Desert Region would potentially be destroyed. Mitigation can reduce the impact of this destruction, but not to a less-than-significant level.

## Summary of Cumulative Impacts to Archaeological Resources

Rio Mesa SEGF impacts, when combined with impacts from past, present, and reasonably foreseeable projects, contribute in a small but significant way to the cumulatively considerable adverse impacts for archaeological resources at both the local Corridor and regional levels.

The majority of the proposed future projects examined in this analysis would likely undergo CEQA and/or NEPA review. Sites that could not be avoided would be tested to evaluate significance. Register-eligible sites would be subject to historical documentation or data recovery excavations to mitigate impacts. Although these measures would reduce most individual site impacts to less-than-significant levels, archaeological excavation and analysis cannot recover all the scientific values of a site.

This analysis estimates that 2,200 sites within the Corridor and over 4,400 sites within the Southern California Desert Region would be destroyed if all reasonably foreseeable projects were built. The destruction of archaeological resources and cultural landscapes results in the loss of information, but also in irreparable damage to cultural and spiritual values. For project impacts that impair the ability of these resources to qualify for the CRHR under Criterion 4, mitigation in the form of data recovery can reduce the impact of the loss of information to a less-than-significant level. But for project impacts that compromise the ability of these resources to qualify for the CRHR under Criterion 1, the degree of potential mitigation of impacts to cultural and spiritual values should be determined with the assistance of members of the community who value the resources and landscapes, in this case Native Americans. This cumulatively considerable impact may be unmitigable.

To reduce as much as possible the region-wide, significant cumulative impact to archaeological resources that staff has identified from its analysis, staff proposes that the Rio Mesa SEGF project be required (**CUL-1** and **CUL-2**) to contribute to the funds established to document and possibly nominate to the NRHP the PTNCL and the DTCCL (see below).

Despite the correct implementation of the mitigation measures outlined here, Rio Mesa SEGF's incremental contribution to cumulative impacts to archaeological resources would nonetheless be cumulatively considerable.

## MITIGATION FOR RIO MESA SEGF CUMULATIVE IMPACTS TO ARCHAEOLOGICAL RESOURCES

Staff has concluded that it can best fulfill its responsibilities under CEQA by designing a dual-level strategy to mitigate cumulative impacts on the regional level and project-specific direct and indirect impacts on the project level. For the region-wide mitigation of cumulative impacts, rather than hiring multiple companies to produce reports in isolation from each other, with results that are difficult to compare and synthesize, staff's recommended mitigation, coordinated among multiple adjacent projects, will standardize terminologies, increase statistical sample sizes, and focus research questions. Staff thinks this will improve the quality and utility of the information collected, as well as save money and time for all involved. Energy Commission staff will save time by creating overarching mitigation measures that will serve for the present projects and be adaptable to later projects in the same region, leaving staff more time to focus on the unique resources specific to each individual project and PAAs. The state Office of Historic Preservation has stated repeatedly that the Office would like to see a landscape approach to the archaeological resources of the region. Staff sees regional mitigation as an advantage for the project owners as well, as it will reduce duplication of effort and allow the pooling of their resources, thereby reducing their overall cultural resources impact mitigation costs.

Staff has already coordinated the cultural resources mitigation of the shared cumulative impacts of four solar projects: the Genesis Solar Energy Project, the Blythe Solar Power Project, the Palen Solar Power Project, and the Rice Solar Energy Project. As noted above, Conditions of Certification **CUL-1** and **CUL-2** would require the Rio Mesa SEGF project owner to contribute $35 per acre enclosed, or otherwise disturbed, for the PTNCL, and $25 per acre for the DTCCL, to special Energy Commission accounts to finance the documentation and possible NRHP nominations of the PTNCL and DTCCL. (These two programs are described in detail below.) The four already-certified projects all have a **CUL-1** and **CUL-2** that are nearly identical to those proposed for Rio Mesa SEGF, except that **CUL-1** and **CUL-2** for the Rio Mesa SEGF projects have a more explicit specification of proration and of timeframes for payment of contributions.

The costs of these two documentation and nomination programs include the hours and expenses of a staff chosen and coordinated by Energy Commission staff. Cultural resources specialists to be shared by the four already-certified solar projects and the proposed Rio Mesa SEGF include: PTNCL Principal Investigator (PI)-Prehistoric Archaeologist, PTNCL Ethnographer, PTNCL Geoarchaeologist, DTCCL Principal Investigator (PI)-Historian and DTCCL Historical Archaeologist. All five specialists are senior professionals in their subfield, qualified according to the Secretary of the Interior's Standards, acknowledged experts in the Southern California Desert region, and have demonstrated experience in synthetic writing. The PTNCL PI-Prehistoric Archaeologist and the DTCCL PI-Historian also have large-scale project management experience. Staff is managing the contributed funds and coordinating the regional research efforts among the shared specialists and between the shared specialists and the project owners' project-specific specialists.

Staff feels that the number of acres disturbed is the most equitable measure of impacts to cultural resources. Each project site has a different relative density of archaeological sites, but the number of buried archaeological sites for each is unknown. So the site counts may change dramatically and unexpectedly during future archaeological exploration and construction. In addition, the nature of direct and indirect impacts to regional ethnographic resources in the PTNCL has not yet been assessed by local Native American community members. Given the sacred nature of these resources, Native Americans may consider some of these impacts severe and difficult or impossible to mitigate to a less-than-significant level. Considering these unknown and unquantifiable factors, staff considers the number of acres disturbed by each project to be a reasonable and concrete proxy.

As noted above, the project owners of the Genesis Solar Energy Project, the Blythe Solar Power Project, the Palen Solar Power Project, and the Rice Solar Energy Project have similar conditions. Any additional coordination among project owners that can be negotiated, beyond that specified here, is welcomed and encouraged.

The two landscape documentation and nomination programs are the same for all projects (see below). It is staff's intention to enable the sharing of costs for these two programs with future projects under Energy Commission jurisdiction that would contribute to the cumulative impacts to cultural resources in the region, and also with any contemporaneous and future projects not under Energy Commission jurisdiction that contribute to the cumulative impacts to cultural resources in the region.

## Mitigation of Cumulative Impacts to Cultural Landscapes (CUL-1 and CUL-2)

### *PTNCL Documentation and Possible NRHP Nomination Program*

The Energy Commission has subcontracted with Jerry Schafer to serve as the principal investigator (PI) and prehistoric archaeologist for the following research on the PTNCL. The PTNCL PI-Prehistoric Archaeologist had to meet the following qualifications:

1. At a minimum, an M.A. in anthropology, with a specialization in archaeology;

2. Education and training that meet the U.S. Secretary of the Interior's Professional Qualifications Standards for Prehistoric Archaeology, as published in Title 36, Code of Federal Regulations, part 61;

3. A background in anthropology and archaeology, with at least 10 years of full-time archaeological resources mitigation and field experience in Southern California;

4. Demonstrated ability to conduct and report on archaeological research; and

5. At least three years of full-time professional experience managing large cultural resources projects in California.

The PTNCL PI-Prehistoric Archaeologist will manage and coordinate the research activities required in this condition, report on progress to staff, and complete Task C. Energy Commission staff will have final decision-making authority regarding budget and technical cultural resources matters.

Under **CUL-4**, the Rio Mesa SEGF project owner will provide to the PTNCL PI-Prehistoric Archaeologist, the PTNCL Ethnographer, and the PTNCL Geoarchaeologist copies of the AFC, data responses, confidential cultural resources documents, and the Final Staff Assessment (FSA) for the project.

A. Ethnographic Study

   The Energy Commission has had the services of Lowell J. Bean, with the assistance of James Toenjes, to serve as the PTNCL Ethnographer. The PTNCL Ethnographer had to meet the NPS standards for Anthropologist/Applied Ethnographer (GS-190, 11-12 or 13-15) and have already-established, long-term relationships with Native American groups whose traditional territories are in or near the Chuckwalla Valley and Palo Verde Mesa.

   The PTNCL Ethnographer will:

   1. Develop an ethnographic context for the PTNCL from ethnohistoric and ethnographic records and sources (completed);

   2. Develop an informant list: The PTNCL Ethnographer has the final choice, but must include representatives from the groups that have expressed concerns about the projects: the Quechan Tribe, the Chemehuevi Tribe, the Cabazon Band of Mission Indians, the Agua Caliente Band of Mission Indians, the San Mañuel Band of Mission Indians, the Twenty-Nine Palms Band of Mission Indians, La Cuna de Aztlan Sacred Sites Protection Circle, the Fort Mojave

Indian Tribe, the Colorado River Indian Tribes, and Cocopah. Other Native Americans identified by the BLM Palm Springs Field Office archaeologist will also be included (in process);

3. Develop interview questions about the PTNCL and potential traditional cultural properties (TCPs) (in process);

4. Submit the draft ethnographic context, informant list, and interview questions to staff for review and approval and to the BLM Palm Springs archaeologist for review and comment (completed);

5. Using the approved informant list and questions, interview local Native American community members about the landscape and pay each an honorarium for their participation, amount to be reviewed and approved by staff (in process);

6. Escort, at PTNCL fund expense, to important, probable, known PTNCL contributors, such as springs, petroglyph sites, earth figures, and major trail segments, those members who want to visit them to determine if the relevant solar projects would have any significant impacts, from the perspective of the Native Americans, and what options for mitigation the Native Americans consider available. Pay each an honorarium for their participation, amount to be reviewed and approved by staff;

7. Alternatively and/or additionally, photograph or simulate the viewsheds from important PTNCL contributors, such as springs, petroglyph sites, earth figures, and major trail segments and show them to interested Native American community members to determine if the three projects would have any significant impacts, from the perspective of the Native Americans, and what options for mitigation the Native Americans consider available. Pay each an honorarium for their participation, amount to be reviewed and approved by staff;

8. Compile location data on PTNCL elements from ethnographic information, draft a map showing all these elements, and draw a provisional boundary for the PTNCL from the ethnographic perspective, with written justification for the boundary.

9. Compile interview transcripts and draft preliminary conclusions identifying TCPS and providing Native Americans' assessment of project impacts on these TCPs and their recommendations for mitigation measures for these impacts, with photos and maps as appropriate;

10. Assist interested Native Americans in adding the TCPs to the NAHC Sacred Sites list;

11. Set up an opportunity for Native Americans to write about or be recorded relating their knowledge, experience, and perspective on the PTNCL. Pay each an honorarium for their participation, amount to be reviewed and approved by staff;

12. Collaborate with the Rio Mesa SEGF Project Prehistoric Archaeologist and the Rio Mesa SEGF Project Ethnographer to develop a monitoring plan for the

PTNCL cultural resources subject to indirect Rio Mesa SEGF construction impacts; and

13. Submit products of 1, 8, and 9 to the Energy Commission.

The Energy Commission will provide products of 1, 8, and 9 to the relevant project CRSs.

The PTNCL Ethnographer will submit the draft PTNCL ethnographic documentation to the Energy Commission for review and approval.

B. Geoarchaeological Study:

The Energy Commission has subcontracted with the Desert Research Institute for the services of Thomas Bullard as PTNCL Geoarchaeologist (PG). The PG’s training and background must meet the U.S. Secretary of Interior’s Professional Qualifications Standards for Prehistoric Archaeology, as published in Title 36, Code of Federal Regulations, part 61, and show the completion of graduate-level coursework in geoarchaeology or Quaternary science. The resume of the proposed PG will be submitted to staff for review and approval.

The PTNCL Geoarchaeologist will:

1. Develop a geoarchaeological context, including reconstruction of the regional paleoenvironment, with lake fluctuations, over the past 14,000 years (in process);
2. Compile a trans-regional landform map;
3. Correlate trans-regional sites types with landforms;
4. Assign known sites to landforms for all relevant projects;
5. Attempt to predict on the basis of 4 where in the Chuckwalla Valley and on the Palo Verde Mesa additional sites of the several types may be found;
6. Conduct field studies [none envisioned yet];
7. Monitor, as needed, Sduring construction; and
8. Submit products 1–4 to the Energy Commission.

The Energy Commission will provide products 1–4 to the three CRSs.

The PTNCL Geoarchaeologist will submit the draft PTNCL geoarchaeological documentation, the trans-regional landform map, the trans-regional correlation of site types to landforms to the Energy Commission for review and approval.

C. Archaeological Study:

The PTNCL PI-Prehistoric Archaeologist will:

1. Synthesize the present state of knowledge of prehistory in the Chuckwalla Valley and Palo Verde Mesa and identify significant gaps in this knowledge, based on all pertinent literature, including published monographs and papers, unpublished reports in the files of the CHRIS and the BLM's Palm Springs Field Office, and on consultation with archaeologists actively conducting research in this region, particularly those based in academia (completed);

2. Develop a comprehensive prehistoric context for the PTNCL (completed);

3. From the prehistoric context and the literature synthesis, identify and describe the full range of archaeological resources known for the PTNCL and posit any additional resources that, while not known, are strongly suggested by the context and synthesis;

4. From the prehistoric context and the literature synthesis, formulate specific research questions:

    a. To fill significant gaps in our knowledge of the prehistory of this area,

    b. Answerable with data from known archaeological resources, and

    c. Specify what kinds of resources have the relevant data

    d. To determine the presence or absence of additional archaeological resources not presently known but likely

    e. Specify the methods for making this determination.

5. Develop criteria for definitively attributing archaeological sites to the PTNCL based on archaeological traits;

6. Compile location data on known PTNCL archaeological elements, draft detailed GIS-based maps of trails and the various site types and their spatial distributions, and draw on a map a provisional boundary for the PTNCL from the archaeological perspective, with a written justification for the boundary;

The Energy Commission will provide products of 1–6 to the relevant project CRSs.

The PTNCL PI-Prehistoric Archaeologist will submit the draft PTNCL prehistoric archaeological documentation to staff for review and approval and to the BLM Palm Springs Field Office archaeologist for review and comment.

D. Possible NRHP nomination of the PTNCL:

After all data recovery for the five projects is completed and reported, the PTNCL PI-Prehistoric Archaeologist and the PTNCL Ethnographer will collaborate on a NRHP nomination for the PTNCL under Criteria A and D. The nomination will include:

1. Definition of resource;

2. PTNCL probable contributing resource types, known and as-yet-unknown

a. trail segments and trail-related features (pot-drops, rock cairns, lithic scatters)

b. features (hearths, other)

c. springs

d. resource areas and associated features (quarries, plant foods/materials)

e. camps

f. habitation areas

g. burial areas

h. petroglyphs (hunting blinds?)

i. earth figures (sacred places?)

j. other;

3. Prehistoric and ethnographic background and context;

4. Justification of eligibility;

5. Period of significance and its justification;

6. Identification of contributors, map of archaeologically confirmed sites, and site descriptions of all;

7. Identify contributors as TCPs, with the permission of Native Americans, if the community representatives determine any of the contributors to be TCPs;

8. Definition of boundaries, with map depicting trail network and nodes, as identified through historical, ethnographic, and archaeological research; and

9. Provision for adding additional contributing resources to the district as further survey is done.

The PTNCL PI-Prehistoric Archaeologist will submit the draft nomination to the Energy Commission for review and approval.

The PTNCL PI-Prehistoric Archaeologist will submit the Energy Commission-approved PTNCL NRHP nomination to the State Historical Resources Commission, to initiate the process of formal consideration by the Keeper of the NRHP, and track and facilitate the review of the nomination to acceptance, including required revisions and additions, or final rejection.

If the PTNCL PI-Prehistoric Archaeologist, the PTNCL Ethnographer, and the PTNCL Ethnohistorian agree that a PTNCL nomination is not appropriate, the PTNCL PI-Prehistoric Archaeologist will write and submit to the Energy Commission staff a summary of the evidence justifying that conclusion.

E. Information Dissemination:

The PTNCL PI-Prehistoric Archaeologist will collaborate with the PTNCL Ethnographer to prepare a research paper, interpreting the implications of the PTNCL data for our understanding of the prehistory of the Mojave Desert, and submit it to a peer-reviewed journal.

The Energy Commission will obtain the services of an exhibit preparer and direct the preparer to craft materials, such as an instruction module for use in local school districts and or a display for existing public interpretation venues at local museums, that interpret the PTNCL for the public, based on the data compiled by the PTNCL PI-Prehistoric Archaeologist, the PTNCL Ethnographer, and the PTNCL Geoarchaeologist. The exhibit preparer will arrange for the materials to be used and displayed.

The PTNCL and its potential contributors are both archaeological and ethnographic resources. As such, the impacts to these resources must be evaluated by different kinds of specialists. The specialists will have individual and shared responsibilities, which are detailed above.

This process will begin with the PTNCL PI-Prehistoric Archaeologist writing an overarching prehistoric context for the Chuckwalla Valley and Palo Verde Mesa region, with specific emphasis on the PTNCL. This context will formally define the landscape boundaries, thematic associations, property types, and significance period by building up on the preliminary definitions provided by staff above. This context will include a synthesis of previous research in the area and, among other things, result in detailed GIS-based maps of trails and the various site types and their spatial distributions. In addition, the specialist will arrange and synthesize the results of a regional paleo-environmental reconstruction including lake fluctuations covering the last 14,000 years. This specialist will also refine the research questions that will be addressed, the specific data sets needed to answer these questions, mitigation measures for the relevant site types, and the analytical standards that will be met. This specialist will ensure that the work on prehistoric sites at all relevant solar project sites is consistent, and of high quality. The Energy Commission will also facilitate data sharing between different projects, project owners, and companies.

The PTNCL Ethnographer will be responsible for identifying impacts to PTNCL ethnographic resources, through research and consultation with Native Americans, and for planning mitigation for these impacts. This specialist will have demonstrated experience as an ethnographer and have already established long-term relationships with Native American groups whose traditional territories are near to the project areas. This individual will develop a historic and ethnographic context for the PTNCL from historical, ethnohistoric, and ethnographic records and sources, including interviews with local Native American community members. The PTNCL Ethnographer will also facilitate site visits by interested individuals to important PTNCL locations such as springs, petroglyph sites, earth figures, and major trail segments. It is hoped that these visits and the resulting conversations will determine if the relevant projects would have any significant impacts on the PTNCL ethnographic resources, from the perspective of the Native Americans, and what options for mitigation the Native Americans consider available. The Native American groups to be consulted by the PTNCL Ethnographer should include at a minimum representatives from the Quechan Tribe, the Chemehuevi Tribe, the Cabazon Band of Mission Indians, the Agua Caliente Band of Mission Indians, the San Mañuel Band of Mission Indians, the Twenty-Nine Palms Band of Mission Indians, La Cuna de Aztlan Sacred Sites Protection Circle, the Fort Mojave Indian Tribe, the Colorado River Indian Tribes, and the Cocopah Tribe.

The PTNCL PI-Prehistoric Archaeologist and PTNCL Ethnographer will communicate frequently and share information as they write their contexts. The final documents will share concepts and terminology. If all specialists agree that the PTNCL is probably eligible for listing on the NRHP, they will jointly write a nomination form under Criteria A and D and list the resources that they have identified from all projects as contributors. Resources will be identified as contributors or non-contributors on the basis of the contexts developed by the specialists and on the basis of the data recovered from each potential contributor during the evaluation and data recovery activities that staff has recommended for each known resource that would be impacted by the Rio Mesa SEGF and the other four projects.

### *DTCCL Documentation and Possible NRHP Nomination Program*

The DTCCL program will have a historian for a principal investigator, who will collaborate with a historical archaeologist in the tasks of documenting and nominating the DTCCL to the NRHP. The DTCCL Historical Archaeologist will also train the individual project historical archaeologists and their crews in the accurate and consistent field identification and recording of historic-period artifacts, with an emphasis on those associated with the DTC/C-AMA. The funding for this program would utilize the same mechanism and contribution basis as the above PTNCL fund, as provided in **CUL-2**.

The Energy Commission has subcontracted with Matt C. Bischoff to serve as the DTCCL Historian and principal investigator (PI) for the following research on the DTCCL. The DTCCL PI-Historian must meet the following qualifications:

1. At a minimum, an M.A. in history, with a specialization in World War II military history.

2. Education and training that meet the U.S. Secretary of the Interior’s Professional Qualifications Standards for Historian, as published in Title 36, Code of Federal Regulations, part 61;

3. Demonstrated ability to conduct and report on historical research; and

4. At least three years of full-time professional experience managing research projects.

The DTCCL PI-Historian will propose and engage the DTCCL Historical Archaeologist, manage and coordinate the research activities required in this condition, report on progress to staff, and complete Task A. Energy Commission staff will have final decision-making authority regarding budget and technical cultural resources matters.

Under **CUL-4** for each project, the project owners will provide to the DTCCL PI-Historian and Historical Archaeologist copies of the AFC, data responses, confidential cultural resources documents, and the Final Staff Assessment (FSA) for the project.

A. Historical Study:

The DTCCL PI-Historian will:

1. Develop an annotated bibliography, including oral history sources, to establish the context, themes, contributing resource types, material culture, period of significance, and boundaries for the DTCCL (completed);

2. Create a time line of DTC/C-AMA activities across the entire maneuver area, including Arizona;

3. Write the context, emphasizing material culture, and define the themes, contributor resource types, and period of significance;

4. Produce a general map of the historical DTC/C-AMA;

5. Compile a detailed map charting the maneuvers conducted on all relevant project sites (GSEP, Blythe Solar Power Plant, Rice Solar Energy Project, and Palen Solar Power Plant);

6. Compile a list of known DTCCL contributors, with a description and individual map plot of each, and a DTCCL map showing all contributors; and

7. Plot, describe, and justify the boundaries of the DTCCL from the historical perspective.

The DTCCL PI-Historian will provide the products of 2 through 6 to the relevant project CRSs.

The DTCCL PI-Historian will submit the draft DTCCL historical documentation to staff for review and approval and to the BLM Palm Springs Field Office archaeologist for review and comment.

B. Historical Archaeological Study

The Energy Commission subcontracted with Scott Baxter and Rebecca Allen (formerly Past Forward Inc) to serve as the DTCCL Historical Archaeologist. The DTCCL Historical Archaeologist's training and background had to meet the U.S. Secretary of Interior's Professional Qualifications Standards for Historical Archaeology, as published in Title 36, Code of Federal Regulations, part 61. The resume of the DTCCL had to demonstrate knowledge of the full range of late nineteenth and early-to-mid-twentieth-century domestic can, bottle, and ceramic diagnostic traits.

The Energy Commission will direct the DTCCL Historical Archaeologist to:

1. Synthesize the present state of knowledge of DTCCL historical archaeology in the Chuckwalla Valley and Palo Verde Mesa and identify significant gaps in this knowledge, based on all pertinent literature, including published monographs and papers, unpublished reports in the files of the CHRIS and the BLM's Palm Springs Field Office, and on consultation with archaeologists actively conducting research in this region, particularly those based in academia (in process);

2. Develop a comprehensive historic-period archaeological context for the DTCCL (in process);

3. Have low-altitude aerial photography of the Chuckwalla Valley and Palo Verde Mesa taken, and analyze the results for evidence of larger-scale DTCCL (or other historic-period) activities and any unrecognized site types; if any such sites are identified within the project areas of the Rio Mesa SEGF, Genesis Solar Energy Project, Blythe Solar Power Project, Rice Solar Energy Project, or Palen Solar Power Project, notify the appropriate CRS(s) and have these resources recorded and added to the project's cultural resources inventory;

4. From the historical archaeological context, the literature synthesis, and the aerial photography, identify and describe the full range of archaeological resources known for the DTCCL and posit any additional resources that, while not known, are strongly suggested by the context and synthesis;

5. From the historical archaeological context and the literature synthesis, formulate specific research questions:
    a. To fill significant gaps in our knowledge of the DTCCL history of this area
    b. Answerable with data from known archaeological resources
    c. Specify what kinds of resources have the relevant data
    d. To determine the presence or absence of additional archaeological resources not presently known but likely
    e. Specify the methods for making this determination
    f. To definitively distinguish Desert Strike sites from DTC/C-AMA sites
    g. Army records for locations of Desert Strike activities may facilitate eliminating some ambiguous sites not in those locations as Desert Strike sites;

6. Develop criteria for definitively attributing archaeological sites to the DTCCL based on archaeological traits;

7. Compile location data on known DTCCL archaeological elements, draft detailed GIS-based maps of the various site types and their spatial distributions, and draw on a map a provisional boundary for the DTCCL from the archaeological perspective, with a written justification for the boundary;

8. Train the Project Historical Archaeologists for the Rio Mesa SEGF to correctly and consistently identify and record the historic-period military and domestic artifacts likely to be encountered on the these project sites and assist them in the development of field recording forms for these artifacts and sites; and

9. Assist the Project Historical Archaeologists for the Rio Mesa SEGF to train their field crews to correctly and consistently identify and record the historic-period military and domestic artifacts likely to be encountered on the these project sites and to correctly and completely fill out the field forms developed for historic-period sites.

The Energy Commission will provide the products of 1–8 to the relevant project CRSs.

The DTCCL PI-Historian will submit the draft DTCCL historical archaeological documentation to the Energy Commission for review and approval.

C. Possible NRHP nomination of the DTCCL:

After all data recovery for the five projects is completed and reported, the DTCCL PI-Historian will confer with the DTCCL Historical Archaeologist and decide if the DTCCL is eligible for the NRHP, and if so, the two will collaborate on a NRHP nomination for the DTCCL under, minimally, Criterion D. If the DTCCL PI-Historian and the DTCCL Historical Archaeologist agree that a DTCCL nomination is appropriate, the DTCCL nomination will include:

1. Definition of the resource;

2. DTCCL probable contributing resource types, known and as-yet-unknown:
    a. tank tracks
    b. refuse (primarily food can) scatter
    c. refuse (other activities, e.g., auto-related; ± food) scatter
    d. multiple-episode refuse dump
    e. foxhole/temporary defensive position
    f. temporary camp-related (cleared areas for tents)
    g. semi-permanent camp-related (paths, activity areas, varied shelter sizes and shapes)
    h. features (hearths, other)
    i. other;

3. Historical background and context;

4. Justification of eligibility;
5. Period of significance and justification for POS;
6. Identification of contributors, map of archaeologically confirmed sites, and site descriptions of all;
7. Definition of boundaries, as identified through historical and archaeological research; and
8. Provision for adding additional contributing resources to the district as further survey is done.

The DTCCL PI-Historian will submit the draft nomination to the Energy Commission for review and approval.

The Energy Commission will submit the staff-approved DTCCL NRHP nomination to the State Historical Resources Commission, to initiate the process of formal consideration by the Keeper of the NRHP, and track and facilitate the review of the nomination to acceptance, including required revisions and additions, or final rejection.

If the DTCCL PI-Historian and the DTCCL Historical Archaeologist agree that a DTCCL nomination is not appropriate, the DTCCL PI-Historian will write and submit to staff a summary of the evidence justifying that conclusion.

D. Information Dissemination:

The DTCCL PI-Historian will collaborate with the DTCCL Historical Archaeologist to prepare a research paper, interpreting the implications of the DTCCL data for our understanding of WWII combat training history, and submit it to a peer-reviewed journal.

The DTCCL PI-Historian will create or direct the creation of and provide an instruction module for use in local school districts, based on the data compiled by the DTCCL PI-Historian and the DTCCL Historical Archaeologist. The Energy Commission will also obtain the services of an exhibit preparer and direct the preparer to craft materials and/or a display for existing public interpretation venues at local museums (such as the nearby George S. Patton Memorial Museum or Wiley's Well rest area), that interpret the DTCCL for the public, based on the data compiled by the DTCCL PI-Historian and the DTCCL Historical Archaeologist. The exhibit preparer will arrange for the materials to be used and displayed.

The DTCCL PI-Historian will also explore other modes of public dissemination of DTCCL data and propose these, with budgets, to staff. Some possibilities are noted here, but the PI-Historian's proposals should not be limited to these.

A DTCCL website and chatroom for WWII veterans and history buffs to acquire and exchange information.

A hiking or off-road-vehicle trail connecting DTCCL archaeological remains of particular interest (and where artifacts of archaeological interest are no longer present), such as the more permanent camps and air bases. This trail and a map of it providing GPS coordinates, descriptions, historical information, and historic-period photographs could be developed with BLM and made available to visitors. A model for such a trail is the California Backcountry Discovery Trails system.

An over-flight video, with a narration identifying and providing the history of the DTCCL contributors that are better observed from the air, such as the airbases, interspersed with historic-period film footage of related DTCCL activities.

The DTCCL and its potential contributors will be defined and impacts to these resources will be evaluated by two specialists: a DTCCL PI and Historian and a DTCCL Historical Archaeologist. The responsibilities of each specialist are outlined below.

The DTCCL PI-Historian will be a specialist in World War military history who will write a context for the DTCCL expanding upon but not duplicating the efforts of Bischoff (2000 and 2006). The context will emphasize material culture, create a timeline of activities across the entire maneuver area and result in detailed maps that focus on the three project areas and the maneuvers that took place in each. This specialist will also conduct oral history interview with veterans and synthesize previously recorded interviews.

The DTCCL Historical Archaeologist will be a specialist in the identification, analysis and interpretation of the historic-period artifacts and knowledgeable of the full range of late nineteenth and early-to-mid-twentieth-century can, bottle, and ceramic diagnostic traits. The DTCCL Historical Archaeologist will be responsible for training the field crews with the above skills so they can accurately complete in-field artifact analyses. This specialist will also ensure that the field work on the historic-period archaeological sites at all five solar project sites is consistent, and of high quality. The Energy Commission will facilitate data sharing between different projects, project owners, and companies.

Together, the DTCCL PI-Historian and the DTCCL Historical Archaeologist will write a context that: refines the research questions that will be addressed, identifies the specific data sets needed to answer these questions, develops mitigation measures for the relevant site types, and establishes the analytical standards that will be met.

Finally, both DTCCL specialists will jointly write a nomination form under Criterion D and any other Criterion they think is appropriate. The nomination will list the resources that they have identified from all projects as contributors and non-contributors on the basis of the contexts developed by the specialists and on the basis of the data recovered from each potential contributor during the evaluation and data recovery activities that staff has recommended for each known resource that would be impacted by the Rio Mesa SEGF and the other four projects.

## CUMULATIVE IMPACTS TO BUILT-ENVIRONMENT RESOURCES

Staff has concluded that the project would impact, to varying degrees, four NRHP- and/or CRHR-listed, eligible, or potentially eligible resources within the built-environment PAA. Of the four resources, staff concluded that the proposed project would result in a less-than-significant impact to two of them: the Pilot Knob-to Blythe 161-kV Transmission Line (RMS-ML-001/P-33-011110) and the Niland-to-Blythe 161kV Transmission Line (RMS-ML-002/CA-RIV-7127H/P33-012532). The Rio Mesa SEGF's impacts to the larger, NRHP-eligible Parker-Davis Project, to which the two transmission lines contribute, must also be considered. When combined with impacts from past, present, and reasonably foreseeable projects, the proposed Rio Mesa SEGF project's contribution to adverse impacts for the two resources and to the Parker-Davis Project is not cumulatively considerable.

As previously stated, project description formation was not available at the time of the publication of this PSA. When the required information is received from the applicant, the assessment of impacts to the Bradshaw Trail (CRHR-eligible) and the Palo Verde Irrigation District (potentially CRHR-eligible) will be analyzed and included in the FSA. The cumulative impacts and mitigation discussion for these two resources will also be included in the FSA.

## CUMULATIVE IMPACTS TO ETHNOGRAPHIC RESOURCES

Due to the large sizes and linear natures of the three ethnographic landscapes, extending through, around, and, in two of the three landscapes, substantially (100 miles) beyond the viewshed of the project, the landscapes will need to be reasonably segmented to fit within staff's current scope of past, present, and reasonably foreseeable projects, including Rio Mesa SEGF, determined by staff to contribute to cumulative impacts. Segmentation will require further consideration by staff in consultation with affiliated Tribes.

## MITIGATION FOR RIO MESA SEGF CUMULATIVE IMPACTS TO ETHNOGRAPHIC RESOURCES

This section will be completed when the analysis of the Rio Mesa SEGF cumulative impacts to ethnographic resources is completed.

# CONCLUSIONS AND RECOMMENDATIONS

## PREHISTORIC ARCHAEOLOGICAL RESOURCES

Staff has concluded that 42 prehistoric archaeological resources are not significant as individual resources and are not contributors to the PTNCL/District or to the PQAD. No mitigation for Rio Mesa SEGF project impacts to these 42 resources is required.

Staff has identified 41 contributors to the PTNCL, a previously identified, assumed CRHR eligible, discontiguous archaeological and ethnographic district in the prehistoric archaeological PAA. These 41 resources are therefore historical resources for the purposes of CEQA. Construction activity on the Rio Mesa SEGF plant site and the proposed linear alignments may cause the destruction of these 41 historical resources. The destruction of these sites through the construction of the proposed project would cause a substantial adverse change in the significance of these historical resources under CRHR Criterion 4 (likely to yield information important to prehistory). Energy Commission staff can identify the destruction of the 41 resources as significantly reducing those aspects of their integrity that qualify them for the CRHR under Criterion 4 and can propose mitigation to reduce those impacts to a less-than-significant level. As contributors to the PTNCL, the 41 resources are also CRHR eligible under Criterion 1, and staff must consider the Rio Mesa SEGF project's impacts on those aspects of the resources' integrity that qualify them under Criterion 1 (associated with events that have made a significant contribution to the broad patterns of our history). In addition to its own assessment of the project's impacts on the resources' integrity of association, feeling, and setting, staff is seeking the assessment of members of the community who value the resources culturally and/or spiritually, in this case, Native Americans. Staff is currently in the process of consulting with local Native American groups and others regarding Rio Mesa SEGF impacts and potential mitigation. Mitigation measures reflecting this consultation will be forthcoming in the FSA.

Staff has concluded 104 prehistoric resources within the prehistoric archaeological PAA may be contributors to an existing noncontiguous archaeological district, the PQAD. The applicant has not conducted the fieldwork required to gather data for site eligibility determinations for these prehistoric resources. Without the required primary field data staff cannot evaluate them sufficiently to determine if they may have the potential to yield information important to prehistory. Therefore staff was unable to determine if these resources are eligible for the CRHR, assess the impacts of the proposed Rio Mesa SEGF project on known and unknown resources, or propose mitigation for these impacts.

Additional data from Phase II archaeological field and laboratory work is required to supplement the very basic descriptive information collected during the applicant's pedestrian surveys. Without these additional field and laboratory studies, staff cannot adequately identify potential impacts to resources or design project-specific mitigation measures, as advised by CEQA (Pub. Resources Code, § 21083.2; Cal. Code Regs., tit. 14, §§ 15064.5(f) and 15126.4(b). When this information is received, staff can recommend a full suite of appropriate mitigation measures that may include, but would not be limited to, a condition requiring the collection and analysis of diagnostic artifacts and a condition requiring a GIS map and associated spatial analysis of trails and features commonly associated with them.

Staff has determined that construction and operation of the Rio Mesa SEGF project, in conjunction with past, present, and reasonably foreseeable projects in the vicinity, would result in significant and unmitigable impacts to 1 combined archaeological district/ethnographic landscape, 2 archaeological districts, and as many as 108 individual archaeological resources. Staff has proposed compensatory mitigation consisting of a contribution to an existing research program to address these cumulative impacts (**CUL-1** and **CUL-2**). Although full implementation of these proposed conditions of certification would reduce the project-related impacts to some extent, thereby reducing the project's contribution to cumulative impacts to the resources, they would not reduce the cumulative project contribution to less than significant.

## HISTORICAL ARCHAEOLOGICAL RESOURCES

Resources representing the World War II U.S. Army training exercises known as the Desert Training Center (DTC) include 32 DTC Maneuver sites, 50 DTC Food-Related sites, and at least 436 recorded isolated artifacts. Desert Training Center resources were previously also identified in the project areas of the Blythe Solar Power Project, the Genesis Solar Energy Project, and the Palen Solar Power Project during staff's CEQA review of these projects, with the result that staff identified a region-wide cultural landscape/district, the Desert Training Center Cultural Landscape, that staff assumed to be eligible for the CRHR. Consequently, staff has concluded that the DTC historical archaeological sites (but not the isolated artifacts) located on and near the Rio Mesa SEGF project site are contributors to the Desert Training Center Cultural Landscape and therefore are also assumed to be eligible for the CRHR. Staff has also concluded that the Rio Mesa SEGF project's direct and cumulative impacts to the Desert Training Center Cultural Landscape resources would be significant. Staff proposes conditions of certification to mitigate these impacts to the extent feasible. Proposed **CUL-2** would have the project owner contribute to an existing fund dedicated to the documentation and nomination of the Desert Training Center Cultural Landscape. Proposed **CUL-8** provides for data recovery at DTC Maneuver sites. Proposed **CUL-9** provides for the preparation of a film documentary focused on the Infantry in the DTC.

## ETHNOGRAPHIC RESOURCES

Staff has identified three ethnographic landscapes within which the Rio Mesa SEGF project is located (Salt Song, Keruk Trail/Xam Kwatcan/Earth Figures Landscape, and Palo Verde Mesa Ethnographic Landscape) and concludes that they are potentially eligible for listing in the CRHR, under, variously, Criteria 1, 3, and 4, and are therefore historical resources under CEQA. Staff finds that the presence and visual impact of the Rio Mesa SEGF proposed project on these three ethnographic landscapes would significantly impact the setting, feeling, and association aspects of the resources' integrity, aspects critical to the resources' ability to convey their associative, artistic, and information values, potentially compromising their CRHR eligibility.

Staff proposes the adoption and implementation of compensatory mitigation in Conditions of Certification **CUL-1** and **CUL-7** for the Rio Mesa SEGF project's impacts on the Palo Verde Mesa Ethnographic Landscape and is discussing the **CUL-7** option with the Native American Tribes who would be most affected by impacts to these landscapes. However, the full implementation of **CUL-1** and **CUL-7** (when finalized) would only mitigate the impacts to the Palo Verde Mesa Ethnographic Landscape to a less-than-significant level. The project would still have significant and unmitigable impacts on the Salt Song and Keruk Trail/Xam Kwatcan/Earth Figures Landscapes and on Native American spiritual practices dependent on these resources.

Condition of Certification **CUL-7**, would require the Rio Mesa SEGF project owner to monetarily compensate each of the Tribes for their losses of subsistence knowledge, as that knowledge is informed by the landscape, and the long-term opportunity that would otherwise be available within the lands currently proposed for permanent Rio Mesa SEGF project-related land use. Each Tribe is affiliated with an existing interpretive center, preserve, or museum as follows.

- Chemehuevi Indian Tribe Cultural Center, Havasu Lake, CA

- A hak hav Tribal Preserve (Colorado River Indian Tribes), Parker, AZ
- Colorado River Indian Tribes Museum, Parker, AZ
- Aha Makav Cultural Society (Fort Mojave Indian Tribe), Mohave Valley, AZ
- Fort Yuma-Quechan Tribal Museum, Yuma, AZ

Staff proposes that each center receive an endowment for the purpose of incorporating traditional subsistence educational, demonstration, and utilization programs that would contribute to the continuance of Chemehuevi and Yuman-affiliated understanding and practice of subsistence patterns that combine agriculture and hunting and gathering activities.

Specific loss of trail segments in the project area (still subject to on-going research) would remove the information potential that these segments retain and convey. If the project is approved, minimal trail study will have been completed on these segments. This loss of information potential can be reduced to less than significant by implementation of **CUL-1**.

**CUL-1** and **CUL-7** would reduce the impacts of the Rio Mesa SEGF project on the Palo Verde Mesa Ethnographic Landscape to less-than-significant.

## BUILT-ENVIRONMENT RESOURCES

Staff identified seven historic-period built-environment resources in the Rio Mesa SEGF built-environment PAA, of which three have been either previously listed or found to be eligible by staff or by previous researchers for the CRHR and/or the NRHP: Pilot Knob-to-Blythe 161-kV Transmission Line, Niland-to-Blythe 161-kV Transmission Line, and the Bradshaw Trail. Staff has concluded that one additional resource, the Palo Verde Irrigation District, is potentially eligible for the CRHR. Elements of the Palo Verde Irrigation District are in the built-environment PAA, and analysis is ongoing as to eligibility and potential impacts.

Staff has concluded that the impacts to the Pilot Knob-to-Blythe 161-kV Transmission Line and the Niland-to-Blythe 161-kV Transmission Line are less than significant, and no mitigation measures are proposed. The full impact of the proposed Rio Mesa SEGF project on the Bradshaw Trail is unknown due to an incomplete project description for the access road, which would require modifications or improvements to portions of the Bradshaw Trail. Staff has submitted to the applicant a set of Data Requests (CEC 2012az: #s 186–187) seeking specific information about proposed project access road improvements. When received, this information will assist staff in determining the potential for impacts on the PVID and the Bradshaw Trail.

Assuming these details are provided in a timely manner, staff will include this analysis in the FSA. Staff may propose a mitigation measure for the FSA, **CUL-10**, that would apply if the PVID is determined to be a historical resource under CEQA and project impacts are determined to be significant.

## CUMULATIVE IMPACTS

Staff finds that construction and operation of the Rio Mesa SEGF project, in conjunction with past, present, and reasonably foreseeable projects in the archaeological, ethnographic, and built-environment PAAs, would result in significant and unmitigable cumulative impacts to one combined archaeological district/ethnographic landscape, two archaeological districts, 108 individual prehistoric archaeological resources, and three ethnographic landscapes. Staff has proposed compensatory mitigation (**CUL-1, CUL-2**, and **CUL-7**) for these cumulative impacts. Although full implementation of these proposed conditions of certification would reduce the project-related impacts to some extent, they would not reduce the cumulative project contribution to less than significant.

## PROJECT CONFORMITY WITH LORS

When additional requested data are received and analyses are complete, staff would find that full implementation of all cultural resources conditions of certification would ensure compliance with all applicable LORS, plans, and policies identified in **Cultural Resources Table 2**.

## ADDITIONAL INFORMATION STAFF REQUIRES FROM THE APPLICANT AND OTHER SOURCES IN ORDER TO COMPLETE THE FINAL STAFF ASSESSMENT

Staff is awaiting additional data from the applicant that will allow it to evaluate the CRHR eligibility of potential historical resources and/or to assess the significance of the Rio Mesa SEGF project's impacts on any previously known or newly determined historical resources. Once the applicant makes the requested data available and staff completes its own studies and analyses, staff will provide the results and recommend any further mitigation in the FSA. The following additional data are needed:

- Results from Phase II subsurface geoarchaeological field investigations, per the plan that staff and the applicant are negotiating at this time. Staff needs information on the age and the depositional origin of the landforms in the prehistoric archaeological PAA to establish on which landforms known surface archaeological deposits would require archaeological excavation to support determinations of CRHR eligibility. The same information is also critical to establishing whether monitoring related to construction or facility operational activity would be warranted on particular landforms. When staff receives this information, evaluation of prehistoric sites, assessment of project impacts, and recommendations for impact mitigation can be completed and will be provided in the FSA.
- Results of Phase II archaeological excavations and laboratory data analyses, per the plan that staff and the applicant are presently negotiating, regarding 104 prehistoric resources within the prehistoric archaeological PAA. Until the applicant provides the site-specific data needed regarding these prehistoric resources, staff cannot evaluate them for CRHR eligibility, assess the impacts of the proposed Rio Mesa SEGF project on them, or propose possible mitigation for impacts. When staff receives this information, evaluation of these prehistoric sites and assessment of project impacts can be completed and will be provided in the FSA.

- Outcome of Native American consultation on project impacts to the Palo Verde Mesa Ethnographic Landscape and potential mitigation. The prehistoric archaeological resources that staff is as yet unable to evaluate for CRHR eligibility, due to the absence of needed data, are archaeological in nature, and 41 of them have been identified by staff as contributors to the archaeological and ethnographic PTNCL (District), assumed CRHR eligible under Criterion 4. But these 41 resources may also have potential associative values for Native Americans that could qualify them as CRHR eligible under Criterion 1. So they may also be contributors to the Palo Verde Mesa Ethnographic Landscape, which staff has concluded is CRHR eligible under Criterion 1. The Rio Mesa SEGF project's impacts on those aspects of their integrity by which these resources qualify for the CRHR under Criterion 1 can only be identified by members of the Native American community who value the resources culturally and/or spiritually. Staff is currently in the process of consulting with local Native American groups and others regarding impacts and potential mitigation, including the adoption and implementation of compensatory mitigation in Conditions of Certification **CUL-1** and **CUL-7** for the Rio Mesa SEGF project's impacts on the Palo Verde Mesa Ethnographic Landscape. Staff is discussing the **CUL-7** option with the Native American Tribes who would be most affected by impacts to this landscape.
- Outcome of ongoing staff study of trails in the Palo Verde Mesa Ethnographic Landscape.
- Outcome of ongoing staff oral history interviews.
- A final and complete project description of the proposed Rio Mesa SEGF access road, from which staff can determine the full impact of this road on the Bradshaw Trail. When the additional information is received, staff will assess the project's impacts on the CRHR-eligible resource and recommend any necessary mitigation measures in the FSA.
- A final and complete project description of proposed Rio Mesa SEGF road improvements and/or canal and drain overcrossing improvements. These could impact the Bradshaw Trail and the five individual PVID resources, listed in **Cultural Resources Table 20** and identified by staff as contributors to a potentially CRHR-eligible historic district. Staff has submitted to the applicant a set of Data Requests (CEC 2012az:#s 186–187) seeking specific information about proposed project access road improvements. When the additional information is received, in the FSA staff will assess the project's impacts on the PVID resources, revise **CUL-10** accordingly, and recommend any needed mitigation for impacts to the Bradshaw Trail.

## PROPOSED CONDITIONS OF CERTIFICATION

### CUL-1 Prehistoric Trails Network Cultural Landscape (PTNCL) Documentation and Possible NRHP Nomination Program

The project owner shall contribute to a special fund set up by the Energy Commission to finance the completion of the PTNCL Documentation and Possible NRHP Nomination Program (PTNCL Program) presented in the Rio Mesa Solar Electric Generating Facility Final Staff Assessment.

The amount of the contribution shall be $35 per acre that the project encloses or otherwise disturbs. The project owner may elect to make the contribution in one, two, or three installments, at intervals no greater than six months between installments.

An additional contribution not to exceed 20 percent of the total required contribution may be further required to ensure the completion of the PTNCL Program.

If the project is not certified, or if the project owner does not build the project, or, if for some other reason deemed acceptable by the Compliance Project Manager (CPM), a project owner does not participate in funding the PTNCL Program, the other contributing project owner(s) may consult with the CPM to adjust the scale of the PTNCL Program research activities to match available funding. A project owner that funds the PTNCL Program, and then withdraws, will be able to request the refunding of its monetary contribution, on a prorated basis, depending on how much of its contribution remains unexpended on the PTNCL Program at the time of the owner's withdrawal of the project.

**Verification:**

1. No later than 60 days prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the site and for access roads and linear facilities, the project owner shall transfer the funds specified in an Energy Commission invoice for an installment of the required contribution to the Energy Commission's special PTNCL Program account.

2. No later than 10 days after receiving notice of the successful transfer of funds to the Energy Commission's special PTNCL Program account, the project owner shall submit a copy of the notice to the CPM.

**CUL-2 Desert Training Center California-Arizona Maneuver Area Cultural Landscape (DTCCL) Documentation and Possible NRHP Nomination Program**

The project owner shall contribute to a special fund set up by the Energy Commission to finance the completion of the DTCCL Documentation and Possible NRHP Nomination Program (DTCCL Program) presented in the Rio Mesa Solar Electric Generating Facility Final Staff Assessment.

The amount of the contribution shall be $25 per acre that the project encloses or otherwise disturbs. The project owner may elect to make the contribution in one, two, or three installments, at intervals no greater than six months between installments.

An additional contribution not to exceed 20 percent of the total required contribution may be further required to ensure the completion of the DTCCL Program.

If a project is not certified, or if a project owner does not build the project, or if, for some other reason deemed acceptable by the CPM, a project owner does not participate in funding the DTCCL Program, the other contributing project owner(s) may consult with the CPM to adjust the scale of the DTCCL Program research activities to match available funding. A project owner that funds the DTCCL Program, and then withdraws, will be able to request the refunding of its monetary contribution, on a prorated basis, depending on how much of its contribution remains unexpended on the DTCCL Program at the time of the owner's withdrawal of the project.

**Verification:**

1. No later than 60 days prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the site and for access roads and linear facilities, the project owner shall transfer the funds specified in an Energy Commission invoice for an installment of the required contribution to the Energy Commission's special DTCCL Program account.

2. No later than 10 days after receiving notice of the successful transfer of funds to the Energy Commission's special DTCCL Program account, the project owner shall submit a copy of the notice to the CPM.

**CUL-3 Cultural Resources Personnel**

Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the site and for access roads and linear facilities, the project owner shall obtain the services of a Cultural Resources Specialist (CRS) and one or more Alternate CRS(s). The project owner shall submit the resumes and qualifications for the CRS, CRS alternates, and all technical specialists to the CPM for review and approval.

The project owner shall ensure that the CRS manages all cultural resources monitoring, mitigation, curation, and reporting activities, and any pre-construction cultural resources activities (e.g., geoarchaeology or data recovery), unless management of these is otherwise provided for in accordance with the cultural resources conditions of certification (Conditions). The CRS may elect to obtain the services of Cultural Resources Monitors (CRMs) and other technical specialists, if needed, to assist in monitoring, mitigation, and curation activities. The project owner shall obtain the services of Native American Monitors (NAMs), as required by **CUL-12**. The project owner shall ensure that the CRS makes recommendations regarding the eligibility for listing in the California Register of Historical Resources (CRHR) of any cultural resources that are newly discovered or that may be affected in an unanticipated manner.

No construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the site, access roads, and linear facilities, shall occur prior to CPM approval of the CRS and alternates, unless such activities are specifically approved by the CPM.

Approval of a CRS may be denied or revoked for reasons including but not limited to non-compliance on this or other Energy Commission projects and for concurrent service as CRS on an unmanageable number of Energy Commission projects, as determined by the CPM. After all ground disturbance is completed and the CRS has fulfilled all responsibilities specified in these cultural resources conditions, the project owner may discharge the CRS, if the CPM approves.

If, during operation of the proposed power plant, circumstances develop that would require ground disturbance in soils or sediments previously undisturbed during project construction, no surface grading or subsurface soil work shall occur prior to submission of a Petition to Modify and CPM review and approval of a project-specific protocol for addressing unanticipated discoveries, consistent with the approved Cultural Resources Mitigation and Monitoring Plan (CRMMP).

**CULTURAL RESOURCES SPECIALIST**

The resumes for the CRS and alternate(s) shall include information demonstrating to the satisfaction of the CPM that their training and backgrounds conform to the U.S. Secretary of the Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 C.F.R., part 61). In addition, the CRS and alternate(s) shall have the following qualifications:

- Listing in the Register of Professional Archaeologists;
- Qualifications appropriate to the needs of the project, including a background in anthropology, archaeology, history, architectural history, or a related field;
- At least three years of archaeological or historical, as appropriate (per nature of predominant cultural resources on the project site), resources mitigation and field experience in California; and
- At least one year of experience in a decision-making capacity on cultural resources projects in California and the appropriate training and experience to knowledgably make recommendations regarding the significance of cultural resources.

The resumes of the CRS and alternate CRS shall include the names and telephone numbers of contacts familiar with the work of the CRS/alternate CRS on referenced projects and demonstrate to the satisfaction of the CPM that the CRS/alternate CRS has the appropriate training and experience to implement effectively the Conditions.

### CULTURAL RESOURCES MONITORS

CRMs shall have the following qualifications:

- B.S. or B.A. degree in anthropology, archaeology, historical archaeology, or a related field, and one year experience monitoring in California; or
- A.S. or A.A. degree in anthropology, archaeology, historical archaeology, or a related field, and four years experience monitoring in California; or
- Enrollment in upper division classes pursuing a degree in the fields of anthropology, archaeology, historical archaeology, or a related field, and two years of monitoring experience in California.

### REQUIRED CULTURAL RESOURCES TECHNICAL SPECIALISTS

The project owner shall ensure that the CRS obtains the services of a qualified prehistoric archaeologist to conduct the research specified in **CUL-6**. The Project Prehistoric Archaeologist's (PPA) training and background must meet the U.S. Secretary of the Interior's Professional Qualifications Standards for prehistoric archaeology, as published in Title 36, Code of Federal Regulations, part 61, and the resume of the PPA must demonstrate familiarity with the similar artifacts and environmental modifications (deliberate and incidental) to those associated with the prehistoric and protohistoric use of the Palo Verde Mesa. The PPA must meet OSHA standards as a "Competent Person" in trench safety.

The project owner shall ensure that the CRS obtains the services of a qualified historical archaeologist to conduct the research specified in **CUL-8**. The Project Historical Archaeologist's (PHA) training and background must meet the U.S. Secretary of Interior's Professional Qualifications Standards for historical archaeology, as published in Title 36, Code of Federal Regulations, part 61. The resume of the PHA must demonstrate familiarity with the artifacts, environmental modifications (deliberate and incidental, including tank tracks), and trash disposal patterns associated with World War II land-based army activities, and knowledge of the full range of late nineteenth and early-to-mid-twentieth-century domestic can, bottle, and ceramic diagnostic traits.

The resumes of the CRS, alternate CRS, the PPA, and the PHA, and any other proposed technical specialists, shall be submitted to the CPM for approval and shall include the names and telephone numbers of contacts familiar with the work of these persons on projects referenced in the resumes and demonstrate to the satisfaction of the CPM that these persons have the appropriate training and experience to undertake the required research.

**Verification:**

1. At least 45 days prior to the start of ground disturbance, the project owner shall submit the resumes for the CRS and alternate(s) to the CPM for review and approval.

2. At least 10 days prior to a termination or release of the CRS, or within 10 days after the resignation of a CRS, the project owner shall submit the resume of the proposed new CRS, if different from the alternate CRS, to the CPM for review and approval. At the same time, the project owner shall also provide to the proposed new CRS the AFC and all cultural resources documents, field notes, photographs, and other cultural resources materials generated by the project. If no alternate CRS is available to assume the duties of the CRS, the project owner shall designate a CRM to serve in place of a CRS for a maximum of 3 days. If cultural resources are discovered, ground disturbance shall remain halted until there is a CRS or alternate CRS to make a recommendation regarding significance.

3. At least 20 days prior to ground disturbance, the CRS shall provide a letter naming CRMs and attesting that the identified CRMs meet the minimum qualifications for cultural resources monitoring required by this condition.

4. At least 5 days prior to additional CRMs beginning on-site duties during the project, the CRS shall provide letters to the CPM identifying the new CRMs and attesting to their qualifications.

5. At least 10 days prior to any technical specialists, other than CRMs, beginning tasks, the resume(s) of the specialists shall be provided to the CPM for review and approval. At least 10 days prior to the start of ground disturbance, the project owner shall confirm in writing to the CPM that the approved CRS will be available for onsite work and is prepared to implement the cultural resources conditions.

**CUL-4 Project Documents for Cultural Resources Personnel**

Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the project site, access roads, and linear facilities, if the CRS has not previously worked on the project, the project owner shall provide the CRS with copies of the AFC, data responses, confidential cultural resources reports, all supplements, the Energy Commission cultural resources Final Staff Assessment, and the cultural resources conditions of certification from the Final Decision, for the project. The project owner shall also provide the CRS and the CPM with maps and drawings showing the footprints of the power plant, all linear facility routes, all access roads, and all laydown areas. Maps shall include the appropriate USGS quadrangles and a map at an appropriate scale (e.g., 1:24,000 or 1” = 200’) for plotting cultural features or materials. If the CRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the CRS and CPM. The CPM shall review map submittals and, in consultation with the CRS, approve those that are appropriate for use in cultural resources planning activities. No ground disturbance shall occur prior to CPM approval of maps and drawings, unless such activities are specifically approved by the CPM.

If construction of the project would proceed in phases, maps and drawings not previously provided shall be provided to the CRS and CPM prior to the start of each phase. Written notice identifying the proposed schedule of each project phase shall be provided to the CRS and CPM.

Weekly, until ground disturbance is completed, the project construction manager shall provide to the CRS and CPM a schedule of project activities for the following week, including the identification of area(s) where ground disturbance will occur during that week.

The project owner shall notify the CRS and CPM of any changes to the scheduling of the construction phases.

**Verification:**

1. At least 40 days prior to the start of ground disturbance, the project owner shall provide the AFC, data responses, confidential cultural resources documents, all supplements, cultural resources conditions of certification, and the FSA to the CRS, if needed, and the subject maps and drawings to the CRS and CPM. The CPM will review submittals in consultation with the CRS and approve maps and drawings suitable for cultural resources planning activities.

2. At least 15 days prior to the start of ground disturbance, if there are changes to any project-related footprint, the project owner shall provide revised maps and drawings for the changes to the CRS and CPM.

3. At least 15 days prior to the start of each phase of a phased project, the project owner shall submit the appropriate maps and drawings, if not previously provided, to the CRS and CPM.

4. Monthly, during ground disturbance, the project owner shall email a progress report to the CPM, interested Native Americans and other interested parties.

5. Within 5 days of changing the scheduling of phases of a phased project, the project owner shall provide written notice of the changes to the CRS and CPM.

**CUL-5 Cultural Resources Monitoring and Mitigation Plan (CRMMP)**

Prior to the start of ground disturbance, the project owner shall submit the Cultural Resources Monitoring and Mitigation Plan (CRMMP), as prepared by, or under the direction of, the CRS, to the CPM for review and approval. The CRMMP shall follow the content and organization of the draft model CRMMP, provided by the CPM, and the authors' name(s) shall appear on the title page of the CRMMP. The CRMMP shall identify measures to minimize potential impacts to sensitive cultural resources. Implementation of the CRMMP shall be the responsibility of the CRS and the project owner. Copies of the CRMMP shall reside with the CRS, alternate CRS, each CRM, and the project owner's on-site construction manager. No ground disturbance shall occur prior to CPM approval of the CRMMP, unless such activities are specifically approved by the CPM.

The CRMMP shall include, but not be limited to, the following elements and measures:

1. The following statement included in the Introduction: “Any discussion, summary, or paraphrasing of the conditions of certification in this CRMMP is intended as general guidance and as an aid to the user in understanding the conditions and their implementation. The conditions, as written in the Commission Decision, shall supersede any summarization, description, or interpretation of the conditions in the CRMMP. The Cultural Resources conditions of certification from the Commission Decision are contained in Appendix A.”

2. A proposed general research design that includes a discussion of archaeological research questions and testable hypotheses specifically applicable to the project vicinity, and a discussion of artifact collection, retention/disposal, and curation policies as related to the research questions formulated in the research design. The research design will specify that the preferred treatment strategy for any buried archaeological deposits is avoidance. A specific mitigation plan shall be prepared for any unavoidable impacts to any CRHR-eligible (as determined by the CPM) resources. A prescriptive treatment plan may be included in the CRMMP for limited data types.

3. Specification of the implementation sequence and the estimated time frames needed to accomplish all project-related tasks during the ground disturbance and post-ground–disturbance analysis phases of the project.

4. Identification of the person(s) expected to perform each of the tasks, their responsibilities, and the reporting relationships between project construction management and the mitigation and monitoring team.

5. A description of the manner in which Native American observers or monitors, as required by Condition of Certification **CUL-12**, will be included, the procedures to be used to select them, and their role and responsibilities.

6. A description of all impact-avoidance measures (such as flagging or fencing) to prohibit or otherwise restrict access to sensitive resource areas that are to be avoided during ground disturbance, construction, and/or operation, and identification of areas where these measures are to be implemented. The description shall address how these measures would be implemented prior to the start of ground disturbance and how long they would be needed to protect the resources from project-related effects.

7. A statement that all encountered cultural resources 50 years old or older shall be recorded on the appropriate Department of Parks and Recreation

(DPR) 523 form(s) and mapped and photographed. In addition, all archaeological materials retained as a result of the archaeological investigations (e.g., survey, testing, data recovery) shall be curated in accordance with the California State Historical Resources Commission's Guidelines for the Curation of Archaeological Collections, into a retrievable storage collection in a public repository or museum.

8. A statement that the project owner will pay all curation fees for artifacts recovered and for related documentation produced during cultural resources investigations conducted for the project. The project owner shall identify three possible curation facilities that could accept cultural resources materials resulting from project activities.

9. A statement demonstrating when and how the project owner will comply with Health and Human Safety Code 7050.5(b) and Public Resources Code 5097.98(b) and (e), including the statement that the project owner will notify the CPM and the Native American Heritage Commission (NAHC) of the discovery of human remains.

10. A statement that the CRS has access to equipment and supplies necessary for site mapping, photography, and recovery of any cultural resource materials that are encountered during ground disturbance and cannot be treated prescriptively.

11. A description of the contents, format, and review and approval process of the final Cultural Resource Report (CRR), which shall be prepared according to ARMR guidelines.

**Verification:**

1. After approval of the CRS proposed by the project owner, the CPM will provide to the project owner an electronic copy of the draft model CRMMP for the CRS.

2. At least 30 days prior to the start of data recovery required in **CUL-6** and **CUL-8**, the project owner shall submit the CRMMP to the CPM for review and approval.

3. At least 30 days prior to the start of ground disturbance, in a letter to the CPM, the project owner shall agree to pay curation fees for any materials generated or collected as a result of the archaeological investigations (survey, testing, data recovery).

4. Within 90 days after completion of ground disturbance (including landscaping), if cultural materials requiring curation were generated or collected, the project owner shall provide to the CPM a copy of an agreement with, or other written commitment from, a curation facility that meets the standards stated in the California State Historical Resources Commission's Guidelines for the Curation of Archaeological Collections, to accept the cultural materials from this project. Any agreements concerning curation will be retained and available for audit for the life of the project.

**CUL-6 Data Recovery for Prehistoric Sites and Features**

Under development.

**Verification:**

**CUL-7 Mitigation for Impacts to Ethnographic Resources**

Under development.

**Verification:**

**CUL-8 Data Recovery for DTC Maneuver Sites**

Prior to the start of ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the project site, access roads, and linear facilities, the project owner shall hire a PHA with the qualifications described in **CUL-2** to supervise the data recovery at those DTC Maneuver Sites that the project will impact. The project owner shall ensure that the CRS and the PHA submit for CPM review and approval a data recovery plan for the impacted DTC Maneuver Sites. The plan must include, but is not limited to, the following:

1. Prior to beginning data recovery, the PHA and all field crew members shall be trained by the DTCCL Historical Archaeologist, or equivalent qualified person approved by the CPM and hired by the project owner should the DTCCL Historical Archaeologist not be available, in the identification, analysis and interpretation of the artifacts, environmental modifications, and trash disposal patterns associated with the early phases of WWII land-based U.S. army activities, as researched and detailed by the DTCCL PI-Historian and the DTCCL Historical Archaeologist.

2. Prior to beginning the data recovery, the field crew members shall also be trained in the consistent and accurate identification of the full range of late nineteenth and early-to-mid-twentieth-century can, bottle, and ceramic diagnostic traits.

3. Prior to the start of ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the project site, access roads, and linear facilities, a geophysical survey is completed that meets these requirements:

   a. Use hand-held magnetometer equipment (e.g., the Schonstedt GA-52C magnetic locator) that will detect buried metallic items or a dipole soil conductivity meter (e.g., the Geonics EM-031) that will detect changes in the soil that may indicate the presence of buried cultural materials and features.

b. Identify significant buried deposits. Small or isolated finds (such as isolated nails or small and amorphous metal pieces) will not be recorded; only buried deposits representing multiple artifacts will be tested and possibly excavated.

c. Analysis of the results of the geophysical survey and determination of which subsurface deposits are new features that will be tested, possibly excavated, and recorded as follows:

   i. Four or more shovel test probes (STPs) will be used to ground-truth each geophysical anomaly;

   ii. Possible expansion to larger unit exposure will be done if buried deposits are present and a feature's vertical extent needs to be determined;

   iii. Complete feature excavation by the PHA will be done of all buried deposits found by the geophysical survey, with attention to possible stratigraphy;

   iv. Detailed in-field analysis of all artifacts found in buried deposits identified by the geophysical survey will be done, documenting the measurements and the types of seams and closures for each bottle, and the measurements, seams, closure, and opening method for all cans. Photographs will be taken of maker's marks on bottles, any text or designs on bottles and cans, and of decorative patterns and maker's marks on ceramics. Artifacts, unless unique, will not be collected.

   v. All buried deposits will be mapped, measured, photographed, and fully described in writing. All contents of buried deposits will be mapped, measured, photographed, and fully described in writing.

   vi. DPR site forms will be updated with information from the new features

4. The project owner shall ensure that the original site map shall be updated to include at minimum: landform features such as small drainages, any man-made features, the limits of any artifact concentrations and features (previously known and newly found in the geophysical survey), using location recordation equipment that has the latest technology with sub-meter accuracy (and to the standard of UTM 11 North or California Teale Albers, or equivalent).

5. The project owner shall ensure that the details of what is found at each site is presented in a letter report from the CRS or PHA, to which are

attached the DPR form for the site updated with new features, which shall serve as a preliminary report for each site, as follows:

a. Letter reports shall address just one site;

b. The letter report shall include, but is not limited to, a description of the schedule and methods used in the field effort, a preliminary tally of the numbers and types of features and deposits that were found, and a map showing the location of excavation units, including topographic contours and the site landforms.

c. The letter report shall make a recommendation on whether each site is a contributor to the DTTCL.

6. The project owner shall ensure that the data collected from the field work shall be provided to the DTCCL PI-Historian to assist in the determination of which, if any, of the historic-period sites are contributing elements to the DTCCL.

7. The project owner shall ensure that the PHA analyzes all recovered data and writes or supervises the writing of a comprehensive final report of the data collection on impacted DTC Maneuver Sites. This report shall be included in the CRR (CUL-15). Relevant portions of the information gathered shall be included in the possible NRHP nomination for the DTCCL.

**Verification:**

1. At least 120 days prior to ground disturbance, the project owner shall submit for CPM review and approval a data recovery plan for impacted DTC Maneuver Sites.

2. At least 105 days prior to ground disturbance, the project owner shall notify the CPM that required crew training (in the identification, analysis and interpretation of the DTC artifacts, environmental modifications, and trash disposal patterns and in the consistent and accurate identification of the full range of late nineteenth and early-to-mid-twentieth-century can, bottle, and ceramic diagnostic traits) has taken place.

3. At least 90 days prior to ground disturbance, the project owner shall notify the CPM on what date the geophysical survey and data recovery on impacted DTC Maneuver Sites will begin.

4. Within one week of completing data recovery at a site, the project owner shall submit to the CPM for review and approval a letter report written by the CRS and/or the PHA, evidencing that the data recovery at each impacted DTC Maneuver Sites site has been completed. When the CPM approves the letter report, ground disturbance may begin at the site location(s) that are the subject of the letter report.

### CUL-9 Preparation of a Documentary Focused on the Infantry in the DTC

The project owner shall produce a high-definition, broadcast quality documentary on the training of the infantry and integrated infantry (including motorized infantry), army engineers, and armor in the Desert Training Center.

Costs for the documentary (including pre- and post-production costs) shall be required not to exceed the industry average of $4,500.00 per minute. The final edited documentary shall be at least 26 minutes in length, excluding titles and credits. An approximately 10-minute abbreviated version of the documentary shall also be produced using primary material from the 26-minute documentary. Copies of the resulting documentary film shall be presented to the Patton Museum, as well as the Infantry School at Fort Benning, Georgia.

Prior to the start of filming, the project owner shall provide the qualifications of the proposed production company to the Executive Director of the General Patton Memorial Museum for review and comment, and to the CPM for review and approval. The production company shall have experience in the creation of historic documentary style videos, and shall provide evidence of the successful completion of at least three videos of similar quality from project development to release. A copy of any scope of work related to the production of the documentary shall be submitted to the CPM within 10 days of execution.

Prior to the start of filming, the project owner shall also submit the resume of a proposed production advisor to the CPM for review and approval. The production advisor shall be a qualified historian, with training and experience consistent with the requirements of the U.S. Secretary of Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61. In addition, the advisor must have experience researching and documenting historic military resources, preferably within the DTCCL. The production advisor shall provide direction during production and post-production to ensure historical accuracy and provide assistance obtaining historic WWII documentation (e.g., military film and training footage, news clips, still photos, audio, and written transcripts of interviews) and the most recent information on Camp Hyder and the 77th Infantry Division in particular, and the DTC/C-AMA in general.

Historic film, still photos, re-creations, interview footage and audio tracks, and compatible, high-quality video footage of the subject areas taken prior to current filming may also be integrated into the final product. The original acquisition format shall be high definition, 16X9, 1080p digital format, using broadcast-level cameras and lenses.

Prior to the start of site mobilization, the production company shall make a filmed interview of Colonel (Ret.) Theodore ("Ted") Bell, a former company commander with the 307th Infantry Regiment of the 77th Infantry Division who was stationed at Camp Hyder in 1943 and participated in the maneuvers in June of that year.

Prior to the start of production editing, the owner shall submit a first draft script, storyboard, and description of other related project elements, including proposed finished length of the documentary (a minimum of 26 minutes of edited footage for the full-length version and 10 minutes for the abbreviated (excerpt) version), to the DTCCL PI Historian, production advisor, and Executive Director of the General Patton Memorial Museum for review and comment, and to the CPM for review and approval.

Prior to the start of Rio Mesa SEGF operations, the project owner shall submit the final cut, with voice-over and background music track, along with packaging proofs, including sample cover, disk label, and packaging materials, to the DTCCL PI- Historian, production advisor, and Executive Director of the General Patton Memorial Museum for review and comment, and to the CPM for review and approval.

Concurrent with the start of Rio Mesa SEGF operations, the project owner shall provide the final approved full-length documentary to the General Patton Memorial Museum in a high definition format, suitable for mass market duplication, along with 500 DVD copies and 100 BluRay copies of the full-length packaged documentary, suitable for resale. Ten DVD copies and five BluRay copies of the packaged documentary shall also be provided to the BLM Palm Springs-South Coast Field Office and the CPM. The 10-minute excerpt shall be provided to all parties in a digital format compatible with the display requirements of the Museum and the webcasting requirements of the Energy Commission.

In conjunction with delivery of the final approved documentary in the designated format, the project owner shall provide a letter to the General Patton Memorial Museum confirming that the Museum is assigned and shall exclusively retain all DVD, BluRay, and video reproduction and sales rights, and broadcast television distribution rights of the production, both foreign and domestic, excepting use of excerpts from the documentary [including the 10-minute abbreviated documentary in any Bureau of Land Management or Energy Commission website related to DTC/C-AMA, southern California Desert history, or renewable energy projects within former DTC/C-AMA areas. The letter shall also confirm that the production company may retain copies of the production specifically for promotional and demonstration purposes only. Copies of the letter shall be sent to the CPM and the production company representative.

The project owner shall ensure that all raw footage acquired during the production of the documentary is submitted to the DTCCL PI-Historian for use in the DTCCL study. Use of the footage for research purposes shall not be restricted. Ten DVD copies and five BluRay copies of the packaged documentary shall also be provided to the DTCCL PI Historian.

**Verification:**

1. Within 10 days of execution, the project owner shall submit to the CPM a copy of the scope of work associated with any contract related to the production of the documentary.

2. At least 15 days prior to the start of filming, the project owner shall provide the qualifications of the proposed production company to the Executive Director of the

General Patton Memorial Museum for review and comment, and to the CPM for review and approval.

3. At least 15 days prior to the start of filming, the project owner shall submit the resume of a proposed production advisor to the CPM for review and approval.

4. At least 90 days prior to the start of site mobilization, the production company shall shoot the initial footage of the interview with Colonel Bell and obtain footage of films made during army training of infantry and armor forces in the DTC, with particular emphasis on Camp Hyder and other infantry camps within the DTC/C-AMA.

5. At least 30 days prior to the start of production editing, the project owner shall submit a first draft script, storyboard, and description of other related project elements, including proposed finished length of the documentary (a minimum of 26 minutes of edited footage), to the DTCCL PI-Historian, production advisor, and Executive Director of the General Patton Memorial Museum for review and comment, and to the CPM for review and approval.

6. At least 90 days prior to the start of Rio Mesa SEGF operations, the project owner shall submit the final cut, with voice-over and background music track, along with packaging proofs, including sample cover, disk label, and packaging materials, to the DTCCL PI-Historian, production advisor, and Executive Director of the General Patton Memorial Museum for review and comment, and to the CPM for review and approval.

7. Concurrent with the start of Rio Mesa SEGF operations, the project owner shall provide the final approved documentary to the General Patton Memorial Museum in a high definition format, suitable for mass market duplication, along with 500 DVD copies and 100 BluRay copies of the full length packaged documentary, suitable for resale. Ten DVD copies and five BluRay copies of the packaged documentary shall also be provided to the BLM Palm Springs-South Coast Field Office and the CPM.

8. In conjunction with delivery of the final approved documentary in the designated format, the project owner shall provide a letter to the Executive Director of the General Patton Memorial Museum confirming that the Museum is assigned and shall exclusively retain all DVD, BluRay, and video reproduction and sales rights, and broadcast television distribution rights of the production, both foreign and domestic, excepting use of excerpts from the documentary (including the 10- minute abbreviated documentary on any Bureau of Land Management or Energy Commission website related to DTC/C-AMA, military history, or energy projects in the southern California desert. The letter shall also confirm that the production company may retain copies of the production specifically for promotional and demonstration purposes only. Copies of the letter shall be sent to the CPM and the production company representative.

9. Within 180 days from the start of construction, the project owner shall ensure that all raw footage acquired during the production of the documentary is submitted to the DTCCL PI-Historian for use in the DTCCL study. Use of the footage for research

purposes shall not be restricted. Ten DVD copies and five BluRay copies of the packaged documentary shall also be provided to the DTCCL PI-Historian.

**CUL-10 Project Road Improvements Related to Project**

To be determined**.**

**Verification:**

**CUL-11 Worker Environmental Awareness Program (WEAP) Training**

Prior to, and for the duration of, ground disturbance, the project owner shall provide Worker Environmental Awareness Program (WEAP) training to all new workers within their first week of employment at the project site, along the linear facilities routes, and at laydown areas, roads, and other ancillary areas. The cultural resources part of this training shall be prepared by the CRS, may be conducted by any member of the archaeological team, and may be presented in the form of a video. During the training and during construction, the CRS shall be available (by telephone or in person) to answer questions posed by employees. The training may be discontinued when ground disturbance is completed or suspended, but must be resumed when ground disturbance, as described in detail in **CUL-1**, resumes.

The training shall include:

1. A discussion of applicable laws and penalties under law;
2. Samples or visuals of artifacts that might be found in the project vicinity;
3. A discussion of what such artifacts may look like when partially buried, or wholly buried and then freshly exposed;
4. A discussion of what prehistoric and historical archaeological deposits look like at the surface and when exposed during construction, and the range of variation in the appearance of such deposits;
5. Instruction that the CRS, alternate CRS, and CRMs have the authority to halt ground disturbance in the area of a discovery to an extent sufficient to ensure that the resource is protected from further impacts, as determined by the CRS;
6. Instruction that employees, if the CRS, alternate CRS, or CRMs are not present, are to halt work on their own in the vicinity of a potential cultural resources discovery, and shall contact their supervisor and the CRS or CRM, and that redirection of work would be determined by the construction supervisor and the CRS;
7. An informational brochure that identifies reporting procedures in the event of a discovery;
8. An acknowledgement form signed by each worker indicating that they have received the training; and

9. A sticker that shall be placed on hard hats indicating that environmental training has been completed. No ground disturbance shall occur prior to implementation of the WEAP program, unless such activities are specifically approved by the CPM.

**Verification:**

1. At least 30 days prior to the beginning of ground disturbance, the CRS shall provide the cultural resources WEAP training program draft text, including Native American participation, graphics, and the informational brochure to the CPM for review and approval.

2. At least 15 days prior to the beginning of ground disturbance, the CPM will provide to the project owner a WEAP Training Acknowledgement form for each WEAP-trained worker to sign.

3. Monthly, until ground disturbance is completed, the project owner shall provide in the Monthly Compliance Report (MCR) the WEAP Training Acknowledgement forms of workers who have completed the training in the prior month and a running total of all persons who have completed training to date.

**CUL-12 Notice of Ground Disturbance, Construction Monitoring Program**

Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; or surface grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils at the project site, access roads, and linear facilities, the project owner shall notify the CPM and all interested Native Americans of the date on which ground disturbance will ensue. The project owner shall ensure that the CRS, alternate CRS, or CRMs monitor, full time, all the above specified ground disturbance at the project site, along the linear facilities routes in California, and at laydown areas, roads, and other ancillary areas, to ensure there are no impacts to undiscovered resources and to ensure that known resources are not impacted in an unanticipated manner.

Full-time archaeological monitoring for this project shall be the archaeological monitoring of ground-disturbing activities in the areas specified in the previous paragraph, for as long as the activities are ongoing. Where excavation equipment is actively removing dirt and hauling the excavated material farther than fifty feet from the location of active excavation, full-time archaeological monitoring shall require at least two monitors per excavation area. In this circumstance, one monitor shall observe the location of active excavation and a second monitor shall inspect the dumped material. For excavation areas where the excavated material is dumped no farther than fifty feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.

A Native American monitor shall be obtained to monitor ground disturbance in areas where Native American artifacts may be discovered. Contact lists of interested Native Americans and guidelines for monitoring shall be obtained from the Native American Heritage Commission. Preference in selecting a monitor shall be given to Native Americans with traditional ties to the area that shall be monitored. If efforts to obtain the services of a qualified Native American monitor are unsuccessful, the project owner shall immediately inform the CPM. The CPM will either identify potential monitors or will allow ground disturbance to proceed without a Native American monitor.

The research design in the CRMMP shall govern the collection, treatment, retention/disposal, and curation of any archaeological materials encountered.

On forms provided by the CPM, CRMs shall keep a daily log of any monitoring and other cultural resources activities and any instances of non-compliance with the conditions and/or applicable LORS. Copies of the daily monitoring logs shall be provided by the CRS to the CPM, if requested by the CPM. From these logs, the CRS shall compile a monthly monitoring summary report to be included in the MCR. If there are no monitoring activities, the summary report shall specify why monitoring has been suspended.

The CRS or alternate CRS shall report daily to the CPM on the status of the project's cultural resources-related activities, unless reducing or ending daily reporting is requested by the CRS and approved by the CPM.

In the event that the CRS believes that the current level of monitoring is not appropriate in certain locations, a letter or e-mail detailing the justification for changing the level of monitoring shall be provided to the CPM for review and approval prior to any change in the level of monitoring.

The CRS, at his or her discretion, or at the request of the CPM, may informally discuss cultural resources monitoring and mitigation activities with Energy Commission technical staff.

Cultural resources monitoring activities are the responsibility of the CRS. Any interference with monitoring activities, removal of a monitor from duties assigned by the CRS, or direction to a monitor to relocate monitoring activities by anyone other than the CRS shall be considered non-compliance with these conditions.

Upon becoming aware of any incidents of non-compliance with the conditions and/or applicable LORS, the CRS and/or the project owner shall notify the CPM by telephone or e-mail within 24 hours. The CRS shall also recommend corrective action to resolve the problem or achieve compliance with the C conditions. When the issue is resolved, the CRS shall write a report describing the issue, the resolution of the issue, and the effectiveness of the resolution measures. This report shall be provided in the next MCR for the review of the CPM.

**Verification:**

1. At least 30 days prior to the start of ground disturbance, the CPM will notify all Native Americans with whom the Energy Commission communicated during the project review of the date on which the project's ground disturbance will begin.

2. At least 30 days prior to the start of ground disturbance, the CPM will provide to the CRS an electronic copy of a form to be used as a daily monitoring log.

3. Monthly, while monitoring is on-going, the project owner shall include in each MCR a copy of the monthly summary report of cultural resources-related monitoring prepared by the CRS and shall attach any new DPR 523A forms completed for finds treated prescriptively, as specified in the CRMMP.

4. At least 24 hours prior to implementing a proposed change in monitoring level, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for changing the monitoring level.

5. Daily, as long as no cultural resources are found, the CRS shall provide a statement that "no cultural resources over 50 years of age were discovered" to the CPM as an e-mail or in some other form of communication acceptable to the CPM.

6. At least 24 hours prior to reducing or ending daily reporting, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for reducing or ending daily reporting.

7. No later than 30 days following the discovery of any Native American cultural materials, the project owner shall submit to the CPM copies of the information transmittal letters sent to the chairpersons of the Native American Tribes or groups who requested the information. Additionally, the project owner shall submit to the CPM copies of letters of transmittal for all subsequent responses to Native American requests for notification, consultation, and reports and records.

**CUL-13 Authority to Halt Ground Disturbance, Treatment of Discoveries**

The project owner shall grant authority to halt ground disturbance to the CRS, alternate CRS, and the CRMs in the event of a cultural resources discovery. Redirection of ground disturbance shall be accomplished under the direction of the construction supervisor in consultation with the CRS.

In the event that a cultural resource over 50 years of age is found (or if younger, determined exceptionally significant by the CPM), or impacts to such a resource can be anticipated, ground disturbance shall be halted or redirected in the immediate vicinity of the discovery sufficient to ensure that the resource is protected from further impacts. If the discovery includes human remains, the project owner shall comply with the requirements of Health and Human Safety Code § 7050.5(b) and shall notify the CPM and the NAHC of the discovery of human remains. No action shall be initiated without direction from the CPM. Monitoring and daily reporting, as provided in other conditions, shall continue during the project's ground-disturbing activities elsewhere. After the discovery of human remains, cultural resources monitoring of ground disturbance shall continue or be initiated, and shall include a Native American monitor pursuant to requirements in these conditions of certification. The halting or redirection of ground disturbance shall remain in effect until the CRS has visited the discovery, and all of the following have occurred:

1. The CRS has notified the project owner, and the CPM has been notified within 24 hours of the discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning, including a description of the discovery (or changes in character or attributes), the action taken (i.e., work stoppage or redirection), a recommendation of CRHR eligibility, and recommendations for data recovery from any cultural resources discoveries, whether or not a determination of CRHR eligibility has been made.

2. If the discovery would be of interest to Native Americans, the CRS has notified all Native American groups that have requested to be notified in the event of such a discovery within 24 hours of the discovery.

3. The CRS has completed field notes, measurements, and photography for a DPR 523 "Primary" form. Unless the find can be treated prescriptively, as specified in the CRMMP, the "Description" entry of the DPR 523 "Primary" form shall include a recommendation on the CRHR eligibility of the discovery. The project owner shall submit completed forms to the CPM.

4. The CRS, the project owner, and the CPM have conferred, and the CPM has concurred with the recommended eligibility of the discovery and approved the CRS's proposed data recovery, if any, including the curation of the artifacts, or other appropriate mitigation; and any necessary data recovery and mitigation have been completed. Ground disturbance may resume only with the approval of the CPM.

**Verification:**

1. At least 30 days prior to the start of ground disturbance, the project owner shall provide the CPM and CRS with a letter confirming that the CRS, alternate CRS, and CRMs have the authority to halt ground disturbance in the vicinity of a cultural resources discovery, and that the project owner shall ensure that the CRS notifies the CPM within 24 hours of a discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning.

2. Unless the discovery can be treated prescriptively, as specified in the CRMMP, completed DPR 523 forms for resources newly discovered during ground disturbance shall be submitted to the CPM for review and approval no later than 24 hours following the notification of the CPM, or 48 hours following the completion of data recordation/recovery, whichever the CRS decides is more appropriate for the subject cultural resource.

3. Within 48 hours of the discovery of a resource of interest to Native Americans, the project owner shall ensure that the CRS notifies all Native American groups that expressed a desire to be notified in the event of such a discovery, and the CRS must inform the CPM when the notifications are complete.

4. No later than 30 days following the discovery of any Native American cultural materials, the project owner shall submit to the CPM copies of the information transmittal letters sent to the chairpersons of the Native American Tribes or groups who requested the information. Additionally, the project owner shall submit to the CPM copies of letters of transmittal for all subsequent responses to Native American requests for notification, consultation, and reports and records.

5. Within 15 days of receiving them, the project owner shall submit to the CPM copies of any comments or information provided by Native Americans in response to the project owner's transmittals of information.

**CUL-14 Use of Soil Borrow and Disposal Sites**

If fill soils must be acquired from a non-commercial borrow site or disposed of to a non-commercial disposal site, unless less-than-five-year-old surveys of these sites for archaeological resources are documented and approved by the CPM, the CRS shall survey the borrow and/or disposal site/s for cultural resources and record on DPR 523 forms any that are identified. When the survey is completed, the CRS shall convey the results and recommendations for further action to the project owner and the CPM, who will determine what, if any, further action is required. If the CPM determines that significant archaeological resources that cannot be avoided are present at the borrow site, other conditions shall apply. The CRS shall report on the methods and results of these surveys in the final CRR.

**Verification:**

1. As soon as the project owner knows that a non-commercial borrow site and/or disposal site will be used, he/she shall notify the CRS and CPM and provide documentation of previous archaeological survey, if any, dating within the past five years, for CPM approval.

2. In the absence of documentation of recent archaeological survey, at least 30 days prior to any soil borrow or disposal activities on the non-commercial borrow and/or disposal sites, the CRS shall survey the site/s for archaeological resources. The CRS shall notify the project owner and the CPM of the results of the cultural resources survey, with recommendations, if any, for further action.

**CUL-15 Final Cultural Resources Report**

The project owner shall submit the final Cultural Resources Report (CRR) to the CPM for approval. The final CRR shall be written by or under the direction of the CRS and shall be provided in the ARMR format. The final CRR shall report on all field activities including dates, times and locations, results, samplings, and analyses. All survey reports, DPR 523 forms, data recovery reports, and any additional research reports not previously submitted to the California Historical Resource Information System (CHRIS) and the State Historic Preservation Officer (SHPO) shall be included as appendices to the final CRR.

If the project owner requests a suspension of ground disturbance and/or construction activities, then a draft CRR that covers all cultural resources activities associated with the project shall be prepared by the CRS and submitted to the CPM for review and approval. The draft CRR shall be retained at the project site in a secure facility until ground disturbance and/or construction resumes or the project is withdrawn. If the project is withdrawn, then a final CRR shall be submitted to the CPM for review and approval at the same time as the withdrawal request.

**Verification:**

1. Within 30 days after requesting a suspension of construction activities, the project owner shall submit a draft CRR to the CPM for review and approval.

2. Within 90 days after completion of ground disturbance (including landscaping), the project owner shall submit the final CRR to the CPM for review and approval. If any reports have previously been sent to the CHRIS, then receipt letters from the CHRIS or other verification of receipt shall be included in an appendix.

3. Within 10 days after CPM approval of the CRR, the project owner shall provide documentation to the CPM confirming that copies of the final CRR have been provided to the SHPO, the CHRIS, the curating institution, if archaeological materials were collected, and to the Tribal chairpersons of any Native American groups requesting copies of project-related reports.

## CULTURAL RESOURCES ACRONYM GLOSSARY

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| AD | After the Birth of Christ |
| AFC | Application for Certification |
| ARMR | Archaeological Resource Management Report |
| BC | Before the Birth of Christ |
| BLM | Bureau of Land Management |
| CA-Riv-# | Archaeological site numbers (Riverside County) assigned by a CHRIS Information Center |
| CEQA | California Environmental Quality Act |
| CHRIS | California Historical Resources Information System |
| Conditions | Conditions of Certification |
| CPM | Compliance Project Manager (Energy Commission) |
| CRHR | California Register of Historical Resources |
| CRM | Cultural Resources Monitor |
| CRMMP | Cultural Resources Monitoring and Mitigation Plan |
| CRR | Cultural Resource Report |
| CRS | Cultural Resources Specialist |
| DTC/C-AMA | World War II Desert Training Center/California-Arizona Maneuver Area |
| DTCCL | Desert Training Center Cultural Landscape/District |
| EIC | Eastern Information System, CHRIS, Department of Anthropology, University of California, Riverside |
| Eligible | A cultural resource need only be determined eligible for listing on the CRHR or the NRHP, using the criteria listed above, in order to be determined culturally significant |
| DPR 523 | Department of Parks and Recreation cultural resource inventory form |
| FSA | Final Staff Assessment |
| GPS | Global Positioning System, a U.S. space-based global navigation satellite system |
| I-10 | Interstate 10 |
| LORS | laws, ordinances, regulations, and standards |
| MCR | Monthly Compliance Report |
| MLD | Most Likely Descendent |
| NAGPRA | Native American Graves Protection and Repatriation Act |
| NAHC | Native American Heritage Commission |
| NEPA | National Environmental Policy Act |

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| NHPA | National Historic Preservation Act |
| NPS | National Park Service |
| NRHP | National Register of Historic Places |
| OHP | Office of Historic Preservation |
| PAA | Project Area of Analysis---The project site (see below) plus what additional areas staff defines for each project that are necessary for the analysis of the cultural resources that the project may impact. |
| PQAD | Prehistoric Quarries Archaeological District |
| Project Site | The bounded area(s) identified by the applicant as the area(s) within which they propose to build the project. |
| PSA | Preliminary Staff Assessment |
| PTNCL | Prehistoric Trails Network Cultural Landscape/District |
| PVID | Palo Verde Irrigation District |
| RSA | Revised Staff Assessment (Energy Commission, CEQA) |
| RM SEGF | Rio Mesa Solar Electric Generating Facility |
| SHPO | State Historic Preservation Officer |
| SLF | Sacred Lands File at the NAHC |
| Staff | Energy Commission cultural resources technical staff |
| TCP | Traditional Cultural Property, as described in the regulations for Section 106 of the NHPA, can be a site, structure, district, landscape, or natural feature that has traditional cultural significance, that is, significance based in the role the property plays in a community’s historically rooted beliefs, customs, and practices. |
| THPO | Tribal Historic Preservation Officer |
| WEAP | Worker Environmental Awareness Program |

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## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-1-
## Previous Cultural Resources Investigations in the Rio Mesa SEGF Records Search Area

| Survey Report Number | Author | Date | Report Title | Investigation | Survey Type, Acreage | Survey Location | Project Component |
|---|---|---|---|---|---|---|---|
| AECOM 2010 | AECOM | 2010 | Cultural Resources Class III Survey Draft Report for the Proposed Blythe Solar Power Project | Intensive pedestrian survey | Intensive pedestrian survey of 8,005 acres | Within record search | N/A |
| Applied Earthworks 2011 | Applied Earthworks | 2011 | Class III Cultural Resources Survey Draft for the Colorado River Substation | Intensive pedestrian survey | Intensive pedestrian survey of 1264.3 acres | Within record search | N/A |
| ASM 2010 | ASM Affiliates, Inc. | 2010 | Cultural Resources Inventory of the Proposed Colorado River Substation Expansion Project, Riverside, California | Intensive pedestrian survey | Intensive pedestrian survey of 226 acres | Within record search | N/A |
| NADB 1100139 | Von Werlhof, Sherilee | 1978 | Archaeological Examinations Of A Utility Site In Palo Verde Valley | Literature review | N/A | Within record search | N/A |
| NADB 1100695 | Moreno, Jerry L et al. | 1995 | Intensive Cultural Resource Inventory for the Western Area Power Administration Blythe-Knob 161-kV Transmission Line, Riverside and Imperial Counties, California for U.S. Department of Energy Western Area Power Administration | Intensive pedestrian survey | Intensive pedestrian survey of 63.8-mile linear corridor + 33.5 miles of access roads. | Within record search | N/A |
| NADB 1100854 | Kirkish, Alex, Rebecca Apple, Jackson Underwood, and James Cleland | 2000 | Cultural Resources Overview and Survey for the Proposed Alignment of the North Baja Gas Pipeline. KEA Environmental, Inc. | Intensive pedestrian survey and literature review | Intensive pedestrian survey of 79.8-mile linear corridor | Within record search | N/A |
| NADB 1100862 | EDAW, Inc. | 2001 | Cultural Resources Evaluation for the North Baja Gas Pipeline | Intensive pedestrian survey and test excavation | Field investigations of 79.8-mile linear corridor | Within record search | N/A |
| NADB 1100864 | Underwood, Jackson | 2002 | Addendum 11 to Cultural Resources Overview and Survey for the North Baja Gas Pipeline Project - Archaeological Survey of Twenty-Four Extra Temporary Work Spaces | Intensive pedestrian survey | Intensive pedestrian survey of 24 temporary extra work spaces; 4 acres | Within record search | N/A |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-1-
## Previous Cultural Resources Investigations in the Rio Mesa SEGF Records Search Area

| Survey Report Number | Author | Date | Report Title | Investigation | Survey Type, Acreage | Survey Location | Project Component |
|---|---|---|---|---|---|---|---|
| NADB 1101191 | BLM and CDFG | 2001 | Draft Northern & Eastern Colorado [sic] Desert Coordinated Management Plan and Environmental Impact Statement - An Amendment to the California Desert Conservation Area Plan 1980 and Sikes Act Plan with the California Department of Fish and Game | Literature review and sample survey | Pedestrian sample surveys and literature review of 179,200 acres | Within record search | N/A |
| NADB 1101242 | BLM and CDFG | 2007 | Final Environmental Impact Statement/ Environmental Impact Report and Proposed Land Use Plan Amendment - Volume I and II - North Baja Pipeline Expansion Project | Intensive pedestrian survey and environmental document | Intensive pedestrian surveys of approximately 127.6 miles of linear routes and contractor yards | Within record search | N/A |
| NADB 1101243 | BLM | 2006 | Draft Environmental Impact Statement/ Environmental Impact Report and Draft Land Use Plan Amendment - Volumes I and II - North Baja Pipeline Expansion Project | Intensive pedestrian survey and environmental document | Intensive pedestrian surveys of approximately 127.6 miles of linear routes and contractor yards | Within record search | N/A |
| RI-00002 | San Diego Museum of Man | 1953 | Miscellaneous Field Notes - Riverside County, San Diego Museum of Man | Regional overview | Several areas in region | Within record search | N/A |
| RI-00160 | Greenwood and Associates | 1977 | Archaeological Resources Survey - West Coast - Mid-Continent Pipeline Project, Long Beach to Colorado River | Intensive pedestrian survey | Survey of 11-mile, 100-ft-wide, linear corridor | Within record search | N/A |
| RI-00161 | Greenwood and Associates | 1975 | Paleontological, Archaeological, Historical, and Cultural Resources, West Coast-Midwest Pipeline Project, Long Beach to Colorado River | Literature review | Literature review for 235-mile, 5-mile-wide linear corridor | Within record search | N/A |
| RI-00220 | Archaeological Research Unit, UC Riverside | 1977 | Interim Report Field Work and Data Analysis: Cultural Resources Survey of the Proposed Southern California Edison Palo Verde-Devers 500-kV Transmission Line | Intensive pedestrian survey | Intensive pedestrian survey of 200-mile linear corridor | In PAA | Transmission |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-1-
## Previous Cultural Resources Investigations in the Rio Mesa SEGF Records Search Area

| Survey Report Number | Author | Date | Report Title | Investigation | Survey Type, Acreage | Survey Location | Project Component |
|---|---|---|---|---|---|---|---|
| RI-00221 | WESTEC Service, Inc. | 1982 | Cultural Resource Inventory and National Register Assessment of the Southern California Edison Palo Verde to Devers Transmission Line Corridor (California Portion) | Intensive pedestrian survey | Intensive pedestrian survey of 128-mile linear corridor | In PAA | Transmission |
| RI-00222 | Archaeological Research Unit, UC Riverside | 1977 | Final Report: Cultural Resource Survey of the Proposed Southern California Edison Palo Verde -Devers 500-kV Power Transmission Line | Intensive pedestrian survey | Intensive pedestrian survey of 216.5-mile linear corridor | In PAA | Transmission |
| RI-00243 | Imperial Valley College Museum | 1977 | Archaeological Examinations of Mesa Drive into Sundesert Site, an Addendum Report | Intensive pedestrian survey and windshield survey | Windshield and pedestrian survey of 10.8-mile linear corridor | In PAA | Transmission, Rio Mesa I, Rio Mesa II |
| RI-00284 | Archaeological Research Unit, UC Riverside | 1977 | Cultural Resource Identification - Sundesert Nuclear Project | Sample survey | Sample survey units of 320-mile long linear corridor | In PAA | Transmission |
| RI-00991 | Cultural Systems Research, Inc. | 1978 | Persistence and Power: A Study of Native American Peoples in the Sonoran Desert and the Devers-Palo Verde High Voltage Transmission Line | Regional overview | Ethnographic study | Within record search | N/A |
| RI-01020 | Imperial Valley College Museum | 1978 | Archaeological Examinations of West and North Perimeters of Sundesert Site and Requisition for Determination of Eligibility for the National Register Sun Desert Site | Intensive pedestrian survey and resource evaluation | Approximately 2536 acres | In PAA | Rio Mesa I, Rio Mesa II |
| RI-01021 | Imperial Valley College Museum | 1978 | Archaeological Examinations of the South Section 21: Sundesert, An Addendum Report | Intensive pedestrian survey | Approximately 183 acres | In PAA | Rio Mesa I, Rio Mesa II |
| RI-01022 | Imperial Valley College Museum | 1975 | Archaeological Examination of the Sundesert Nuclear Plant Site, Final Report | Intensive pedestrian survey | Intensive pedestrian survey of six Sections and small portions of four sections | In PAA | Rio Mesa I, Rio Mesa II |
| RI-01023 | Imperial Valley College Museum | 1977 | Archaeological Examinations of Certain Geologic Drill Test Holes and Backhoe Trenches at Sundesert | Construction monitoring | N/A | In PAA | Rio Mesa I |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-1-
## Previous Cultural Resources Investigations in the Rio Mesa SEGF Records Search Area

| Survey Report Number | Author | Date | Report Title | Investigation | Survey Type, Acreage | Survey Location | Project Component |
|---|---|---|---|---|---|---|---|
| RI-01038 | William D. Alderson | 1977 | An Aboriginal Trail Complex in the Big Maria, McCoy and Mule Mountains of the Central Colorado Desert | Windshield survey, sample survey and data recovery | Windshield and sample survey of 986 sq. miles in Western Riverside County | Within record search | N/A |
| RI-01211 | Institute for American Research | 1980 | A Cultural Resources Overview of the Colorado Desert Planning Units | Regional overview | N/A | Within record search | N/A |
| RI-01249 | BLM | 1978 | California Desert Program: Archaeological Sample Unit Records for the Big Maria Planning Unit | Sample survey | 1.6 km | in PAA | Rio Mesa II |
| RI-01300 | BLM, California Desert District | 1981 | Mule Mountains - Area of Critical Environmental Concern - Management Plan | Environmental document | N/A | Within record search | N/A |
| RI-01305 | Imperial Valley College Museum | 1977 | Archaeological Examinations of the Proposed Railroad Line from Ripley to Sundesert | Intensive pedestrian survey | Intensive pedestrian survey of ##-mile linear corridor. | Within record search | N/A |
| RI-01664 | WESTEC Service, Inc. | 1982 | Cultural Resource Inventory of Seisdata Services Chuckwalla Geophysical Test Corridor, Riverside County, California | Intensive pedestrian survey | Intensive pedestrian survey of 6.5-mile linear corridor. | in PAA | Transmission |
| RI-02481 | BLM, Palm Springs-South Coast Field Office, North Palm Springs, CA | 1989 | An Archaeological Inventory and Evaluation of the Pebble Terraces in Riverside County, California | Intensive pedestrian survey and resource evaluation | 12 sites | Within record search | N/A |
| RI-04061 | ASM Affiliates, Inc. | 1998 | Cultural Resources Inventory of 1,542 acres of Palo Verde Mesa and Palo Verde Valley Catellus/BLM Land Exchange Area | Sample survey | Sample pedestrian surveys of parcels; 10,652 acres | In PAA | Transmission |
| RI-04768 | Tierra Environmental Services | 2001 | Cultural Resource Survey Report for the Blythe Water Project , Riverside and Imperial Counties, California | Intensive pedestrian survey | Intensive pedestrian survey of 60-mile linear corridor | Within record search | N/A |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-1-
## Previous Cultural Resources Investigations in the Rio Mesa SEGF Records Search Area

| Survey Report Number | Author | Date | Report Title | Investigation | Survey Type, Acreage | Survey Location | Project Component |
|---|---|---|---|---|---|---|---|
| RI-05520 | LSA Associates, Inc. | 1993 | Draft Southern California Gas Company Natural Gas Transmission Line 6902 Project, Riverside and Imperial Counties, CA, The Bradshaw Trail: Recommendation for National Register Eligibility | Literature review and resource evaluation | Literature review; windshield survey of 12-mile linear corridor | Within record search | N/A |
| RI-06186 | KEA Environmental, Inc. | 2000 | Cultural Resources Overview and Survey for the Proposed Alignment of the North Baja Gas Pipeline | Intensive pedestrian survey | Intensive pedestrian survey of 79.8-mile linear corridor | In PAA | Transmission, Rio Mesa I |
| RI-06187 | EDAW, Inc. | 2001 | Cultural Resources Evaluation for the North Baja Gas Pipeline | Resource evaluation | Resource evaluation of results of intensive pedestrian survey of 79.8-mile linear corridor | In PAA | Transmission |
| RI-06707 | ICF Jones & Stokes | 2008 | Cultural Resources Surveys of Alternative Routes within California for the proposed Devers-Palo Verde 2 Transmission Project | Intensive pedestrian survey | Intensive pedestrian survey of alternative linear corridor alignments (segments of varying mileage) | Within record search | N/A |
| RI-06999 | ASM Affiliates, Inc. | 2003 | A Class III Cultural Resource Inventory, and Evaluation for the Coachella Canal, Lining Project: Prehistoric and Historic, Sites Along the Northeastern Shore of, Ancient Lake Cahuilla, Imperial and Riverside Counties, California | Intensive pedestrian survey | Out of record search area | Not in record search area | N/A |
| RI-07204 | KEA Environmental, Inc. | 2000 | Overview and Cultural Resources Survey for the De Anza Natural Gas Pipeline | Intensive pedestrian survey and literature review | Intensive pedestrian surveys of portions of 113.76-mile linear corridor | Within record search | N/A |
| RI-07348 | KEA Environmental, Inc. | 2000 | Overview and Cultural Survey for the De Anza Natural Gas Pipeline | Duplicate record (RI-7204) | Duplicate record (RI-7204) | Duplicate record (RI-7204) | N/A |
| RI-07349 | EDAW, Inc. | 2005 | Chocolate Mountain Aerial Gunnery Range: Cultural Resources Survey of 12 Targets and Monitoring of 14 Archaeological Sites | Intensive pedestrian survey and construction monitoring | Out of record search area | Not in record search area | N/A |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-1-
## Previous Cultural Resources Investigations in the Rio Mesa SEGF Records Search Area

| Survey Report Number | Author | Date | Report Title | Investigation | Survey Type, Acreage | Survey Location | Project Component |
|---|---|---|---|---|---|---|---|
| RI-07790 | ASM Affiliates, Inc. | 2003 | A Class II Cultural Resources Assessment for the Desert-Southwest Transmission Line, Colorado Desert, Riverside and Imperial Counties, California | Literature review and sample survey | Sample pedestrian surveys + literature review; several optional alignments for each linear corridor + more than 527 miles of alternative alignment | Within record search | N/A |
| RI-07967 | BLM, Palm Springs-South Coast Field Office, North Palm Springs, CA | 2009 | A Class III Cultural Resources Survey for the Proposed Mesa Ranch Water Pipeline Right-of-Way Project, Palo Verde Mesa, Eastern Riverside County, California | Intensive pedestrian survey | Intensive pedestrian survey of 4 acres | In PAA | Transmission |
| RI-08373 | ICF Jones & Stokes | 2009 | Final Cultural Resources Inventory of the Proposed DPV2 Colorado River Switchyard Project, Riverside County California | Intensive pedestrian survey | Intensive pedestrian survey of 597 acres | Within record search | N/A |
| RI-08410 | Mooney/Hayes Associates, LLC | 2004 | Draft Cultural Resources Inventory of the Proposed Devers to Palo Verde II 500-kV Transmission Line, Riverside County, California | Intensive pedestrian survey | Intensive pedestrian survey of 232 acres | In PAA | Transmission |
| RI-08411 | Tetra Tech EC, Inc. | 2009 | Final Amendment to Cultural Resources Inventory of the Proposed Blythe Energy Project Transmission Line, Riverside County, California | Intensive pedestrian survey | Intensive pedestrian survey of 157 acres | In PAA | Transmission |

Acronyms/Abbreviations: BLM = (United States) Bureau of Land Management CDFG = California Department of Fish and Game CEC = California Energy Commission EIC = Eastern Information Center kV = kilovolt UC = University of California

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-IMP-00872 | Previous | USGLO Survey Notes by R.C. Matthewson 1855 | Prehistoric | Prehistoric. Trail segment, north-south. | Trail | Qa3 | Not evaluated |
| CA-IMP-00873 | Previous | USGLO Survey Notes by R.C. Matthewson 1856 | Prehistoric | Prehistoric. Trail segment, north-south. | Trail | Qa3 | Not evaluated |
| CA-IMP-02455 | Previous | Imperial Valley College Museum 1978 | Prehistoric | Prehistoric. < 0.1 acre. Feature, 1 stone lined cleared circle. | Cleared Circle | T?? | Not evaluated |
| CA-IMP-02457 | Previous | Imperial Valley College Museum 1978 | Prehistoric | Prehistoric. < 0.1 acre. Trail segment and 3 artifacts, including 1 milling slab and 2 lithics. | Trail | Qa3 | Not evaluated |
| CA-IMP-02458 | Previous | Imperial Valley College Museum 1978 | Prehistoric | Prehistoric. < 0.1 acre. Sparse artifact scatter (including scrapers and cores) with 1 disturbed cleared circle and bisected by a trail. | Trail/Cleared Circle | T?? | Not evaluated |
| CA-IMP-02459 | Previous | Imperial Valley College Museum 1978 | Prehistoric | Prehistoric. < 0.1 acre. Trail segment with adjacent prehistoric lithic artifacts (n= 7), including flakes and hammerstone. | Trail | T?? | Not evaluated |
| CA-IMP-02463 | Previous | Bill Nolta 1978 | Prehistoric | Prehistoric. Possible lithic quarry/workshop. Small artifact scatter including hammerstone, cores, and lithic work debitage. | Lithic Scatter | Qa3 | Not evaluated |
| CA-IMP-02466 | Previous | Bill Nolta 1978 | Prehistoric | Prehistoric. < 0.1 acre. Possible lithic quarry/workshop. Small artifact scatter including hammerstone, biface chopper and debitage. | Lithic Scatter | Qa3 | Not evaluated |
| CA-IMP-02468 | Previous | Bill Nolta 1978 | Prehistoric | Prehistoric. < 0.1 acre. Possible lithic quarry/workshop. Small lithic scatter, including flakes of honey quartz. | Lithic Scatter | Qa3 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-IMP-07237 | Previous | Western Cultural Resource Management 1994 | Prehistoric | Prehistoric. 0.9 acres. Lithic quarry/workshop quarry with 2 reduction loci surrounded by a low density lithic scatter. | Lithic Quarry | Qw | Not evaluated |
| CA-IMP-07238 | Previous | Western Cultural Resource Management 1994 | Prehistoric | Prehistoric. 3.5 acres. Lithic quarry/workshop. Low density artifact scatter, with 2 concentrations and 3 lithic reduction locations. | Lithic Quarry | Qa3 | Not evaluated |
| CA-RIV-00664 | Previous | Imperial Valley College Museum 1974 | Prehistoric | Prehistoric. 0.9 acre. Possible lithic quarry/workshop, with lithic scatter containing choppers, scrapers, and hammerstones. | Lithic Scatter | QTmw | Not evaluated |
| CA-RIV-00665 | Previous | Imperial Valley College Museum 1974 | Prehistoric | Prehistoric. 0.6 acre. Possible lithic quarry/workshop, with lithic scatter including Malpais tools, scrapers, and cobbles. | Lithic Scatter | QTmw | Not evaluated |
| CA-RIV-00666 | Previous | Imperial Valley College Museum 1974 | Prehistoric | Prehistoric. 0.6 acre. Possible lithic quarry/workshop, with lithic scatter including Malpais tools, scrapers, and cobbles. | Lithic Scatter | QTmw | Not evaluated |
| CA-RIV-01120 | Previous | Cowan 1976 | Prehistoric | Prehistoric. < 0.1 acre. Possible lithic quarry/workshop. Lithic scatter (n=13), including chert flakes, core, and quartzite hammerstones. | Lithic Scatter | Qpv | Not evaluated |
| CA-RIV-01481 | Previous | E. Levy 1978 | Prehistoric | Prehistoric. < 0.1 acre. 1 ceramic concentration/pot drop, 6 sherds. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-01489 | Previous | Unknown | Multi-component | Multi-component. < 0.1 acre. 1 prehistoric lithic artifact locus (n=8). Historic component consists of rectangular cleared area possibly for a tent; rock ring likely for a campfire; and bullet casings. | Lithic Scatter; Historical refuse (non-military) | Qw | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-06534 | Previous | Tierra Environmental Services 2000 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter (n= 13) with tested cobbles and flakes. | Lithic Quarry | Qpv | Not eligible |
| CA-RIV-06536 | Previous | Tierra Environmental Services 2000 | Prehistoric | Prehistoric. < 0.1 acre. Small lithic scatter (n= 8) consisting of 1 cobble, 1 core, and 6 flakes. 1 additional flake separate from the main scatter. | Lithic Scatter | Qpv | Not evaluated |
| CA-RIV-09005 | Previous | ICF Jones & Stokes 2008 | Historic | Historic. 3.6 acres WWII-era refuse scatter, primarily consisting of cans along with wood and wire. 4 loci of historic trash scatter. Possibly representative of a WWII campsite or training bivouac. | DTC Maneuvers | Not on Geo Map | Not evaluated |
| CA-RIV-09010 | Recent | ICF Jones & Stokes 2008 | Prehistoric | Prehistoric. Lithic quarry/workshop, with 10 to 20 flakes, core, and petrified wood. 2 loci. | Lithic Quarry | Not on Geo Map | Not evaluated |
| CA-RIV-09011 | Previous | ICF Jones & Stokes 2008 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 15) consisting of milk cans and 1 glass food jar distributed within 2 loci. | Historical refuse (non-military) | Qs | Not eligible |
| CA-RIV-09276 | Previous | ASM Affiliates, Inc. 2010 | Historic | Historic. 2 acres. WWII-era can scatter consisting of 35 cans. 1 concentration of 9 cans. | DTC food related refuse | Qs | Not evaluated |
| CA-RIV-09279 | Previous | ASM Affiliates, Inc. 2010 | Historic | Historic. 0.3 acres WWII-era refuse scatter (n= 4) consisting of 3 glass bottles and 1 can. | DTC food related refuse | Not on Geo Map | Not evaluated |
| CA-RIV-09280 | Previous | ASM Affiliates, Inc. 2010 | Historic | Historic. 12 acres. WWII-era refuse, with can and glass trash scatter in 2 loci. 1 thermal feature and 1 feature consisting of structural ruins of a historic bivouac. | DTC food related refuse | Not on Geo Map | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-09281 | Previous | ASM Affiliates, Inc. 2010 | Historic | Historic. 0.3 acres. WWII-era refuse scatter (n= 18), consisting of widely dispersed cans and milled lumber. | DTC Maneuvers | Not on Geo Map | Not evaluated |
| CA-RIV-09282 | Previous | ASM Affiliates, Inc. 2010 | Historic | Historic. < 0.1 acre. WWII-era refuse (n=22) consisting of cans and glass located within 2 historic refuse loci. | DTC food related refuse | Qs | Not evaluated |
| CA-RIV-09283 | Recent | ASM Affiliates, Inc. 2010 | Multi-component | Multi-component. < 0.1 acre. Prehistoric component includes 1 lithic flake within a compact ceramic concentration/pot drop of 5 sherds. 1 historic refuse concentration contains 5 cans and bottles. | Pot Drop; DTC food related refuse | Not on Geo Map | Not evaluated |
| CA-RIV-09284 | Recent | ASM Affiliates, Inc. 2010 | Multi-component | Multi-component. 9.9 acres. ~229 artifacts. 1 prehistoric ceramic concentration/pot drop, with 50 Buff Ware sherds. Historic refuse (including beer bottles, jars, cans, and metal fragments) in 4 historic refuse scatter loci. | Pot Drop; DTC Maneuvers | Not on Geo Map | Not evaluated |
| CA-RIV-09285 | Recent | ASM Affiliates, Inc. 2010 | Multi-component | Multi-component. 0.9 acres. ~213 artifacts. 1 isolated prehistoric jasper projectile point. Historic refuse scatter with three loci, containing metal fragments, cans, bottles, household goods, 100+ porcelain fragments, barbed wire, glass tableware, and wire nails. | Isolated Lithic Artifacts; Historical refuse (non-military) | Not on Geo Map | Not evaluated |
| CA-RIV-09989 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. Low-density WWII refuse scatter consisting of 10 food and beverage cans and can fragments. | DTC food related refuse | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-09990 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 2 isolated prehistoric artifacts include 1 core and 1 flake. WWII-era refuse scatter includes 8 cans and 1 spent brass shell. | Isolated Lithic Artifacts; DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-09991 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, with 15 Lower Colorado Buffware body sherds. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-09992 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. WWII-era can refuse scatter consisting of 5 cans. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-09993 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, with 15 Lower Colorado Buffware body sherds. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-09994 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, with 7 Lower Colorado Buffware body sherds. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-09995 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Low density lithic scatter (n= 32) consisting of debitage, cores, tested cobbles, and tools spread across two loci. | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-09997 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. WWII refuse scatter, with 1 locus containing 24 cans and 100+ can fragments. Additional refuse scatter includes 5 cans and several can fragments. | DTC food related refuse | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-09999 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. Prehistoric lithic quarry/workshop, including flakes, core, and shatter (n=9). WWII era refuse scatter (n= 33) primarily includes cans, as well as hardware, glass, and a battery. | Lithic Quarry; DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10000 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 1.1 acres. Prehistoric lithic quarry/workshop, with low density lithic scatter (n= 17). 3 WWII era historic refuse concentrations, with 12 cans and lids. | Lithic Quarry; DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10001 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric.1.8 acres. Lithic quarry/workshop, with low-density lithic scatter (n=98) consisting of a variety of lithic debitage, cores, tested cobbles, and a core tool. | Lithic Quarry; DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10002 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric.< 0.1 acre. Lithic quarry/workshop, with low-density lithic scatter (n=16) consisting of chert, jasper, quartz, and chalcedony debitage. 1 segregated reduction locus. | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-10003 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric.< 0.1 acre. Artifact scatter with 2 ceramic concentrations/pot drops including 81 Parker Buffware sherds and 6 Salton Brown sherds. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-10004 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. Low-density historic refuse scatter (n= 11) consisting of 3 pieces of milled lumber, 3 metal strap jar closures, 4 evaporated milk cans, and 1 large sanitary can. | Historical refuse (non-military) | Qa6 | Not evaluated |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
# CULTURAL RESOURCES TABLE A-2
# Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-10007 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 1917 GLO survey monument feature. | Government survey marker | Qa6 | Not evaluated |
| CA-RIV-10008 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. Artifact scatter (n= 9), 6 pieces of weathered milled lumber, 1 wire nail, 1 WWII era 0.50-caliber belt clip, and 1 evaporated milk can. | DTC Maneuvers | Qa6 | Not evaluated |
| CA-RIV-10009 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 1.2 acres. Ceramic concentration/pot drop of 6 Colorado Buff sherds, 1 collapsed historic wood-frame structure, 1 historic refuse scatter, 1 window glass scatter and 1 low-density artifact scatter. | Pot Drop; Historical refuse (non-military) | Qa6 | Not evaluated |
| CA-RIV-10010 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. < 0.1 acre. Prehistoric artifact scatter includes 3 Lower Colorado Buffware sherds and 2 lithics. 2 isolated historic cans. | Artifact Scatter; Isolated Historic Artifacts | Qa6 | Not evaluated |
| CA-RIV-10011 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric.< 0.1 acre. Ceramic concentration/pot drop, 34 sherds of Colorado Buff. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-10012 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. Six WWII-era C-ration cans. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10014 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 1.2 acres. 1910s-1930s refuse scatter consisting of glass, cans, ceramics and milled lumber. In addition, there is a quartz cobble concentration likely associated with gold mining/prospecting activities. | Early 20th century refuse scatter | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-10021 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic.0.2 acres. Low-density WWII era historic refuse scatter (n=15), including cans, bottles, glass, and a U.S. Army mess kit spoon. | DTC Maneuvers | Qa6 | Not evaluated |
| CA-RIV-10022 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Low-density lithic scatter, including 1 chert primary flake, 2 split chert cobbles, and 1 chalcedony core fragment. | Lithic Scatter | Qa6 | Not evaluated |
| CA-RIV-10023 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 0.3 acres. Low density lithic scatter (n=13). Features include 1 rock cairn and 1 deflated thermal feature. | Lithic Scatter/Processing/Cairn | Qa6 | Not evaluated |
| CA-RIV-10024 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Artifact scatter, 4 lithics and 1 ceramic concentration/pot drop consisting of 10 Parker Buff sherds. Possible lithic quarry/workshop. | Lithic Scatter/Pot Drop | Qa6 | Not evaluated |
| CA-RIV-10025 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Multi-component | Multi-component.1.4 acres. Prehistoric lithic scatter (n=8); possible lithic quarry/workshop. Historic component includes 7 metal cans, 1 concrete mounted marker and wires possible associated with the section line, and a partially filled WWII era excavation. | Lithic Scatter; DTC Maneuvers | Qa6 | Not evaluated |
| CA-RIV-10026 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Possible lithic quarry/workshop. Low-density artifact scatter (n= 4), with 1 chert core, 2 primary flakes, and 1 secondary flake. | Lithic Scatter | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-10027 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Multi-component | Multi-component. 0.6 acres. Prehistoric component consists of low density lithic scatter and 1 mid-stage reduction locus. 1 prehistoric deflated thermal feature. 3 historic can fragments. | Lithic Scatter/Processing; Isolated Historic Artifacts | Qa6 | Not evaluated |
| CA-RIV-10028 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Multi-component | Multi-component. 0.1 acre. 2 prehistoric lithic artifacts and 14 WWII era cans. | Isolated Lithic Artifacts; DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10029 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. WWII-era refuse scatter consisting of 6 C-ration cans. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10030 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. 2 acres. Low-density, WWII-era refuse scatter (n= 39) including 13 C-ration cans. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10031 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. < 0.1 acre. 1 isolated prehistoric chalcedony flake tool. WWII-era temporary campsite with 3 artifacts (2 C-ration can lids and 1 boot sole) and 2 foxhole features. | Isolated Lithic Artifacts; DTC Maneuvers | Qa6 | Not evaluated |
| CA-RIV-10032 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 1.3 acres. 1 isolated prehistoric chert shatter. Historic WWII-era refuse scatter consisting of 12 cans and 1 glass bottle. | Isolated Lithic Artifacts; DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10033 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. 5.3 acres. 644 lithic artifacts spread over 3 mid-stage segregated reduction loci. 1 deflated thermal feature. | Lithic Scatter/Processing | Qa6 | Not evaluated |
| CA-RIV-10034 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic.< 0.1 acre. Low-density, WWII-era refuse scatter consisting of 5 food and beverage cans. | DTC food related refuse | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-10035 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 0.15 acres. Prehistoric ceramic concentration/pot drop consisting of 14 Colorado Red sherds, 1 piece of angular chert shatter. 3 WWII era cans. | Isolated Lithic Artifacts/Pot Drop; Isolated Historic Artifacts | Qa6 | Not evaluated |
| CA-RIV-10036 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 2 ceramic concentration/pot drops with 9 sherds of Parker Buff. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-10037 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. < 0.1 acre. Prehistoric ceramic concentration/pot drop, with 7 ceramic body sherds. Surrounded by historic refuse scatter (n= 6) consisting of cans, glass and milled lumber. | Pot Drop; Historical refuse (non-military) | Qa6 | Not evaluated |
| CA-RIV-10038 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. 4 ceramic concentrations/pot drops of Lower Colorado Buffware Colorado Beige (n=50), 1 biface, and a low density lithic scatter. | Lithic Scatter/Pot Drop | Qa6 | Not evaluated |
| CA-RIV-10039 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter (n= 13), with 1 segregated reduction locus consists of flakes, shatter, and core. A single outlying flake also present. | Lithic Scatter | Qa6 | Not evaluated |
| CA-RIV-10040 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 deflated hearth feature containing 144+ pebbles. | Processing | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

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|---|---|---|---|---|---|---|---|
| CA-RIV-10041 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Multi-component | Multi-component. 0.1 acre. Prehistoric component consists of 2 thermal features surrounded by a low density artifact scatter (n=5). The historic component consists of 1 isolated WWII-era C-ration can with lid. | Artifact Scatter/Processing; Isolated Historic Artifacts | Qa6 | Not evaluated |
| CA-RIV-10042 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component 3.4 acres. 2 isolated prehistoric lithic artifacts. Historic refuse (n= 31) includes bottles and cans from the 1900-1950s. 1 historic rectangular pit feature may be a potential multi-person foxhole. | Isolated Lithic Artifacts; Early 20th century refuse scatter | Qa6 | Not evaluated |
| CA-RIV-10043 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre, WWII era refuse scatter consisting of three vent-hole evaporated milk cans dating to 1935-1945. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10044 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre, WWII era refuse scatter, 7 small ferrous metal cap covers. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10045 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter consisting of 10 sanitary cans and can fragments and a long section of well drill casing. Represents the remains of a temporary/single-use camp area. | DTC Maneuvers | Qa6 | Not evaluated |
| CA-RIV-10046 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Artifact scatter (n= 7) consisting of 5 lithics and 2 Colorado Buffware ceramic body sherds. Possible lithic quarry/workshop. | Artifact Scatter | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-10047 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 2.8 acres. Lithic quarry/workshop, with sparse lithic scatter (n= 39) primarily consisting of flakes, along with cobbles, shatter, core, and biface. | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-10048 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 0.4 acres. Prehistoric component includes lithic quarry workshop; scatter (n= 8) consists of flakes, cobbles, tool, and core. Historic component consists of WWII-era refuse scatter, with 4 cans and lids. | Lithic Quarry; DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10049 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 0.7 acres. Lithic quarry/workshop, with sparse lithic scatter (n= 18) including flakes and cobbles. | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-10050 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 0.1 acre. Scatter of 50 boards of milled lumber. Nails, steel wire, and metal gasket for a straight six-cylinder engine also present. | Historical refuse (non-military) | Qa6 | Not evaluated |
| CA-RIV-10051 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 0.6 acres. Lithic quarry/workshop; sparse prehistoric scatter consists of 23 lithic artifacts including 21 flakes, 1 shatter, and 1 core. | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-10052 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 0.7 acres. Prehistoric lithic quarry/workshop; sparse lithic scatter (n= 19) including flakes, cobbles, and core. Historic component includes an isolated C-ration can. | Lithic Quarry; Isolated Historic Artifacts | Qa6 | Not evaluated |
| CA-RIV-10053 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with sparse lithic scatter (n= 16) including 13 flakes and 3 cores. | Lithic Quarry | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

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|---|---|---|---|---|---|---|---|
| CA-RIV-10054 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. DTC refuse scatter (n= 9) consisting of sardine and food cans. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10055 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. WWII era refuse scatter (n= 5) consisting of food and beverage cans and lids. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10056 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 0.4 acres. WWII era refuse scatter, 10 food and beverage cans and lids. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10057 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. WWII era refuse scatter (n= 12) consisting of food and beverage cans and lids. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10060 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 0.4 acres. Prehistoric component includes low-density lithic scatter (n= 31), including 24 flakes, 4 shatter, and 3 tools. 1 ceramic concentration/pot drop (n= 7), including 6 Tumco Buff and 1 Colorado Red sherds. Historic component consists of an isolated WWII coffee tin. | Lithic Quarry/Pot Drop; Isolated Historic Artifacts | Qa6 | Not evaluated |
| CA-RIV-10061 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. 1 circular berm feature. Possible DTC-related foxhole or fighting position. | DTC Maneuvers | Qa6 | Not evaluated |
| CA-RIV-10062 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 0.7 acres. Lithic quarry/workshop. Sparse lithic scatter (n= 16), consisting of 15 flakes and 1 chert biface. | Lithic Quarry | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

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|---|---|---|---|---|---|---|---|
| CA-RIV-10063 | Recent | Applied Earthworks, Inc. 2011 | Multi-component | Multi-component. 0.2 acres. Prehistoric component consists of lithic quarry/workshop, with sparse lithic scatter consisting of 6 flakes. 1 isolated historic sanitary can also present. | Lithic Quarry; Isolated Historic Artifacts | Qa6 | Not evaluated |
| CA-RIV-10064 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, 30 Tumco Buff pottery sherds. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-10065 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 4) consisting of 2 food cans, 1 glass bottle, and 1 steel cap. | Early 20th century refuse scatter | Qa6 | Not evaluated |
| CA-RIV-10066 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter of 32 cans and can fragments. | Early 20th century refuse scatter | Qa6 | Not evaluated |
| CA-RIV-10067 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 0.4 acres. WWII era refuse scatter consisting of 13 cans and an opening key. | DTC food related refuse | Qa6 | Not evaluated |
| CA-RIV-10070 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop; lithic scatter (n= 4) consists of 1 core and 3 debitage (including flake and shatter). | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-10071 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 0.2 acres. 5 excavation features and 7 areas of excavation disturbance in a line that roughly parallels an abandoned east-west two-track road. It is likely that these are DTC-related fighting positions. | DTC Maneuvers | Qa6 | Not evaluated |
| P-33-013617 | Previous | LSA Associates, Inc. 1990 | Prehistoric | Prehistoric. Pot drop, 4 Parker Buffware sherds. | Pot Drop | Not on Geo Map | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| P-33-013659 | Previous | Mooney and Associates 2004; Mooney/Jones & Stokes 2005 | Prehistoric | Prehistoric. 1.4 acres. Possible lithic quarry/workshop. Light density lithic scatter, including several flakes. | Lithic Scatter | Qpv | Not evaluated |
| P-33-013660 | Previous | Mooney and Associates 2004; Mooney/Jones & Stokes 2005 | Prehistoric | Prehistoric. 2.5 acres. Large, light-density lithic scatter; ceramic concentration/pot-drop (6 red plainware sherds); 4 thermal features; and segment of trail CA-RIV-772. | Processing/ Pot Drop | Qpv | Additional information required |
| P-33-014197 | Previous | Mooney, Jones & Stokes 2005 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, 6 buffware sherds. | Pot Drop | Qpv | Not evaluated |
| P-33-014198 | Previous | Mooney, Jones & Stokes 2005 | Historic | Historic. 1.2 acres. Widely dispersed artifact scatter, including cans, wire, meat tins and glass. Immediately east of an historic two track road. | Early 20th century refuse scatter | Qpv | Not evaluated |
| P-33-014208 | Previous | Mooney, Jones & Stokes 2005 | Prehistoric | Prehistoric. < 0.1 acre. Possible lithic quarry/workshop. Light-density lithic scatter, including flakes, core, and hammerstone. | Lithic Scatter | Qpv | Not evaluated |
| P-33-018069 | Previous | ASM Affiliates, Inc. 2010 | Historic | Historic. U.S. General Land Office Survey quarter-section marker dated 1917. Marking Sections 5 and 6. | Government survey marker | Qs | Not evaluated |
| P-33-018071 | Previous | ASM Affiliates, Inc. 2010 | Historic | Historic. U.S. General Land Office Survey section marker dated 1917. Marking division between Section 31 and 32 of Township 6 South, Range 21 East on the north and Township 7 South on the south. | Government survey marker | Not on Geo Map | Not evaluated |
| P-33-018675 | Previous | AECOM 2009 | Historic | Historic. < 0.1 acre. WWII era, 3 key-wind military ration cans and 1 glass bottle. | DTC food related refuse | Qs | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-2
## Previously Known Archaeological Resources Identified in Rio Mesa SEGF Records Search Area

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| P-33-018916 | Previous | AECOM 2010 | Historic | Historic. < 0.1 acre. WWII era artifact scatter, 8 metal cans. | DTC food related refuse | Qs | Not evaluated |
| P-33-018917 | Previous | AECOM 2010 | Historic | Historic. < 0.1 acre. WWII era artifact scatter, more than 5 metal cans and a cluster of 16 amber beer bottles. | DTC food related refuse | Qs | Not evaluated |
| P-33-019712 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 1917 GLO survey monument marking the boundary between Sections 7 and 8 of Township 7S, Range 21 E. | Government survey marker | Qa6 | Not evaluated |
| P-33-019746 | Recent | Applied Earthworks, Inc. 2011 | Historic | Historic. 1917 GLO survey monument. Quarter section marker with modern steel and wood posts. | Government survey marker | Qa6 | Not evaluated |
| PVM-SM-118 | New | URS Corp. 2011 | Historic | Historic. Linear feature, comprised of a hand-dug waterline ditch and associated berms. 1,286 feet long by 7 feet wide, east-northeast to west-southwest. | Historic irrigation | Qpv | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-00650 | Previous - Not Relocated | UC Riverside Anthropology Department 1980; Mooney & Associates 2004; ICF Jones & Stokes 2005 & 2008 | Prehistoric | Prehistoric. Trail segment, 750 ft., north-south. Intersects campsite CA-RIV-1821 | Trail | Qpv | Eligible contributor to PTNCL |
| CA-RIV-00668 | Previous - Not Relocated | Imperial Valley College Museum 1978; Mooney-Lettieri & Associates, Inc. 1984 | Prehistoric | Prehistoric. 850 acres. Lithic quarry/workshop and possible campsite. Includes lithic and ceramic scatter, 2 trail segments, 3 cleared circle features, and 1 thermal feature. | Camp | QTmw | Additional information required |
| CA-RIV-01820 | Updated | BLM 1980; Mooney & Associates 2004; Mooney/Jones & Stokes 2005; ICF Jones & Stokes 2008; Applied Earthworks 2011; URS Corp. 2011 | Prehistoric | Prehistoric. 1.5 acres. Low density artifact scatter including debitage, reduction detritus, and cores and hammerstone of quartzite and Cryptocrystalline Silicate. | Lithic Scatter | Qa6 | Additional information required |
| CA-RIV-05532 | Previous - Not Relocated | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001 | Prehistoric | Prehistoric. < 0.1 acre. Low-density lithic scatter. Includes one locus with 7 flakes and cores. | Lithic Quarry | Qpv | Not eligible |
| CA-RIV-05535 | Previous - Not Relocated | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001 | Prehistoric | Prehistoric. 2 acres. Lithic quarry/workshop (n= 420) consisting of flakes and cores, with 14 loci. | Lithic Quarry | Qpv | Additional information required |
| CA-RIV-05545 | Recent | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001; Mooney, Jones & Stokes 2005; ICF Jones & Stokes 2008 | Built-Environment | Built-Environment. Road segment. 150 feet long, northeast-southwest. | Historic road | Qpv | Ask Amber |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| CA-RIV-06538 | Updated | Tierra Environmental Services 2000; URS Corp. 2011 | Multi-component | Multi-component. 17.3 acres. 465 artifacts. Prehistoric component consists of lithic quarry/workshop, including debitage, cores, tested cobbles, flakes, and hammerstones; 2 lithic scatter loci and 4 segregated reduction loci. Historic artifacts present include cans, glass, horseshoe, and wire. | Lithic Quarry; DTC food related refuse | Qa6 | Additional Information Required; Eligible Contributor to DTCCL |
| CA-RIV-06594 | Previous | Tierra Environmental Services 2000 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 7 flakes and 1 segregated reduction locus. | Lithic Quarry | Qa3 | Not evaluated |
| CA-RIV-06612 | Previous | Tierra Environmental Services 2000 | Prehistoric | Prehistoric. < 0.1 acre. 3 rock ring features associated with temporary camp site. | Rock Ring | Qw | Not evaluated |
| CA-RIV-06614 | Updated | Tierra Environmental Services 2000; URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop of 8 Tizon Brown Ware body sherds. | Pot Drop | Qa6 | Not evaluated |
| CA-RIV-06615 | Updated | Tierra Environmental Services 2000; URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop. 19 lithics include flakes, hammerstones, cores, and cobbles; 3 segregated reduction loci. | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-06616 | Previous | Tierra Environmental Services 2000 | Prehistoric | Prehistoric. Lithic scatter includes at least 6 flakes and 1 cobble. | Lithic Quarry | Qa6 | Not evaluated |
| CA-RIV-06675 | Updated | KEA Environmental, Inc. 2000; URS Corp. 2012 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with 243 lithic artifacts, 5 lithic scatter loci, and 1 segregated reduction locus. | Lithic Quarry | Qpv | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| CA-RIV-06676 | Updated | KEA Environmental, Inc. 2000; URS Corp. 2012 | Multi-component | Multi-component. 4 acres. Prehistoric lithic quarry/workshop, with 87 lithic artifacts and 2 segregated reduction loci. Historic component consists of 70 artifacts, primarily cans. | Lithic Quarry; DTC food related refuse | Qpv | Not eligible; Eligible contributor to DTCCL |
| CA-RIV-09009 | Updated | ICF Jones & Stokes 2008; URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 19) including 15 metal cans, 3 can lids and 1 glass jar. | Historical refuse (non-military) | Qa6 | Not eligible |
| CA-RIV-09100 | Updated | Mooney, Jones & Stokes 2005; ICF Jones & Stokes 2008; Tetra Tech EC 2009; URS Corp. 2011 | Built-Environment | Built-Environment. Two-track feature site. 7,957 feet long, six feet wide, southeast to northwest. Originally thought to have been the initial survey road used for the original transmission line survey. | Undetermined | Qa6 | Ask Amber |
| CA-RIV-10005 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. 0.2 acres. Low-density historic can scatter (n= 6) consisting of 1 oval sardine can, 2 sanitary can fragments, and 3 evaporated milk cans. | Historical refuse (non-military) | Qa6 | Not eligible |
| CA-RIV-10013 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. < 0.1 acre. Early 20th century historic refuse scatter, 34 can fragments. | Early 20th century refuse scatter | Qa6 | Not eligible |
| CA-RIV-10017 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. < 0.1 acre. Low-density historic WWII-era refuse scatter consisting of 5 partial C-ration cans one 1942 mercury head dime. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| CA-RIV-10018 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. < 0.1 acre. WWII-era temporary/single-use camp area consisting of a 12-foot x 12-foot excavation and a low-density refuse scatter. | DTC Maneuvers | Qa6 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| CA-RIV-10019 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter consisting of 4 metal artifacts including wire and cans. | Historical refuse (non-military) | Qa6 | Not eligible |
| CA-RIV-10058 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 5) consisting of 4 cans and 1 wire spool dating to 1917–1929. | Early 20th century refuse scatter | Qa6 | Not eligible |
| CA-RIV-10059 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. 0.3 acres. WWII era refuse scatter (n= 8) consisting of food and beverage cans and lids. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| CA-RIV-10068 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, with 19 body sherds and 1 concentration. | Pot Drop | Qa6 | Additional information required |
| CA-RIV-10072 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Prehistoric | Prehistoric. 0.6 acres. Lithic quarry/workshop, with lithic scatter (n= 28) consisting of debitage, tested cobbles, and cores. | Lithic Quarry | Qa6 | Not eligible |
| CA-RIV-10073 | Recent | Applied Earthworks, Inc. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop containing 5 lithics (flakes and scatter). | Lithic Quarry | Qa6 | Not eligible |
| CA-RIV-6678 (P-33-011095) | Updated | KEA Environmental, Inc. 2000; URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. 51 artifacts. 2 segregated reduction loci overlapping 2 ceramic concentration/pot drops (Colorado Buff Ware). Historic refuse (n= 4) outside of loci (possibly WWII era). | Lithic Quarry/Pot Drop; DTC food related refuse | Qpv | Eligible contributor to PTNCL; Not eligible |
| P-33-013672 | Previous - Not Relocated | Mooney and Associates 2004; Mooney/Jones & Stokes 2005 | Prehistoric | Prehistoric. 0.1 acre. Variable-density lithic scatter mainly black and brown siliceous petrified wood with numerous core and hammerstone fragments. 2 lithic reduction concentrations. | Lithic Quarry | Qa6 | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| P-33-014148 | Updated | Mooney, Jones & Stokes 2005 | Historic | Historic. 0.2 acres. Likely WWII era artifact scatter (n= 17) including food and beverage cans, and 1 glass jar. 1 historic scatter locus. In proximity to two track road. | DTC food related refuse | Qpv | Additional information required |
| P-33-014149 | Previous - Not Relocated | Mooney, Jones & Stokes 2005 | Historic | Historic. < 0.1 acre. WW II-era military hardware scatter. | DTC food related refuse | Qpv | Additional information required |
| P-33-014151 | Previous - Not Relocated | Mooney, Jones & Stokes 2005 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, 10 buffware sherds. | Pot Drop | Qpv | Eligible contributor to PTNCL |
| P-33-014175 | Updated | Cooper 2005; URS 2011 | Prehistoric | Prehistoric. Ceramic concentration/pot drop, 5 sherds. | Pot Drop | Qa6 | Eligible contributor to PTNCL |
| P-33-014385 | Recent | Mooney, Jones & Stokes 2005; ICF Jones & Stokes 2008 | Historic | Historic. < 0.1 acre. Four WWII era 0.50-caliber machine gun shell casings. | DTC Maneuvers | Qpv | Eligible contributor to DTCCL |
| P-33-014386 | Recent | Mooney, Jones & Stokes 2005; ICF Jones & Stokes 2008 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter (n= 4) including 1 dark violet quartzite cobble core, 1 flake, 1 granitic hammerstone, and 1 assayed quartzite cobble. | Lithic Scatter | Qpv | Not eligible |
| P-33-017328 | Recent | ICF Jones & Stokes 2008 | Undetermined | Undetermined. Trail segment, 540 feet, north-south trending. Width suggests historic era, however multiple prehistoric trail segments located nearby. | Trail | Qpv | Additional information required |
| PVM-CB-001 | New | URS Corp. 2011 | Prehistoric | Prehistoric site: 0.3 acres. Lithic quarry/workshop, with 54 lithic artifacts and 3 segregated reduction loci. | Lithic Quarry | QTmw | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-CB-010 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. 1 isolated prehistoric lithic flake. WWII era food and beverage containers, and miscellaneous items (n=6). 1 excavated depression (foxhole) and 1 modern thermal feature/hearth. | Isolated lithics; DTC maneuvers | Qa3 | Not evaluated |
| PVM-CB-011 | New | URS Corp. 2011 | Historic | Historic. 1.8 acres. WWII era food and beverage containers (n=36), 1 excavated depression (foxhole), 1 modern/historic hearth, and 1 linear bulldozer scrape. | DTC maneuvers | Qa3, Qa6 | Not evaluated |
| PVM-CB-031 | New | URS Corp. 2011 | Multi-component | Multi-component. 1.5 acres. 1 isolated prehistoric lithic flake. WWII era food and beverage containers (n=28) and 22 excavated depressions (foxholes and gun emplacements). | Isolated lithics; DTC maneuvers | Qa3, Qa6 | Not evaluated |
| PVM-CB-033 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.1 acres. Prehistoric lithic quarry/workshop with 2 segregated reduction loci. 1 isolated historic metal artifact. | Lithic Quarry; Isolated historic artifacts | Qa6 | Not evaluated |
| PVM-CB-034 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. WWII era refuse (n= 13) consists of 5 cans and lids and 8 cartridge casings. 6 of the casings located in 1 historic refuse locus. | DTC food related refuse | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-CB-035 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.9 acres. Prehistoric component consists of lithic quarry/workshop; 39 lithics include flakes, cobbles, cores, and hammerstones. Primarily distributed within 2 loci (1 lithic scatter and 1 segregated reduction). Historic refuse (n= 10) includes 7 cans and parts and 3 metal spent shell casings. 1 military foxhole/bunker feature present. | Lithic Quarry | Qa6, Qw | Not evaluated |
| PVM-CB-037 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. WWII era refuse (1 cartridge case and 1 tire tread) and 3 foxhole features. | DTC maneuvers | Qa3, Qa6 | Not evaluated |
| PVM-CB-038 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Military site, with 1 cartridge casing artifact and 2 foxhole features. | DTC maneuvers | Qa3 | Not evaluated |
| PVM-CB-039 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 18) includes 1 can, 2 can parts, 3 A-frame transportation barricades, 1 glass bottle, and 10 metal pieces. 1 modern/historic hearth feature also present. | Historical refuse (non-military) | Qa6, Qw | Not evaluated |
| PVM-CB-041 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.1 acre. Prehistoric component consists of isolated lithic flake. Historical refuse (n= 34) consists of food cans, spent blanks, porcelain, and a glass jar. Distributed within and surrounding two historic refuse scatter loci. | Isolated lithics; DTC food related refuse | Qa6 | Not evaluated |
| PVM-CB-042 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.2 acres. 1 isolated prehistoric lithic flake artifact. Historic component consists of 1 military foxhole feature. | Isolated lithics; DTC maneuvers | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-CB-043 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. DTC refuse scatter (n= 7) consists of 1 metal horse or mule shoe, 1 glass bottle, and 5 food-related cans and parts. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-CB-044 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.8 acres. Prehistoric component (n= 125) consists of lithic quarry/workshop, with flakes, cores, cobbles, shatter, and hammerstone primarily distributed within 8 loci (2 lithic scatter and 6 segregated reduction). Historic component (n= 14) consists of food and beverage-related cans, metal, and glass, with 1 historic debris locus. | Lithic Quarry | Qa6, Qw | Not evaluated |
| PVM-CB-045 | New | URS Corp. 2011 | Historic | Historic. 0.8 acres. Trash scatter (n= 13) includes 5 food cans, 3 metals (sparkplug, switchblade, and auto filter), and 5 glass. | Historical refuse (non-military) | Qa6, Qpv | Not evaluated |
| PVM-CB-046 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop; 36 lithics include flakes, cobbles, shatter, core, core tools, and hammerstone. 15 artifacts located in 1 lithic scatter locus. | Lithic Quarry | Qpv | Not evaluated |
| PVM-CB-047 | New | URS Corp. 2011 | Historic | Historic. 0.1 acres. Military trash scatter (n= 10) primarily consists of cans and glass bottles. 5 foxhole features and 1 associated thermal feature. | DTC maneuvers | Qa3 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-CB-048 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.8 acres. Prehistoric lithic quarry/workshop consists of 9 lithics, including flakes, cobble, and hammerstones. Historic refuse scatter (n= 11) includes 1 metal, 1 glass bottle, 1 bottle cap, 5 can parts, and 3 cans. | Lithic Quarry | Qpv | Not evaluated |
| PVM-CB-050 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. Prehistoric component consists of lithic quarry/workshop with 10 lithics. 2 isolated historic artifacts (glass jug and motor oil can) also present. | Lithic Quarry; Isolated Historic Artifacts | Qpv | Not eligible; Not eligible |
| PVM-DK-020 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop site with lithic scatter (n= 17) consisting of flakes and shatter. | Lithic Quarry | Qw | Not eligible |
| PVM-DK-023 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. WWII era refuse (n= 26) includes 18 cans (primarily food and beverage), 4 metal, 3 glazed ware, and 1 rubber boot. 1 historic scatter locus. 5 foxhole features. Tank tracks present. | DTC maneuvers | Qa6, Qw | Not evaluated |
| PVM-DK-025 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. WWII era refuse (n= 19) includes 17 cans (primarily food and beverage) and 2 metal pieces. 7 cans located within 1 historic refuse locus. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-DK-026 | New | URS Corp. 2011 | Historic | Historic. 0.7 acres. WWII era refuse scatter (n= 9) includes 7 food and beverage cans, 1 metal strapping, and 1 plastic sling shot handle. | DTC food related refuse | Qa6, Qw | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-DK-027 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic artifacts (n= 3) include 2 flakes and 1 core. 1 thermal feature, with fire affected rocks present. | Processing | Qa6 | Not evaluated |
| PVM-DK-029 | New | URS Corp. 2011 | Historic | Historic. 0.4 acres. Refuse scatter (n= 11) includes 3 food and beverage cans, 5 domestic metal items, and 3 glass bottles. Distributed within 2 historic scatter loci. | DTC food related refuse | Qa3 | Not evaluated |
| PVM-DK-033 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. Refuse scatter (n= 7) includes 5 cans, 1 can lid, and 1 metal iron cover top. | DTC food related refuse | Qa3 | Not evaluated |
| PVM-DK-044 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. 12 lithics include flakes, core, and hammerstone. | Lithic Quarry | Qpv | Not eligible |
| PVM-DK-046 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 2 thermal features. | Processing | Qpv | Additional information required |
| PVM-DK-050 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 87 meters, east-northeast to west. | Trail | Qa6 | Not evaluated |
| PVM-DK-051 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 135 meters, east-northeast to west. | Trail | Qa6 | Eligible contributor to PTNCL |
| PVM-DK-500 | New | URS Corp. 2012 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 7 lithics and no concentrations. | Lithic Quarry | Qa6; Qpv | Additional information required |
| PVM-DK-503 | New | URS Corp. 2012 | Historic | Historic. 0.3 meters. Refuse (n= 313) includes 259 metal sided oil cans, 51 food and beverage cans, 1 oil filter, and 2 glass bottles. Primarily distributed within 5 historic debris loci. | Historical refuse (non-military) | Qa6 | Not evaluated |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-DK-504 | New | URS Corp. 2012 | Historic | Historic. 0.2 acres. Refuse (n=227) includes 1 historic debris locus with 24 glass vessels. Surrounded by 201 cans (primarily food and beverage), 1 toy car, and 1 battery. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-DK-505 | New | URS Corp. 2012 | Historic | Historic. < 0.1 acre. Lithic quarry/workshop; lithic scatter (n= 30) includes 29 shatter and 1 flake. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-DK-506 | New | URS Corp. 2012 | Historic | Historic. < 0.1 acre. Refuse (n= 86) includes 75 metal sided oil cans, 1 cone top can, 8 oil filters, and 2 glass bottles. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-DK-507 | New | URS Corp. 2012 | Multi-component | Prehistoric. < 0.1 acre. Artifact scatter, including 44 ceramics and 1 lithic. 2 ceramic concentrations/pot drops, with 43 buffware body sherds. | Lithic Quarry/Pot Drop; Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-JR-033 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC can scatter consisting of 4 food and beverage cans. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-JR-038 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. Complex lithic scatter (n= 17) consisting of flakes, core, and tested cobbles, located within and surrounding 1 locus. | Lithic Quarry | Qa6, Qpv | Additional information required |
| PVM-JR-039 | New | URS Corp. 2011 | Historic | Historic. 1.5 acres. Refuse scatter consisting of 34 glass and cans. | DTC food related refuse | Qa6, Qw | Eligible contributor to DTCCL |
| PVM-JR-042 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Food and beverage containers, metal hardware and ammunition casings (n=4) likely associated with WWII era training activities. | DTC food related refuse | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-JR-043 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Food and beverage containers including B-Unit cans from military-issued C-Rations, sanitary cans, 1 metal canister (n=8), and 3 excavated depressions (foxholes) likely associated with WWII era training activities. | DTC maneuvers | Qa6 | Not evaluated |
| PVM-JR-045 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Food and beverage containers including B unit can from military-issued C-rations, sanitary can lids, bottle caps, meat can and sanitary juice can (n=12). Likely associated with WWII era training activities. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-JR-046 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Food and beverage containers including B unit cans from military-issue C-rations, knife-opened sanitary can and vent-hole milk cans (n=7). Likely associated with WWII era training activities. | DTC food related refuse | Qa6, Qw | Not evaluated |
| PVM-JR-047 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Food and beverage containers including cans and glass bottles (n=10) and 1 excavated depression (foxhole), likely associated with WWII era training activities. | DTC maneuvers | Qa6 | Not evaluated |
| PVM-JR-048 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Food and beverage containers including pull tab-opened bimetal beverage cans, a church key-opened beverage can, a C-ration can, and a sanitary can lid (n=7). Likely associated with WWII era training activities. | DTC food related refuse | Qw | Not evaluated |

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|---|---|---|---|---|---|---|---|
| PVM-JR-049 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Historic era common household refuse scatter including, cans, glass bottles, metal, ceramic, and rubber (n=75). 1 artifact concentration present. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-JR-050 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.1 acre. 1 isolated prehistoric tested cobble. Historic component consists of 2 C-ration can lids and 1 excavated depression (foxhole) and associated push-pile, likely associated WWII era training activities. | Isolated lithics; DTC maneuvers | Qa6 | Not evaluated |
| PVM-JR-055 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.2 acres. 2 isolated prehistoric lithic flakes. Historic-era food and beverage containers including key wind C-ration lids, hole-in-cap cans, motor oil cans, vent hole cans, sanitary cans, and a key strip-opened lid (n=12). Likely associated WWII era training activities. | Isolated lithics; DTC food related refuse | Qa3, Qa6 | Not evaluated |
| PVM-JR-057 | New | URS Corp. 2011 | Multi-component | Multi-component. 13.9 acres. Prehistoric lithic quarry/workshop with 2 segregated reduction loci, 2 lithic scatter loci, 1 multiple reduction locus, and 1 ceramic concentration/pot drop. Artifacts include debitage, cores, tested cobbles, and hammerstones. This historic component includes 4 excavated depressions (foxholes), 1 historic thermal feature, 1 disturbed survey marker, and 1 rock cluster. Historic artifacts include cans, can parts, metal, and glass, some in 1 refuse locus. | Lithic Quarry/Pot Drop | Qa3, Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-JR-058 | New | URS Corp. 2011 | Historic | Historic. 0.5 acres. Primarily historic-era food and beverage containers including cans, glass bottles and bottle bases, ceramic fragments, and miscellaneous historic automotive parts and metal objects (n=1,295). Mainly in 1 locus. Likely common household refuse dating to between 1930s and 1970s. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-JR-059 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acres. 1 excavated depression (foxhole), likely associated with WWII era training activities. | DTC maneuvers | Qa3 | Not evaluated |
| PVM-JR-060 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.1 acres. Lithic quarry/workshop with 1 segregated reduction locus (n=12). 2 WWII era excavated depressions (foxholes), likely associated with military training activities. | Lithic Quarry; DTC maneuvers | Qa3 | Not evaluated |
| PVM-JR-061 | New | URS Corp. 2011 | Historic | Historic. 0.1 acres. Historic era food and beverage containers including metal cans and glass (n=57). Likely common household refuse dating to between or after 1929-1950. | Historical refuse (non-military) | Qa3 | Not evaluated |
| PVM-JR-062 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.1 acres. Prehistoric lithic quarry/workshop with 1 segregated reduction locus (n=15). Historic component consists of 1 spent blank shell casing, and 1 metal pipe fragment. | Lithic Quarry; Isolated historic artifacts | Qa3 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-JR-063 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.5 acres. Prehistoric lithic quarry/workshop (n=58) with 3 segregated reduction loci and 1 lithic scatter locus. 3 metal historic artifacts. | Lithic Quarry; DTC maneuvers | Qa3 | Not evaluated |
| PVM-JR-064 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Historic-era food and beverage containers, including pull tab-opened bimetal beverage cans, rotary-opened sanitary cans, and glass bottles (n=6). 1 modern rock cluster also present. | Historical refuse (non-military) | Qa3 | Not evaluated |
| PVM-JR-066 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. Refuse scatter, 8 cans. | Historical refuse (non-military) | Qw | Not eligible |
| PVM-JR-067 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, 5 flakes. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-003 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 3.9 acres. Lithic quarry/workshop, with 603 lithic artifacts and 17 loci (6 lithic scatter and 11 segregated reduction). 1 Tizon Brown Ware ceramic sherd also present. | Lithic Quarry | Qa3 | Additional information required |
| PVM-MK-004 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.7 acres. Lithic quarry/workshop, with 102 lithics and 7 loci (6 segregated reduction and 1 lithic scatter). Early-stage bifaces and groundstone present. | Lithic Quarry | QTmw | Additional information required |
| PVM-MK-006 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter, 5 food and beverage cans. | Historical refuse (non-military) | Qw | Not eligible |
| PVM-MK-007 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Refuse scatter, 5 food and beverage cans. | Historical refuse (non-military) | Qw | Not eligible |

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## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-MK-008 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.2 acres. 1 isolated prehistoric quartzite biface. Historic refuse scatter includes 7 food and beverage cans. | Isolated Lithic Artifacts; Historical refuse (non-military) | Qw | Not eligible; Not eligible |
| PVM-MK-009 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.2 acres. Lithic quarry/workshop, with 162 lithics and 10 loci (8 segregated reduction and 2 lithic scatter). | Lithic Quarry | QTmw | Additional information required |
| PVM-MK-012 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop, with 31 lithics (flakes, shatter, tested cobbles, and a hammerstone). | Lithic Quarry | QTmw | Not eligible |
| PVM-MK-013 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.3 acres. Lithic quarry/workshop, with 21 lithics including flakes, shatter, tested cobbles, and a hammerstone. | Lithic Quarry | QTmw | Not eligible |
| PVM-MK-014 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with 37 lithics (flakes, shatter, core, tested cobbles, and an anvil) and 3 segregated reduction loci. 1 volcanic rock cluster feature also present. | Lithic Quarry/Cairn | QTmw | Eligible contributor to PTNCL |
| PVM-MK-015 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.7 acres. Lithic quarry/workshop, with low-density lithic scatter (n= 68) including flakes, cores, hammerstones, tested cobbles, and an anvil. Majority of lithics located outside of 2 segregated reduction loci. | Lithic Quarry | QTmw | Not eligible |
| PVM-MK-016 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop, with 14 lithics consisting of tested cobbles and flakes. | Lithic Quarry | QTmw | Not eligible |
| PVM-MK-017 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 11 lithics (flakes, cores, and tested cobbles). | Lithic Quarry | QTmw | Not eligible |

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## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-MK-018 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 8 lithics (tested cobbles and a core). | Lithic Quarry | QTmw | Not eligible |
| PVM-MK-019 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Low density artifact scatter (n=5), including 3 Colorado Buff Ware sherds, 1 primary flake and 1 tested cobble. | Artifact Scatter | QTmw | Not eligible |
| PVM-MK-020 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.6 acres. Lithic quarry/workshop, with 136 lithics (including flakes, tested cobbles, core, anvils, shatter, hammerstone, and a knife tool). 6 segregated reduction loci, with additional lithic scatter throughout site. | Lithic Quarry | QTmw | Not eligible |
| PVM-MK-033 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter, 10 glass bottles. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-MK-034 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter, 5 cans. | Historical refuse (non-military) | Qw | Not evaluated |
| PVM-MK-037 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. Low density refuse scatter (n= 43), including cans and glass. | Historical refuse (non-military) | Qw | Not eligible |
| PVM-MK-039 | New | URS Corp. 2011 | Historic | Historic. 0.4 acres. WWII era refuse scatter (n= 14), including 3 oil cans, 9 food and beverage cans, 1 wire screen, and 1 tire. | DTC food related refuse | Qw | Not evaluated |
| PVM-MK-040 | New | URS Corp. 2011 | Historic | Historic. 0.4 acres. WWII era refuse scatter (n= 14) includes 9 cans 2 can lids, and 3 metal parts. | DTC food related refuse | Qw | Not evaluated |
| PVM-MK-050 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. WWII era refuse scatter (n= 14) containing 4 cans and 10 glass jars or shards. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-MK-053 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Refuse scatter (n= 8) includes 6 cans (primarily food and beverage), 1 metal wire fragment, and 1 glass fragment. | Historical refuse (non-military) | Qw | Not evaluated |
| PVM-MK-055 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Refuse scatter (n= 6) includes 4 food and beverage cans, 1 glass shard, and 1 metal egg beater. | Historical refuse (non-military) | Qw | Not evaluated |
| PVM-MK-056 | New | URS Corp. 2011 | Multi-component | Multi-component. 3.0 acres. Lithic quarry/workshop; 458 artifacts primarily consisting of lithics (including flakes, shatter, cores, tested cobbles, handstones, and 6 utilized groundstone), along with 1 ceramic brown ware sherd. Distributed within and around 6 lithic scatter loci and 14 segregated reduction loci. 2 cleared circle features, likely prehistoric. 1 historic feature of an aerial surveying marker. | Lithic Quarry/Cleared Circle; Government survey marker | Qa6 | Not evaluated |
| PVM-MK-059 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Refuse scatter (n= 7) consists of 6 food and beverage cans and 1 wire spool. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-MK-060 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 83 flakes and shatter. Located within 1 segregated reduction locus. | Lithic Quarry | Qa6 | Not evaluated |
| PVM-MK-061 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 24 flakes and shatter located in 1 segregated reduction locus. | Lithic Quarry | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-MK-062 | New | URS Corp. 2011 | Historic | Historic. 0.6 acres. Refuse scatter (n= 726) includes 127 cans, 522+ glass, 31 metal, 40 spent cartridge casings, and 6 ceramic sherds. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-MK-075 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 4) includes 2 sanitary cans, 1 flour sifter, and 1 glass bottle. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-MK-077 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop, with 87 lithic artifacts (debitage, cores, cobbles, and hammerstones) and 3 lithic scatter loci. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-078 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Refuse scatter site, containing approximately 200 cans. | Historical refuse (non-military) | Qw | Not eligible |
| PVM-MK-080 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 11 lithic artifacts (flakes, cores, and a tested cobble) and 1 segregated reduction locus. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-082 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 2.6 acres. Lithic quarry/workshop with 304 lithic artifacts (including flakes, cores, cobbles, shatter, hammerstone, and fire-affected rocks) and 7 loci (5 lithic scatter and 2 segregated reduction). 2 thermal features present. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry/Processing | Qpv, Qw | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-MK-083 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.7 acre. Prehistoric component consists of a lithic quarry/workshop with 1 segregated reduction locus and 1 lithic scatter locus, surrounded by a sparse lithic scatter which includes 2 Buff Ware sherds. Historic component consists of 1 isolated sardine can. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry; Isolated Historic Artifacts | Qpv | Not eligible; Not eligible |
| PVM-MK-084 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with low density lithic scatter (n= 14) including flakes, cobbles, and a hammerstone. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-089 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.2 acres. Lithic quarry/workshop with 64 lithic artifacts (including flakes, cobbles, shatter, core, and hammerstones) and 4 loci (3 segregated reduction and 1 lithic scatter). Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-090 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 15 lithics including flakes and tested cobbles. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-MK-091 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 thermal feature of 60 fire affected rocks. No associated artifacts. Site located within boundary of previously surveyed CA-RIV-01750. | Processing | Qpv | Additional information required |
| PVM-MK-092 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.1 acre. Prehistoric component consists of lithic quarry/workshop, with 67 lithics (flakes, cobbles, cores, shatter, and hammerstone) and 2 segregated reduction loci. Historic component consists of 1 isolated tobacco tin. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry; Isolated Historic Artifacts | Qpv, Qw | Not eligible; Not eligible |
| PVM-MK-095 | New | URS Corp. 2011 | Historic | Historic. 1.7 acres. 2 berm features associated with military use. Site located within boundary of previously surveyed CA-RIV-01750. | DTC Maneuvers | Qw | Additional information required |
| PVM-MK-096 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 2.1 acres. Lithic quarry/workshop, with 62 lithics (including flakes, cores, tested cobbles, and hammerstones). 1 lithic scatter locus surrounded by sparse lithic scatter. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv, Qw | Not eligible |
| PVM-MK-097 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with low density lithic scatter (n= 28) containing flakes, cores, tested cobbles, and hammerstones. One fossilized bone fragment also present. | Lithic Quarry | Qm, Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-MK-098 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with low density lithic scatter (n= 40) including flakes, cores, tested cobbles, anvils, and hammerstones. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-099 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with low density lithic scatter (n= 11) including flakes and tested cobble. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-106 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.6 acres. 3 isolated prehistoric lithic artifacts. Historic refuse scatter includes 10 cans. | Isolated Lithic Artifacts; Historical refuse (non-military) | Qpv | Not eligible; Not eligible |
| PVM-MK-108 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 7 lithics (flakes, shatter, core, and hammerstone) in 1 segregated reduction locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-113 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 13) including 3 cans, 7 metals, 1 glass, 1 wooden lid, and 1 ceramic dish. | Historical refuse (non-military) | Qpv | Not eligible |
| PVM-MK-115 | Updated | Mooney, Jones & Stokes 2005 ; URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Ceramic concentration/pot drop of dull plainware (n= 45). 1 quartzite primary flake also present. | Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-MK-116 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 thermal feature composed of 35 fire affected rocks. No associated artifacts. | Processing | Qpv | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-MK-117 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop, with 27 buffware sherds and 1 loci. 1 tested cobble also present. 2 thermal cobble features. | Processing/ Pot Drop | Qpv | Additional information required |
| PVM-MK-119 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Thermal feature site with 15 Colorado River cobbles. No associated artifacts. | Processing | Qpv | Additional information required |
| PVM-MK-121 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop (n= 31). 30 body sherds and 1 rim sherd located in two loci. | Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-MK-124 | New | URS Corp. 2011 | Multi-component | Multi-component. 1 acre. Prehistoric component includes lithic quarry/workshop, with flakes and tested cobbles (n= 15), and 1 thermal feature. Historic component (n= 15) includes 12 cans, 1 glass, 1 jar, and 1 cable. | Lithic Quarry/Processing; DTC food related refuse | Qpv | Additional information required; Eligible contributor to DTCCL |
| PVM-MK-128 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. 14 WWII-era artifacts, including 10 cans, 2 can lids, 1 plastic, and 1 metal nail. Thermal feature containing burned soil and charcoal also present. | DTC food related refuse | Qpv | Eligible contributor to DTCCL |
| PVM-MK-129 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.7 acres. Prehistoric component includes 3 isolated lithics (1 flake and 2 hammerstones). Historic artifacts include 4 cans. | Isolated Lithic Artifacts; DTC food related refuse | Qa6, Qpv | Not eligible; Eligible contributor to DTCCL |
| PVM-MK-130 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.1 acre. 1 prehistoric thermal feature. Historic era food and beverage containers include 4 cans and can lids. | Processing; Historical refuse (non-military) | Qa6 | Additional information required; Eligible contributor to DTCCL |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
# CULTURAL RESOURCES TABLE A-3
# Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-MK-131 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.7 acres. 1 isolated prehistoric core.10 historic food and beverage cans. | Isolated Lithic Artifacts; Early 20th century refuse scatter | Qa6 | Not eligible; Not eligible |
| PVM-MK-134 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 3 lithic flakes. 1 thermal feature that contains ten fire-affected rocks. | Processing | Qpv | Additional information required |
| PVM-MN-069 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with scatter (n= 18) including flakes, shatter, cores, anvil, and hammerstones. 1 locus. | Lithic Quarry | Qa3 | Additional information required |
| PVM-MN-070 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. WWII era refuse (n= 20) including cans, metal and rubber. | DTC Maneuvers | Qa3 | Additional information required |
| PVM-MN-075 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. Prehistoric lithic quarry/workshop, with 28 lithic artifacts mainly in 1 groundstone scatter locus. Evidence of groundstone manufacture. 2 historic mining pit features. | Groundstone Quarry; Historic mining | TRqm, Qa3 | Additional information required; Additional information required |
| PVM-MN-076 | New | URS Corp. 2011 | Undetermined | Undetermined. < 0.1 acre. 1 rock cairn. No associated artifacts. | Cairn | Qa3 | Additional information required |
| PVM-MN-077 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter (n= 127) including flakes, cobbles, blanks, hammerstone. Evidence of groundstone manufacture. | Groundstone Quarry | Qa3 | Eligible |
| PVM-MN-078 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 468m long, north-south. | Trail | TRqm | Eligible contributor to PTNCL |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
# CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-MN-080 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter and groundstone (n= 63) consisting of flakes, cobbles, hammerstone, groundstone preform, and pestle. Evidence of groundstone manufacture. 3 single reduction loci. | Groundstone Quarry | Qa3 | Additional information required |
| PVM-MN-081 | New | URS Corp. 2011 | Undetermined | Undetermined. < 0.1 acre. Free standing rock structure feature on rock outcrop. No associated artifacts. | Rock structure | TRqm | Additional information required |
| PVM-MN-082 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter (n= 38) including shatter and cobbles; 1 locus. 1 prehistoric cairn feature. | Lithic Quarry | TRqm | Additional information required |
| PVM-MN-086 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. WWII era refuse (n= 11) consisting of spent blanks | DTC Maneuvers | Qa3 | Eligible contributor to DTCCL |
| PVM-MN-087 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. WWII era refuse (n= 8) consists of military-issued cans. 1 DTC maneuver (foxhole) feature also present. | DTC Maneuvers | TRqm | Eligible contributor to DTCCL |
| PVM-MN-089 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Prospecting pit feature. | Historic mining | TRqm | Not eligible |
| PVM-MN-090 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 prehistoric rock cairn feature. | Cairn | TRQm | Eligible contributor to PTNCL |
| PVM-MN-091 | New | URS Corp. 2011 | Undetermined | Undetermined. < 0.1 acre. 1 cairn feature. | Cairn | Qa3 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-MN-092 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.3 acres. Prehistoric component consists of lithic quarry/workshop, with 3 lithic scatter loci. Evidence of groundstone manufacture. Historic artifacts (n= 9) including wire, metal, and sapling poles. 1 rock feature of undetermined function. | Lithic Quarry; Historical refuse (non-military) | TRqm, Qa3 | Additional Information Required; Not Eligible |
| PVM-MN-094 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 55 meters, east-west. | Trail | TRqm, Qa3 | Eligible contributor to PTNCL |
| PVM-MN-102 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 1 DTC maneuver pit feature | DTC Maneuvers | TRqm | Eligible contributor to DTCCL |
| PVM-MN-103 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse (n= 4) including cans and wire. | DTC food related refuse | Qa3 | Eligible contributor to DTCCL |
| PVM-MN-108 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 11 flakes and 1 segregated locus. | Lithic Quarry | Qa3 | Additional information required |
| PVM-MN-112 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 1 rock cairn feature | Cairn | Qa3 | Additional information required |
| PVM-MN-126 | New | URS Corp. 2011 | Historic | Historic. 1.9 acres. Refuse (n= 59) includes cans, glass, ceramics, metal, and automobile parts, with 1 historic refuse scatter locus. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-MN-127 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 21 flakes in 1 segregated reduction locus. 1 additional slab milling stone located outside the locus. Unclear whether groundstone represents evidence of groundstone manufacture or utilized groundstone. | Lithic Quarry | Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-MN-128 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Low-density refuse scatter (n= 7) consisting of 6 food and beverage cans and 1 glass bottle. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-MN-131 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 21.9 acres. Lithic quarry/workshop, with 4,084 artifacts distributed within and surrounding 54 loci (31 lithic scatter, 21 segregated reduction, and 2 ceramic shatter). Lithics include flakes, shatter, cores, cobbles, and hammerstones. Groundstone and groundstone performs are also present; evidence of groundstone manufacture unclear. 2 ceramic concentrations/pot drops, with 84 Colorado Buff Ware sherds. 1 thermal feature. Site crossed by prehistoric trail PVM-MN-132. | Lithic Quarry/Processing/Pot Drop | Qpv | Not evaluated |
| PVM-MN-132 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail, 170 meters. Dissects site PVM-MN-131. | Trail | Qpv | Not evaluated |
| PVM-MN-133 | New | URS Corp. 2012 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter includes 12 flakes. 1 groundstone perform (pestle blank), evidence of groundstone manufacture. | Groundstone Quarry | Qa6, Qpv | Not evaluated |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-141 | New | URS Corp. 2011 | Multi-component | Multi-component. 7.9 acres. 787 total artifacts. Prehistoric component consists of lithic quarry/workshop, with cores, shatter, cobbles, hammerstones, and core tools distributed within and surrounding 7 loci. Historic refuse (n= 320) includes cans and parts, glass, ceramics, automobile parts, metal stove part, kiln brick fragments, recliner chair frame, and a tire; located within 1 historic refuse locus. | Lithic Quarry; Historical refuse (non-military) | Qa6, Qpv | Not evaluated |
| PVM-MN-144 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; lithic scatter (n=14) includes flakes, shatter, and a hammerstone. | Lithic Quarry | Qpv | Not evaluated |
| PVM-MN-146 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.7 acres. Prehistoric component consists of isolated quartzite secondary flake. Historic WWII era refuse scatter is comprised of 13 food and beverage cans and lids. | Isolated lithics; DTC food related refuse | Qa6 | Not evaluated |
| PVM-MN-148 | New | URS Corp. 2011 | Historic | Historic. 0.7 acres. Refuse scatter (n=12) includes 10 cans and lids, 1 glass bottle, and 1 metal automotive exhaust pipe. Modern debris also present. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-MN-149 | New | URS Corp. 2011 | Historic | Historic. 0.8 acres. Refuse scatter (n= 24) primarily consisting of food and beverage cans and lids, along with 1 steel box and 1 glass jug. | DTC food related refuse | Qw | Not evaluated |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-MN-150 | New | URS Corp. 2011 | Historic | Historic. 3.9 acres. WWII era refuse scatter (n= 45) primarily consists of food and beverage cans and can parts. Other artifacts include oil cans, metal bucket fragment, and brass bullet casing. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-MN-152 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse (n= 12) including glass, wood, metal, and bullets. | Historical refuse (non-military) | Qw | Not eligible |
| PVM-MN-155 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. DTC refuse scatter (n= 15) including cans, metal, and a boot heel. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-156 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.7 acres. Prehistoric component consists of lithic quarry/workshop (n=7), including flakes and cobbles. WWII era refuse (n= 12) including 11 cans and 1 glass. | Lithic Quarry; DTC food related refuse | Qa6 | Additional information required; Eligible contributor to DTCCL |
| PVM-MN-157 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.2 acres. Prehistoric lithic scatter (n= 2) consisting of 1 flake and 1 cobble. Historic refuse including 9 cans and can parts. | Isolated Lithic Artifacts; DTC food related refuse | Qa3 | Additional information required; Eligible contributor to DTCCL |
| PVM-MN-159 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. WWII era refuse, including 8 cans. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-161 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. WWII era refuse, including 10 cans | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-162 | New | URS Corp. 2011 | Historic | Historic. 0.4 acres. WWII era refuse, including 8 cans | DTC food related refuse | Qa6, Qw | Additional information required |
| PVM-MN-500 | New | URS Corp. 2012 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 9 lithics include flakes, core, and hammerstone. Primarily located within 1 segregated reduction locus. | Lithic Quarry | Qpv | Not evaluated |

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## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-501 | New | URS Corp. 2012 | Historic | Historic. < 0.1 acre. Mid-20th century refuse (n= 35) consisting of ceramic insulator fragments, wood, and wire. | Mid-20th century refuse | Qpv | Not eligible |
| PVM-MN-503 | New | URS Corp. 2012 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop; lithics (n= 24) include cobbles, shatter, and flakes. 8 lithics located within 1 lithic scatter locus. | Lithic Quarry | Qpv | Not evaluated |
| PVM-MN-504 | New | URS Corp. 2012 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; scatter (n= 4) includes flakes and cobbles | Lithic Quarry | Qpv | Not eligible |
| PVM-MN-509 | New | URS Corp. 2012 | Historic | Historic. < 0.1 acre. 2 DTC features, including 1foxhole and 1 defensive position rock cluster. 1 can lid also present. | DTC maneuvers | Qa6 | Not evaluated |
| PVM-MN-510 | New | URS Corp. 2012 | Prehistoric | Prehistoric. 0.2 acres. 226 lithic and groundstone artifacts (including 20 pestle preforms), primarily located in 4 lithic scatter loci. Evidence of groundstone manufacture. 1 rock ring feature. | Groundstone Quarry | TRqm | Eligible |
| PVM-MN-511 | New | URS Corp. 2012 | Historic | Historic. < 0.1 acre. Refuse includes 2 cans 1 glass bottle. 5 features include 3 DTC foxholes and 2 rock lines (1 DTC-related and 1of undetermined age). DTC footpath traverses site. | DTC maneuvers | Qa6 | Not evaluated |
| PVM-MN-513 | New | URS Corp. 2012 | Historic | Historic. < 0.1 acre. USGS brass cap bench mark feature. No date. | Government survey marker | Qa6 | Not evaluated |

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## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-514 | New | URS Corp. 2012 | Historic | Historic. 0.8 acres. Refuse (n= 33) includes metal sided oil cans, food and beverage cans, and glass bottles/jars. Primarily located within 1 historic debris locus. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-PM-001 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop with 14 flakes and 1 segregated reduction locus. | Lithic Quarry | Qa3 | Additional information required |
| PVM-PM-002 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.8 acres, Lithic quarry/workshop, with 39 lithic artifacts (flakes and cores) and 2 segregated reduction loci. 1 feature consists of a possible modern rock hammer made from river cobbles. | Lithic Quarry | Qa3 | Additional information required |
| PVM-PM-003 | New | URS Corp. 2011 | Prehistoric | Prehistoric.0.2 acres. Lithic quarry/workshop, with 8 lithics (mostly debitage and a tested cobble). | Lithic Quarry | Qa3 | Additional information required |
| PVM-PM-004 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop, with 11 flakes and 1 segregated reduction locus. | Lithic Quarry | Qa3 | Additional information required |
| PVM-PM-005 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry workshop; lithic scatter (n= 14), with 1 lithic scatter locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-007 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.2 acres. Cobble terrace quarry (n = 122) with 2 lithic scatter loci and by a low density artifact scatter including 1 projectile point and 1 biface. 28 ceramic sherds. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-008 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse site (n= 10) including 1 ceramic sherd, 3 glass, and 6 cans. | Historical refuse (non-military) | Qpv | Not eligible |

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## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-PM-009 | Updated | Imperial Valley College Museum 1978; Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001, URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 16 lithics (flakes, shatter, and cobble) and 1 lithic scatter locus. Located within boundary of previously surveyed CA-RIV-01751. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-012 | Updated | Imperial Valley College Museum 1978; Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001, URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 4 flakes and shatter. 1 hearth feature of unknown temporal association. Located within boundary of previously surveyed CA-RIV-01751. | Lithic Quarry/Processing | Qpv | Additional information required |
| PVM-PM-013 | Updated | Imperial Valley College Museum 1978; Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001, URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 4 lithics (1 flake and 3 tested cobbles). Located within boundary of previously surveyed CA-RIV-01751. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-017 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop. Lithic scatter (n= 18) consists of flakes, cores, and tested cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-020 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 44 lithics (including flakes, shatter, core, and cobbles) and 3 segregated reduction loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-021 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse, 5 cans. | Historical refuse (non-military) | Qa6 | Not eligible |
| PVM-PM-022 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse, 98 cans. | DTC Maneuvers | Qpv | Eligible contributor to DTCCL |
| PVM-PM-029 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Refuse, 8 cans and glass | Historical refuse (non-military) | Qpv | Not eligible |

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## CULTURAL RESOURCES TABLE A-3
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|---|---|---|---|---|---|---|---|
| PVM-PM-091 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 21 lithics including flakes, shatter, cores, and cobbles. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-092 | New | URS Corp. 2011 | Historic | Historic. 1.0 acre. Refuse scatter (n= 206) including cans, glass, and miscellaneous debris. 1 locus. | Historical refuse (non-military) | Qm | Not eligible |
| PVM-PM-096 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 15 lithics (flakes, shatter, cobbles) and 1 lithic scatter locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-097 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.5 acres. Lithic quarry/workshop, with 16 artifacts and 1 lithic scatter locus. Lithic scatter (flakes shatter cobbles hammerstone) and ceramics/pot drop (Buff Ware, rim sherds). Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-098 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop; 42 lithics (including flakes, shatter, cobbles, and hammerstone) and 1 segregated reduction locus. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-100 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; 26 lithics (flakes, shatter, cores, cobbles, hammerstone) and 1 lithic scatter locus. | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

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|---|---|---|---|---|---|---|---|
| PVM-PM-102 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.7 acres. Lithic quarry/workshop; 175 lithics (flakes, shatter, cobbles, cores, hammerstones, and anvil) and 3 lithic scatter loci. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-103 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; 44 lithics (flakes, shatter, cobbles, core, anvils) and 2 lithic scatter loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-104 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.6 acres. Lithic quarry/workshop; 170 lithics (flakes, shatter, cores, cobbles, hammerstones, and anvils) and 4 lithic scatter loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-107 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop; lithic scatter (n= 11) includes flakes, shatter, cobbles, and hammerstone. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-108 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; 26 lithics (including flakes, cobbles, hammerstone, and anvils) and 1 segregated reduction locus. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-109 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop; 38 lithics (flakes, cobbles, core, and hammerstone) and 1 lithic scatter locus. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-110 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; lithics (n= 12) include flakes and tested cobbles. Site located within boundary of previously surveyed CA-RIV-01750. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-111 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Low density artifact scatter, mainly of Buff Ware ceramics and some lithics (n=18). Possible deflated ceramic concentration/pot drop. Site located within boundary of previously surveyed CA-RIV-01750. | Artifact Scatter | Qpv | Not eligible |
| PVM-PM-112 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop; lithic scatter (n= 5) includes flakes, cobbles, and an anvil. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-113 | New | URS Corp. 2011 | Multi-component | Multi-component. 13.5 acres. The prehistoric component consists of 7 segregated reduction loci, 6 lithic scatter loci, 1 thermal feature, at least 1 ceramic concentration/pot drop, surrounded by a low density lithic scatter (n=834). The historic component consists of 1 historic debris concentration of metal and glass likely dating from the 1920s (n=13). | Lithic Quarry/Processing/Pot Drop; Early 20th century refuse scatter | Qpv | Additional information required; Not eligible |
| PVM-PM-114 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; lithic scatter (n= 17) includes flakes, cobbles, and cores. | Lithic Quarry | Qm, Qpv | Additional information required |
| PVM-PM-115 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop; artifact scatter (n= 67) includes flakes, cores, shatter, cobbles, anvil, and isolated ceramic sherd. | Lithic Quarry | Qm, Qpv | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-116 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; lithic scatter (n= 9) includes flakes, cobbles, and cores. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-118 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Historic DTC refuse (n= 10), including cans and metal scrap | DTC food related refuse | Qpv | Eligible contributor to DTCCL |
| PVM-PM-119 | New | URS Corp. 2011 | Multi-component | Multi-component. 3.2 acres. 198 total artifacts. Prehistoric lithic scatter includes flakes, shatter, core, and cobbles; 1 segregated reduction locus. WWII era refuse includes cans, lids, glass, ceramics, and wood; 1 historic refuse scatter locus. | Lithic Quarry; DTC food related refuse | Qpv | Not eligible; Eligible contributor to DTCCL |
| PVM-PM-120 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 2.1 acres. Lithic quarry/workshop; lithic scatter (n= 45) includes flakes, cobbles, and hammerstone. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-125 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 9.5 acres. Lithic quarry/workshop, with 3 lithic scatter loci. Lithics (n= 144) include flakes, shatter, cores, cobbles, and hammerstones. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-127 | New | URS Corp. 2011 | Multi-component | Multi-component. 3.3 acres. 63 artifacts. Prehistoric component consists of lithic quarry/workshop including flakes, cobbles, and cores. WWII era refuse includes cans and tires; 1 locus with 9 cans. 4 excavated depression features are likely trenches used for DTC maneuvers. | Lithic Quarry; DTC food related refuse | Qpv | Not eligible; Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-131 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 19 lithics (including flakes, cores, cobbles) and 1 segregated reduction locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-132 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with lithic scatter (n= 9) including flakes, cores, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-133 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. Refuse, 13 cans. | Historical refuse (non-military) | Qpv | Not eligible |
| PVM-PM-136 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop; lithic scatter (n= 17) includes flakes, cores, cobbles, and anvils. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-138 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.4 acres. 1 isolated prehistoric hammerstone. WWII era refuse (n= 14) includes cans and munitions. | Isolated Lithic Artifacts; DTC Maneuvers | Qpv | Not eligible; Additional information required |
| PVM-PM-140 | New | URS Corp. 2011 | Multi-component | Multi-component. Site is 0.2 acres. 1 isolated prehistoric tested cobble. WWII era refuse including cans, glass, metal; 1 historic refuse locus. | Isolated Lithic Artifacts; DTC food related refuse | Qpv | Not eligible; Additional information required |
| PVM-PM-142 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop; lithic scatter (n= 12) includes flakes, cores, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-143 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse (n= 5) consisting of cans, metal, and bottles. | Historical refuse (non-military) | Qpv | Not eligible |
| PVM-PM-144 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; lithic scatter (n= 5) consists of flakes, cobbles, hammerstone, and shatter. | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-146 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 1 lithic scatter loci surrounded by a low density lithic scatter (n=23). 1 thermal feature. | Lithic Quarry/Processing | Qpv | Additional information required |
| PVM-PM-147 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop; lithic scatter (n= 11) includes flakes and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-149 | New | URS Corp. 2011 | Historic | Historic.0.2 acres. Historic DTC refuse (n= 14) includes cans and lids. | DTC food related refuse | Qpv | Eligible contributor to DTCCL |
| PVM-PM-150 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Historic DTC refuse (n= 6) including cans and metal. 1 DTC road feature. | DTC Maneuvers | Qpv | Eligible contributor to DTCCL |
| PVM-PM-151 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop, with 94 lithics including flakes, cobbles, cores, and hammerstones. Distributed within and surrounding 3 segregated reduction loci and 1 lithic scatter locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-154 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 thermal feature consisting of fire affected rock. | Processing | Qpv | Additional information required |
| PVM-PM-156 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0 .1 acre. 1 prehistoric thermal feature and 1 historic feature consisting of 3 cut tree stumps. | Processing; Unknown historic | Qpv | Additional Information Required; Additional Information Required |
| PVM-PM-158 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. DTC refuse (n= 11) consisting of cans and glass; 1 historic debris locus. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
# CULTURAL RESOURCES TABLE A-3
# Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-159 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop; 35 lithics include flakes, shatter, cores, texted cobbles, and anvils. Distributed within and surrounding 3 loci (2 segregated reduction and 1 lithic scatter). | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-163 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 3 ceramic concentrations/pot drops of buff ware, red ware, and brown ware (n=95). | Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-PM-164 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. 12 segregated reduction loci, 13 lithic scatter loci, 1 ceramic concentration/pot drop, and 2 fire-cracked rocks surrounded by a low density lithic scatter (n=817). | Lithic Quarry/Pot Drop | Qpv | Additional information required |
| PVM-PM-166 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.8 acres. Lithic quarry/workshop, with 205 lithics including flakes, shatter, core, and cobbles. Distributed within and surrounding 4 lithic scatter loci. | Lithic Quarry | Qa6 | Additional information required |
| PVM-PM-167 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter, 15 glass bottles. | Mid-20th century refuse | QPv | Not eligible |
| PVM-SM-018 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 3 trail segments, 254 m long in total. | Trail | Qa3 | Eligible contributor to PTNCL |
| PVM-SM-020 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 thermal feature, possibly associated with nearby prehistoric trail (PVM-SM-018). | Processing | Qa3 | Additional information required |
| PVM-SM-021 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 1 historic cairn feature. | Cairn | Qa3 | Not eligible |
| PVM-SM-022 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Rock cairn feature that is a possible mining claim marker. | Mining claim marker | Qa3 | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-024 | New | URS Corp. 2011 | Prehistoric | Prehistoric.< 0.1 acre. Lithic quarry/workshop, with lithic scatter (n= 16) including flakes, shatter, core, and hammerstone. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-025 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. 1 prehistoric hammerstone. 2 historic artifacts (1 glass and 1 bailing wire). 1 rock alignment feature of undetermined function and temporal association. | Isolated Lithic Artifacts; Historical refuse (non-military) | TRqm, Qa3 | Additional Information Required; Additional Information Required |
| PVM-SM-027 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop; lithic scatter (n= 49) includes flakes, hammerstone, core, and shatter. Evidence of groundstone manufacture. 2 segregated reduction loci. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-080 | New | URS Corp. 2011 | Multi-component | Multi-component site. 2.1 acres. The prehistoric component consists of an isolated lithic multiple-platform core. The historic component consists of military refuse (n= 61), primarily food and beverage cans and bottles. Additional historic artifacts include vehicle parts and a 30-06 spent blank. 1 feature of a probable foxhole. | Isolated lithics; DTC maneuvers | Qa6 | Not evaluated |
| PVM-SM-083 | New | URS Corp. 2011 | Historic | Historic. 2.6 acres. DTC refuse scatter site, consisting of 64 food and beverage containers. 3 features include 1 foxhole and 2 circular pits. | DTC maneuvers | Qa3, Qa6 | Not evaluated |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-084 | New | URS Corp. 2011 | Multi-component | Multi-component. 1.6 acres. Prehistoric component consists of lithic quarry/workshop, with 393 lithics (including cores, cobbles, flakes, and hammerstone) primarily located in 4 lithic scatter loci. 1 thermal feature. The historic component consists of 3 cans. | Lithic Quarry/Processing; Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-SM-085 | New | URS Corp. 2011 | Multi-component | Multi-component. 31.5 acres. Prehistoric component consists of isolated volcanic tabular milling slab. Historic component consists of WWII era refuse (n= 72), including 54 cans, 3 glass, 5 munitions, 6 metal, and 4 batteries. 5 historic features include 4 probable defensive positions and 1 military hearth. | Isolated groundstone; DTC maneuvers | Qa6 | Not evaluated |
| PVM-SM-086 | New | URS Corp. 2011 | Historic | Historic. 0.6 acres. WWII era refuse scatter (n= 68), including 61 cans (primarily food and beverage), 6 miscellaneous metal, and 1 glass. Distributed within and surrounding one historic refuse scatter locus. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-SM-087 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 thermal hearth feature; no associated artifacts | Processing | Qa6 | Not evaluated |
| PVM-SM-088 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. U.S. General Land Office survey monument and adjacent collapsed rock cairn. Marking the quarter section of the southern edge of Section 34 within Township 7 south, Range 21 east. | Government survey marker | Qa3 | Not evaluated |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-092 | New | URS Corp. 2011 | Historic | Historic. 0.2 acre. WWII era refuse scatter, including 2 cans, 17 glass and fragments, 18 steel bindings, and 17 wire bindings. | DTC food related refuse | Qa6 | Not evaluated |
| PVM-SM-097 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter, 5 food and beverage cans. | Historical refuse (non-military) | Qa6 | Not evaluated |
| PVM-SM-098 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.3 acres. Prehistoric component consists of isolated quartzite hammerstone. Historic refuse scatter includes 14 food and beverage cans, pre- and WWII era. | Isolated lithics; DTC food related refuse | Qa6 | Not evaluated |
| PVM-SM-105 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 1 WWII era foxhole feature. Associated artifacts include 1 razor blade. | DTC maneuvers | Qa6 | Not evaluated |
| PVM-SM-106 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 1 WWII era foxhole feature. No associated artifacts. | DTC maneuvers | Qa6 | Not evaluated |
| PVM-SM-117 | New | URS Corp. 2011 | Historic | Historic. Linear feature, comprised of a hand-dug waterline ditch and associated berms. 2,795 feet long by 7 feet wide, north-south. | Historic irrigation | Qpv | Additional information required |
| PVM-SM-119 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.7 acres. Lithic quarry/workshop. 38 lithics (including flakes, cobbles, cores, and hammerstones), with the majority distributed outside 2 segregated reduction loci. | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-121 | New | URS Corp. 2011 | Historic | Historic. 0.7 acres. WWII era refuse (n= 39), primarily consisting of food and beverage cans and lids. Other artifacts present include glass bottle, steel jug, forks, file, steel mesh, wood, wire, and rubber boots. 4 features, including 1 excavated pit (tank defensive position) and 3 scatters of charcoal and ash. | DTC maneuvers | Qa6 | Not evaluated |
| PVM-SM-122 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.3 acres. Lithic quarry/workshop, with 85 lithics (including flakes, cores, cobbles, hammerstones) and 4 segregated reduction loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-SM-123 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.1 acres. Lithic quarry/workshop, with 140 lithics (including flakes, cores, cobbles, hammerstones) and 7 segregated reduction loci. | Lithic Quarry | Qpv | Additional information required |
| PVM-SM-124 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 2.4 acres. Lithic quarry/workshop; lithic scatter (n= 64) includes flakes, core, cobbles, and hammerstone. 2 thermal features. | Lithic Quarry/Processing | Qpv | Additional information required |
| PVM-SM-128 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic workshop/quarry; lithic scatter (n= 12) includes flakes, cores, and cobbles. | Lithic Quarry | Qpv | Not evaluated |
| PVM-SM-129 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. WWII era refuse (n= 4) consisting of 3 can lids and a glass ink bottle. 1 vehicle foxhole feature. | DTC maneuvers | Qpv | Not evaluated |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-3
## Archaeological Resources Identified in the Rio Mesa SEGF Vicinity but Excluded from the PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-131 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.5 acres. Lithic quarry/workshop, with 207 lithics (flakes, cores, cobbles, hammerstones, and core tools) and 5 segregated reduction loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-SM-132 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop; sparse lithic scatter (n= 20) includes 20 flakes, cores, cobbles, and hammerstones. | Lithic Quarry | Qpv | Not eligible |
| PVM-SM-134 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop; sparse lithic scatter (n= 12) includes flakes, core, and cobble. | Lithic Quarry | Qw | Not eligible |
| PVM-SM-135 | New | URS Corp. 2011 | Historic | Historic. 1 acre. WWII era and historic refuse scatter, 12 cans. | DTC food related refuse | Qpv, Qw | Eligible contributor to DTCCL |
| PVM-SM-136 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.9 acres. 532 artifacts. Prehistoric component consists of lithic quarry/workshop; 1 segregated reduction locus. Historic refuse includes food and beverage cans, glass, and miscellaneous items; 2 historic refuse scatter loci. | Lithic Quarry; Historical refuse (non-military) | Qpv, Qw | Not eligible; Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-00343 | Updated | Johnston et al. 1964; UC Riverside Anthropology Department 1978 & 1980; Mooney & Associates 2004; ICF Jones & Stokes 2008; URS Corp. 2011 | Multi-component | Multi-component. Trail segment,133 m, east-west; previous site record also mentions thermal hearth feature and historic cans. | Trail/ Processing; Historical refuse (non-military) | Qa6, Qpv | Additional information required; Not eligible |
| CA-RIV-00672 / 05539 | Updated | Imperial Valley College Museum 1978; URS Corp. 2011 [CA-RIV-5539 component: Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001] | Multi-component | Multi-component. 74 acres. 11,798 artifacts. Prehistoric lithic quarry/workshop and resource processing site with 180 lithic reduction loci, 4 thermal features, 2 rock piles, and 3 ceramic concentrations/pot drops. The site is crossed by a segment of prehistoric trail PVM-CB-016. Historic component consists of 2 refuse loci dating to the late 1950s or early 1960s; artifacts include cans, glass, and housewares. | Lithic Quarry/Processing/Pot Drop; DTC food related refuse | Qpv | Additional information required; Not eligible |
| CA-RIV-00673 | Updated | Imperial Valley College Museum 1974; University of California 1977; UC Riverside Anthropology Department 1980; Mooney and Associates 2004; Mooney/Jones & Stokes 2005; ICF Jones & Stokes 2008; URS Corp. 2011 | Multi-component | Multi-component. 0.6 acres. Prehistoric trail segment, 65 meters, east-west. WWII era artifact scatter with 4 cans. | Trail; DTC food related refuse | Qa6, Qpv | Eligible contributor to PTNCL; Eligible contributor to DTCCL |
| CA-RIV-00772 | Previous - Not Relocated | UC Riverside Anthropology Department 1980; Mooney and Associates 2004; Mooney/Jones & Stokes 2004/2005; ICF Jones & Stokes 2008; URS 2011 | Prehistoric | Prehistoric. Trail segments, 600 meters and 30 meters, east-west. Likely part of Coco-Maricopa Trail. Not relocated. | Trail | Qpv | Eligible contributor to PTNCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-00775 | Previous - Not Relocated | UC Riverside Anthropology Department 1980; Mooney and Associates 2004; Mooney/Jones & Stokes 2005; ICF Jones & Stokes 2008; URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 65 meters, northeast-southwest. Not relocated. | Trail | Qpv | Eligible contributor to PTNCL |
| CA-RIV-01095 | Updated | Imperial Valley College Museum 1974; San Bernardino County Museum 1976; URS Corp. 2011 | Multi-component | Multi-component. 66 acres. 5,275 total artifacts. Prehistoric lithic quarry/workshop with 130 lithic reduction loci and ceramic scatter. The WWII era historic component consists of 17 excavated depressions which may be foxholes, 1 tent pad, 1 tank maneuver area, tank tracks, roads, and 3 historic refuse loci. Artifacts include cans, glass, hardware, wood, housewares and metal. 12 rock clusters and 5 thermal features are of unknown temporal association. | Lithic Quarry; DTC Maneuvers | Qa6 | Additional information required; Eligible contributor to DTCCL |
| CA-RIV-01488 | Previous - Not Relocated | Imperial Valley College Museum 1978 | Prehistoric | Prehistoric. < 0.1 acre. 19 possible cleared circles, 1 trail segment, and 1 sherd of sand-tempered plain buffware. | Trail/Cleared Circle | Qa3 | Eligible contributor to PTNCL |
| CA-RIV-01490 | Previous - Not Relocated | Unknown | Prehistoric | Prehistoric. Trail segment, 1,609 meters, east-west. 1 piece of red jasper found in association. | Trail | Qa3, Qa6 | Eligible contributor to PTNCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| CA-RIV-01745 (P-33-001745) | Updated | Imperial Valley College Museum 1978; URS Corp. 2011 | Multi-component | Multi-component. 18 acres. 1,487 surface artifacts. Prehistoric component consists of lithic quarry/workshop, with 57 loci (28 segregated reduction, 22 multiple reduction, 3 ceramic scatter, and 4 lithic scatter). Ceramics include buff and brown ware (n= 124); 3 concentrations/potential pot drops. Historic artifacts consist of 7 cans and 2 pieces of wire. 1 rock ring feature also present. | Lithic Quarry/Pot Drop; Mid-20th century refuse | Qa6 | Additional information required; Not eligible |
| CA-RIV-01746 | Updated | Imperial Valley College Museum 1978; URS Corp. 2011 | Multi-component | Multi-component. 39 acres. 3,147 total artifacts. Prehistoric lithic workshop/quarry with multiple lithic tools, 1 thermal feature, 1 ceramic concentration/pot drop, 22 segregated reduction loci, 9 multiple reduction loci, 12 lithic scatter loci, and 1 ground stone manufacturing loci. Evidence of groundstone manufacture. 1 possible intaglio and 1 trail were not relocated. The historic component consists of 2 refuse loci; WWII era refuse and non-military refuse appears to be represented. 9 cleared circles identified in the 1970s of unknown function and temporal association. | Camp; DTC Maneuvers | QTmw | Additional Information Required; Not eligible |
| CA-RIV-01747 | updated | Imperial Valley College Museum 1978; URS Corp. 2011 | Prehistoric | Prehistoric. 6 trail segments, ranging in length from 46 to 187 meters. | Trail | Qa3, Qa6 | Eligible contributor to PTNCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-01748 / 01752 | Updated | Imperial Valley College Museum 1978; Mooney-Lettieri & Associates, Inc. 1984; URS Corp. 2011 | Multi-component | Multi-component. 2,241 acres. Over 27,750 total artifacts. Prehistoric component includes 19 thermal features, 7 cleared circles, 3 rock piles/cairns, 22 ceramic concentrations/pot drops (23 ceramic scatter loci), 174 segregated reduction loci, 22 multiple reduction loci, and 201 lithic scatter loci. Groundstone also present. Conflicting reports of a cremation. Extensive WWII era military refuse deposits and features including tank tracks, bulldozer scrapes, rock rings and trenches as well as non-military refuse deposits - cans, shoe soles, and metal. 4 historic refuse loci. | Camp; DTC Maneuvers | Qa3, QTMW, Qa6 | Additional information required; Eligible contributor to DTCCL |
| CA-RIV-01749 (P-33-001749) | Updated | Imperial Valley College Museum 1978; URS Corp. 2011 | Multi-component | Multi-component. 17.3 acres. Prehistoric component consists of lithic quarry/workshop (21 segregated reduction, 34 lithic scatter), 1 ceramic concentration/pot drop with 24 Colorado buff ware sherds, and 2 thermal features. 1 historic survey marker feature. | Lithic Quarry/Processing/Pot Drop; Government survey marker | Qpv | Additional information required; Not eligible |
| CA-RIV-01750 | Previous | Imperial Valley College Museum 1978 | Prehistoric | Prehistoric. Multiple campsites, with groundstone, 1 thermal feature, lithics, 1 ceramic concentration/pot drop, and hammerstones. | Camp | Qpv, Qw | Additional information required |
| CA-RIV-01819 | Updated | BLM 1980; Mooney & Associates 2004; Mooney/Jones & Stokes 2005; ICF Jones & Stokes 2008; Applied Earthworks 2011; URS Corp. 2011 | Multi-component | Multi-component. 0.9 acres. Prehistoric lithic quarry/workshop. 312 lithics include flakes, cores, cobbles, and hammerstone, with 3 loci (2 segregated reduction and 1 lithic scatter). Historic DTC refuse includes 9 cans. | Lithic Quarry; DTC food related refuse | Qa3, Qa6 | Additional information required; Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-01821 | Updated | BLM 1980; Mooney & Associates 2004; Mooney/Jones & Stokes 2005; ICF Jones & Stokes 2008; URS Corp. 2011 | Prehistoric | Prehistoric. No dimensions provided. Low density artifact scatter with 3 thermal features, 1 ceramic scatter, calcined bone and bisected by two previously recorded trail segments (CA-RIV-343T and CA-RIV-650T). | Processing | Qpv | Additional information required |
| CA-RIV-01822 | Updated | BLM 1980; Mooney & Associates 2004; Mooney/Jones & Stokes 2005; ICF Jones & Stokes 2008; URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Low -density artifact scatter with 1 ceramic concentration and 3 thermal features near previously recorded trail CA-RIV-00343. Calcined bone present. | Processing | Qa6, Qpv | Additional information required |
| CA-RIV-05533/05534/06616 | Updated | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001; URS Corp. 2011 | Multi-component | Multi-component. 101 acres. 8,210 total artifacts. Prehistoric component consists of lithic quarry/workshop, with cores, cobbles, flakes, hammerstones, shatter, preforms, and other lithics. 23 lithic scatter loci, 13 segregated reduction loci, and evidence of groundstone manufacture. 10 likely prehistoric features, including 8 thermal features. The historic component includes military and historic refuse, with 2 historic debris loci. 6 WWII era foxhole features, 2 historic and modern thermal features, and 1 rock cluster/cairn feature. | Lithic Quarry/Processing; DTC food related refuse | Qpv, Qw | Additional information required; Eligible contributor to DTCCL |
| CA-RIV-05538 (P-33-005809) | Updated | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001; URS Corp. 2011 | Multi-component | Multi-component. 7.3 acres. 482 artifacts.. Prehistoric component comprised of lithic quarry/workshop; 7 lithic scatter loci, 8 segregated reduction loci, and 1 undefined prehistoric locus. Historic artifacts located out of loci and include 6 military-related food and beverage cans. | Lithic Quarry; DTC food related refuse | Qpv | Additional information required; Eligible contributor to DTCCL |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| CA-RIV-05540/05541 | Updated | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001; URS Corp. 2011 | Prehistoric | Prehistoric. 16.1 acres. Lithic quarry/workshop, with 3,877 artifacts, including flakes, cores, cobbles, hammerstones, and ceramics. 76 loci (35 lithic scatter, 40 segregated reduction, and 1 lithic/ceramic scatter). 2 ceramic concentrations/pot drops, with 115 total sherds. | Lithic Quarry/Pot Drop | Qpv | Additional information required |
| CA-RIV-05542 | Previous - Not Relocated | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001 | Prehistoric | Prehistoric. 0.7 acres. Sparse lithic scatter (n= 16) of flakes and cobble cores. | Lithic Scatter | Qpv | Not eligible |
| CA-RIV-05543 | Previous - Not Relocated | Western Cultural Resource Management 1994; KEA Environmental, Inc./EDAW, Inc. 2000/2001 | Prehistoric | Prehistoric. 6 acres. Lithic quarry/workshop. Low density lithic scatter (n= 300), with 8 lithic reduction loci, 1 sherd of pottery. | Lithic Quarry | Qpv | Additional information required |
| CA-RIV-05551 | Previous - Not Relocated | Western Cultural Resource Management 1994 | Prehistoric | Prehistoric. 0.1 acre. Lithic scatter (n= 5) includes cores, cobble, and split pebble. | Lithic Scatter | Qpv | Not eligible |
| CA-RIV-06533/05531 | Updated | Western Cultural Resource Management 1994; Tierra Environmental Services 2000; KEA Environmental, Inc./EDAW, Inc. 2000/2001; URS Corp. 2011 | Multi-component | Multi-component. 6.3 acres. 561 artifacts. Prehistoric lithic quarry/workshop, with lithic artifacts including flakes, tested cobbles, shatter, cores, hammerstones, and anvils; 14 segregated reduction loci and 7 lithic scatter loci. Historic artifacts include cans, glass, and hardware; 1 historic refuse locus. One feature consists of a circular depression with raised berm. | Lithic Quarry; DTC Maneuvers | Qpv | Additional information required; Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| CA-RIV-06535 | Updated | Tierra Environmental Services 2000; URS Corp. 2011 | Prehistoric | Prehistoric. 1.5 acres. Two east-west trails, 40 meters and 80 meters, respectively. Lithic quarry/workshop with 1 segregated reduction locus containing 8 lithics. | Lithic Quarry/Trail | Qpv | Eligible contributor to PTNCL |
| CA-RIV-06613 | Updated | Tierra Environmental Services 2000; URS Corp. 2011 | Multi-component | Multi-component. 6.6 acres. Prehistoric component comprised of 3 ceramic concentrations/pot drops (n= 225 buffware sherds). Historic WWII era refuse includes cans, hardware, auto parts, and glass; 1 historic refuse locus. 2 rock rings and 1 pile of rocks with undetermined temporal association. | Pot Drop; DTC Maneuvers | TRqm, Qa6 | Additional information required; Eligible contributor to DTCCL |
| CA-RIV-06677 | Updated | KEA Environmental, Inc. 2000; URS Corp. 2011 | Multi-component | Multi-component. 13.6 acres. 861 total artifacts. Prehistoric component consists of lithic quarry/workshop; lithic artifacts include flakes, cores, cobbles, and shatter. 6 lithic scatter loci and 8 segregated reduction loci. Historical component primarily includes cans and jars, as well as ceramics, metal, and automotive. 2 historic refuse scatter loci and 2 historic scatter loci. | Lithic Quarry/Processing; Historical refuse (non-military) | Qa6, Qpv | Additional information required; not eligible |
| CA-RIV-07307 | Previous - Not Relocated | Western Cultural Resource Management 1994 | Prehistoric | Prehistoric. 0.1 acre. Lithic scatter (n= 5) consisting of cores, cobbles, and a split pebble. | Lithic Scatter | Qpv | Not eligible |
| CA-RIV-09012 | Updated | ICF Jones & Stokes 2008; URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 2 thermal features with no associated artifacts. | Processing | Qpv | Additional information required |
| CA-RIV-10020 | Recent | Applied Earthworks, Inc. 2011; URS Corp. 2011 | Historic | Historic. 0.1 acre. Low-density WWII-era refuse scatter, 20 cans/can fragments. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| DTC 2-Track Vehicles | New | URS Corp. 2011 | Historic | Historic. 35 two-track vehicle alignments associated with DTC activity, recorded throughout the project area. Tracks range from 6 to 2,995 feet in length. Overall fair condition, with many segments transected or followed by multiple military vehicles and OHV activities. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| DTC Tank Tracks | New | URS Corp. 2011 | Historic | Historic. 70 tank track alignments associated with DTC activity, recorded throughout the project area. Tracks range from 52 to 9,496 feet in length. Overall fair condition, with many segments transected or followed by multiple military vehicles and OHV activities. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-CB-006 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 30 lithic artifacts and 1 segregated reduction locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-CB-008 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. Lithic quarry/workshop, with 13 lithic artifacts and 1 segregated reduction locus. 1 historic five gallon can isolate. | Lithic Quarry; Isolated Historic Artifacts | Qa6 | Additional information required; Not eligible |
| PVM-CB-013 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop; 16 low density lithics including flakes, cores, hammerstones, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-CB-016 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 5 east-west trail segments, with a total length of 305 meters. | Trail | Qpv | Eligible contributor to PTNCL |
| PVM-CB-018 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 137 meters, east-west. | Trail | Qpv | Eligible contributor to PTNCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-CB-020 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Low density lithic scatter and 2 ceramic concentrations/pot drops of Salton Buff Ware (n=35). | Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-CB-021 | New | URS Corp. 2011 | Prehistoric | Prehistoric site. < 0.1 acre. Ceramic concentration/pot drop of 11 buff ware sherds and 1 lithic. | Pot Drop | Qa6, Qpv | Eligible contributor to PTNCL |
| PVM-CB-028 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 35.5 acres. 2 thermal features, 1 dirt mound, 47 segregated reduction loci, 33 lithic scatter loci, 14 ceramic concentration/pot drops, 1 cremation, and multiple lithic tools surrounded by a low density artifact scatter (n= 6,576). | Camp | Qa6, Qpv | Additional information required |
| PVM-CB-029 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic procurement and reduction site, with low density lithics (n= 9) including debitage and tested cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-CB-030 | New | URS Corp. 2011 | Multi-component | Multi-component. 46 acres. Prehistoric component consists of 1 thermal feature and 1 cleared circle. Lithic quarry/workshop with 30 segregated reduction loci, 18 lithic scatter loci, and multiple lithic tools surrounded by a low density lithic scatter. Historic component consists of low density WWII era artifact scatter. | Camp; DTC food related refuse | Qa6, Qpv, Qw | Additional information required; Eligible contributor to DTCCL |
| PVM-CB-049 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Low density refuse scatter (n=32), with 1 locus. Cans, metal, and 5 pieces of wood. | DTC food related refuse | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-DK-003 | New | URS Corp. 2011 | Multi-component | Multi-component. 319 acres. 12,370 total artifacts. Prehistoric lithic quarry/ workshop, with lithic scatter (including flakes, cobbles, hammerstones, and anvils) and 38 segregated reduction loci and 15 lithic scatter loci. 4 loci of ceramic concentrations/pot drops, with Colorado Buff Ware sherd counts of 26, 135, 24, and 69, respectively. 1 thermal feature, possibly prehistoric. Historic component primarily consists of food and beverage containers. Other historic artifacts include fuel, solvent, and oil containers; cans and tins; metal; wood; glass bottles; other household and automotive items. 13 historic refuse loci and 1 modern ceramic loci. 29 historic features include 18 excavated depressions, 4 berm piles, 1 55-gallon drum, 1 fence, 2 concrete/cement, 1 rock alignment, 1 thermal, and 1 wood. | Lithic Quarry/Pot Drop; DTC Maneuvers | Qa6, Qpv | Additional information required; Eligible contributor to DTCCL |
| PVM-DK-006 | New | URS Corp. 2011 | Multi-component | Multi-component. 270 square meters. Low density artifact scatter (n= 4). The prehistoric component consists of ceramics and lithics suggesting a small lithic quarry/workshop. The historic component consists of 1 sanitary can and 1 glass jar. | Artifact Scatter; Isolated Historic Artifacts | Qpv | Not eligible; Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-DK-011 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop, with 29 lithics (including flakes, cores, cobble, and hammerstone) and 3 segregated reduction loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-DK-014 | New | URS Corp. 2011 | Prehistoric | Prehistoric site. 0.2 acres. Lithic quarry/workshop, with 6 lithic artifacts (flakes, cobbles, and shatter) located within 1 single reduction locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-DK-015 | New | URS Corp. 2011 | Prehistoric | Prehistoric site. 0.5 acres. Lithic quarry/workshop, with 29 lithics (flakes, cobble, core, anvil, and hammerstone) and 2 segregated reduction loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-DK-017 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 11.3 acres. Lithic quarry/workshop, with 1,102 lithics (primarily flaked stone debitage) and 25 loci (19 segregated reduction and 6 scatter). Features include 1 thermal feature and 1 DTC tank tracks. | Lithic Quarry/Processing | Qpv, Qw | Additional information required |
| PVM-DK-018 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 70m long, east to west. | Trail | Qpv | Eligible contributor to PTNCL |
| PVM-DK-039 | New | URS Corp. 2011 | Historic | Historic. 153 acres. Refuse disposal site, with debris including cans, buckets, glass, metal, household items, and wood (n = 166). | Historical refuse (non-military) | Qpv | Not eligible |
| PVM-DK-040 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Low density lithic quarry/workshop, with 50 lithic (including flakes, cores, and cobble) and 1 locus. | Lithic Quarry | Qpv | Not eligible |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
# CULTURAL RESOURCES TABLE A-4
# Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-DK-045 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. 166 total artifacts. Prehistoric lithic quarry/workshop, with bone, ceramic, and lithic scatter. Ceramic concentration/pot drop (n= 39) of Colorado buff ware body sherds. 1 bone and lithic scatter loci; 1 ceramic and lithic scatter loci; and 1 lithic scatter loci. 5 associated prehistoric thermal features. Historic component primarily consists of food and beverage cans, with 1 historic refuse loci. | Camp; DTC food related refuse | Qpv | Additional information required; Eligible contributor to DTCCL |
| PVM-DK-047 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Low density artifact scatter (n= 112). 3 ceramic concentrations/pot drops located in 2 ceramic scatter loci and 1 ceramic and lithic scatter locus. | Pot Drop | Qa6 | Additional information required |
| PVM-DK-048 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail, 196 meters, east-west. | Trail | Qa6 | Eligible contributor to PTNCL |
| PVM-DK-049 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Low density refuse site, with food and beverage cans (n = 8). 1 historic debris locus. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-DK-508 | New | URS Corp. 2012 | Historic | Historic. < 0.1 acre. Household refuse (n= 53), primarily located in 1 historic debris locus. Artifacts include 9 oil cans, 31 food cans, 1 lid, 11 glass bottles, and 1 plate. | Historical refuse (non-military) | Qa6 | Not eligible |
| PVM-DT-001 | New | URS Corp. 2011 | Historic | Historic linear feature. Fenceline associated with DTC training activity in the 1940s, 13,656 feet in length, northeast to southwest. | DTC Maneuvers | Qa3, Qa5, Qa6, Qw | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-DT-002 | New | URS Corp. 2011 | Historic | Historic linear feature. 2 WWII era barbed wire alignments and wooden posts associated with military training in the area during the 1940s and 1960s. Alignments range from 7 to 2,675 feet in length. | DTC Maneuvers | Qpv | Eligible contributor to DTCCL |
| PVM-DT-003 | New | URS Corp. 2011 | Historic | Historic linear feature. DTC linear depressions and scrapes associated with military training in the area during the 1940s and 1960s. 9 alignments range from 79 to 1,594 feet in length. | DTC Maneuvers | QTmw | Eligible contributor to DTCCL |
| PVM-EK-030 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 23 lithic artifacts and 1 segregated reduction locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-EK-031 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 14 lithic artifacts (flakes, core, hammerstone, and cobble) and 1 locus. | Lithic Quarry | Qa3 | Additional information required |
| PVM-EK-032 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 4 food cans. | DTC food related refuse | Qw | Eligible contributor to DTCCL |
| PVM-EK-033 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 13 lithic artifacts (including flakes, shatter, cobble, and core) primarily located within 1 locus. | Lithic Quarry | Qw | Not eligible |
| PVM-EK-035 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 5 lithics consisting of flakes, core, and cobble. | Lithic Quarry | Qa6 | Additional information required |
| PVM-EK-036 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 26 lithic artifacts (flakes, shatter, and hammerstone) primarily located within 2 loci. | Lithic Quarry | Qa5 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-EK-038 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 11 sparse lithic artifacts, including flakes, shatter, and cobble. | Lithic Quarry | Qa6 | Additional information required |
| PVM-EK-039 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. Can scatter, 4 WWII-era food and beverage containers. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-EK-040 | New | URS Corp. 2011 | Multi-component | Multi-component. 5.2 acres. Prehistoric component (n= 390) consists of lithic quarry/workshop (308 lithics; 17 loci- 3 lithic scatter, 8 segregated reduction, and 6 multiple reduction) and ceramic concentration/possible pot drop (82 sherds; 1 locus). Historic component consists of 2 metal and 1 plastic artifacts and 3 sets of tank tracks. | Lithic Quarry/Pot Drop; DTC Maneuvers | Qa6 | Additional information required; Eligible contributor to DTCCL |
| PVM-EK-042 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter, 4 food and beverage cans. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-EK-043 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, 4 flakes. | Lithic Quarry | Qa6 | Additional information required |
| PVM-EK-046 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop (n=77) 2 segregated reduction loci and 1 lithic scatter locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-EK-051 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. 5 cans. | Mid-20th century refuse | Qa6 | Not eligible |
| PVM-EK-053 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.6 acres. Lithic quarry/workshop, 10 low density lithic scatter. | Lithic Quarry | Qa3, Qa6 | Additional information required |
| PVM-EK-057 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Scattered food and beverage cans (n= 8). | Historical refuse (non-military) | Qa3, Qa6 | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-EK-058 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 1 segregated reduction locus containing 6 lithics. | Lithic Quarry | Qa6 | Additional information required |
| PVM-JR-001 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Low density ceramic scatter, 44 Colorado Buff Ware sherds and 1 lithic. Possible deflated ceramic concentration/pot drop. | Artifact Scatter | Qa6 | Additional information required |
| PVM-JR-004 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 7 cans and 1 wooden lath. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-JR-005 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. Complex lithic scatter (n= 10). | Lithic Quarry | Qa6 | Additional information required |
| PVM-JR-007 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Low density artifact scatter, with a ceramic concentration/pot drop of 5 Colorado Buff Ware sherds and 3 lithics. | Pot Drop | Qa6 | Additional information required |
| PVM-JR-008 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acre. Low density artifact scatter (n=15) including ceramics and lithics. | Artifact Scatter | Qa6 | Additional information required |

## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-JR-012 | New | URS Corp. 2011 | Multi-component | Multi-component. 23 acres. 1,032 total artifacts. The prehistoric component consists of a lithic quarry/workshop, with flaked stone debitage as the primary constituent. Evidence of groundstone manufacture, and 1 thermal feature. Prehistoric loci include 30 segregated reduction, 2 ceramic scatter, 2 lithic scatter, and 2 multiple reduction. 2 ceramic concentrations/pot drops consist of Colorado buff ware sherds. Historic artifacts include glass, ceramics, metal, cans, and miscellaneous items; 1 historic refuse scatter locus. 4 historic features include 2 barbed wire fences, 1 RR tie set, and 1 cairn. | Lithic Quarry; DTC Maneuvers | Qa3, Qa6, Qw | Additional information required; Eligible contributor to DTCCL |
| PVM-JR-014 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with 44 lithics and 3 loci (2 segregated reduction and 1 lithic scatter). | Lithic Quarry | Qw | Not eligible |
| PVM-JR-015 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 18 lithics including flakes, core, cobbles, and percussion tools. | Lithic Quarry | Qa6 | Additional information required |
| PVM-JR-016 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.5 acres. Lithic quarry/workshop, with 27 lithics including flakes, cores, cobbles, and percussion tools. | Lithic Quarry | Qa6 | Additional information required |
| PVM-JR-018 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 4 lithics including core, cobbles, and an anvil. | Lithic Quarry | Qa6 | Additional information required |
| PVM-JR-019 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. Complex lithic scatter (n= 7) includes flakes, core, and cobble. | Lithic Quarry | Qa6 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-JR-020 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 19 lithics (flakes, core, cobble, shatter, and hammerstone) and 1 segregated reduction locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-JR-027 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Bottle scatter (n= 7). | Historical refuse (non-military) | Qw | Not eligible |
| PVM-JR-028 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. 2 isolated prehistoric flakes. Historic-era food and beverage container scatter, including 4 cans and 3 fragments. | Isolated Lithic Artifacts; Mid-20th century refuse | Qw | Not eligible; Not eligible |
| PVM-JR-029 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Complex lithic scatter (n= 15) including flakes, core, core tools, cobble, and hammerstone. 1 multiple reduction locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-JR-032 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Trash dump containing 7 cans, 2 glass bottle parts, and 30 brown bottle shards. | Mid-20th century refuse | Qpv | Not eligible |
| PVM-MK-021 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with low density lithic scatter (n= 21). | Lithic Quarry | Qa6 | Additional information required |
| PVM-MK-022 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 7 lithics including flakes and tested cobbles. | Lithic Quarry | Qa6 | Additional information required |
| PVM-MK-023 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 10 lithics (flakes, core, and tested cobbles) and 1 segregated reduction locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-MK-024 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.6 acres. Lithic quarry/workshop, with 86 lithic artifacts and 4 segregated reduction loci. | Lithic Quarry | Qa6 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-MK-025 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. Low density lithics (n= 10) include flakes and tested cobbles. | Lithic Quarry | Qa6 | Additional information required |
| PVM-MK-026 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Refuse scatter (n= 13), primarily consisting of historic-era food and beverage cans. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MK-027 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Low density refuse scatter (n= 5), primarily consisting of WWII-era food and beverage cans. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MK-028 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Low density DTC refuse scatter (n= 7) consisting of food and beverage can parts. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MK-029 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Refuse scatter (n= 92) including glass bottles, cans, housewares, and personal items. | Historical refuse (non-military) | Qa6 | Not eligible |
| PVM-MK-035 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.8 acres. Lithic quarry/workshop, with 175 lithic artifacts (including flakes, cores, cobbles, and groundstone) and 6 segregated reduction loci. 1 thermal feature also present. | Lithic Quarry/Processing | Qpv | Not eligible |
| PVM-MK-038 | New | URS Corp. 2011 | Historic | Historic. 0.5 acres. WWII era refuse scatter (n= 22) consisting of 20 cans and parts and 2 pieces of metal wire. | DTC food related refuse | Qw | Eligible contributor to DTCCL |
| PVM-MK-045 | New | URS Corp. 2011 | Historic | Historic. 1.5 acres. Refuse scatter (n= 40) primarily consisting of food and beverage cans, along with 3 glass, 2 barrels, 1 enamelware, 1 porcelain, and 1 tire. | DTC food related refuse | Qw | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MK-049 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. WWII era refuse scatter (n= 5) includes 3 cans, 1 glass, and 1 metal strapping. | DTC food related refuse | Qa6, Qw | Eligible contributor to DTCCL |
| PVM-MK-051 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.9 acres. Prehistoric component consists of 3 lithic isolates, including 1 flake, 1 cobble, and 1 hammerstone. Historic refuse scatter (n= 16) primarily consists of food and beverage cans. | Isolated lithics; DTC food related refuse | Qpv | Not eligible; Eligible contributor to DTCCL |
| PVM-MK-052 | New | URS Corp. 2011 | Historic | Historic. 7.7 acres. Refuse scatter (n= 287) primarily consists of cans and can parts, along with metal, glass, ceramics, tires, and milled wood. 28 of the artifacts located within 1 historic refuse scatter locus. | DTC food related refuse | Qw | Eligible contributor to DTCCL |
| PVM-MK-053 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Low density refuse scatter (n= 8) with 5 cans, 1 glass, and 1 metal. | Historical refuse (non-military) | Qw | Not eligible |
| PVM-MK-066 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Ceramic scatter (n=25) disturbed by multiple WWII era tank tracks. | Ceramic Scatter | Qa6 | Additional information required |
| PVM-MK-067 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Low density refuse scatter (n= 6) containing 5 cans and 1 metal wire fragment. | Historical refuse (non-military) | Qa6 | Not eligible |
| PVM-MK-070 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. 1 prehistoric hammerstone isolate. Historic component consists of low density refuse scatter site, 7 cans. | Isolated lithic artifacts; Historical refuse (non-military) | Qa6 | Not eligible; Not eligible |
| PVM-MK-071 | New | URS Corp. 2011 | Historic | Historic. Refuse scatter (n= 73) containing 19 cans, 32 metals, 20+ glass, and 2 buttons. | Historical refuse (non-military) | Qa6 | Not eligible |

**Rio Mesa SEGF Cultural Resources PSA Appendix A**
**CULTURAL RESOURCES TABLE A-4**
**Archaeological Resources in the Rio Mesa SEGF Archaeological PAA**

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|---|---|---|---|---|---|---|---|
| PVM-MK-100 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 4 military issued food and beverage cans. | DTC food related refuse | Qpv | Eligible contributor to DTCCL |
| PVM-MK-101 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. WWII-era can scatter (n= 6), 4 cans and 2 lids. | DTC food related refuse | Qpv | Eligible contributor to DTCCL |
| PVM-MK-102 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 2 acres. Lithic quarry/workshop, with 105 lithic artifacts (flakes, cores, and cobbles) and 4 loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-103 | New | URS Corp. 2011 | Multi-component | Multi-component. 6.2 acres. Low density prehistoric artifact scatter (n= 36) surrounding 8 thermal features and 1 ceramic concentration/pot drop. Low density historic artifact scatter (n= 105), with 1 artifact concentration. Tank tracks and 2 historic thermal features also present. | Artifact Scatter/Processing/Pot Drop; DTC Maneuvers | Qpv | Additional information required; Eligible contributor to DTCCL |
| PVM-MK-109 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop with 5 lithic artifacts including flake, hammerstone, pecked stone, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-114 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 5 flakes and 1 cobble. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-122 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 11 lithics including flakes, hammerstone, and cobble. | Lithic Quarry | Qpv | Not eligible |
| PVM-MK-126 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Thermal feature with 40+ fractured cobbles. No associated artifacts. | Processing | Qpv | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MK-127 | New | URS Corp. 2011 | Multi-component | Multi-component. 1.5 acres. Prehistoric component consists of 20 lithics (including flakes, cobbles, and a core) and 1 segregated reduction locus. Historic component (n= 40) consists of cans, lids, glass, and hardware. | Lithic Quarry; DTC Maneuvers | Qpv | Not eligible; Eligible contributor to DTCCL |
| PVM-MK-132 | New | URS Corp. 2011 | Multi-component | Multi-component. 1.1 acres. Prehistoric component consists of lithic quarry/workshop; 12 lithics include flakes, tested cobbles, and hammerstone. Historic debris (n= 53) includes cans, can lids, metal hardware, glass, wooden nail fragments. 1 bottle locus. | Lithic Quarry; DTC Maneuvers | Qpv | Not eligible; Eligible contributor to DTCCL |
| PVM-MN-002 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 4.3 acres. Lithic quarry/workshop, 60 lithics (including flakes, shatter, cobbles, core, hammerstone). Majority of artifacts located outside the 1 lithic scatter locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-MN-004 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.9 acres. Prehistoric lithic scatter (n= 8) including flakes, core, cobbles, hammerstone. WWII era refuse (n= 84) consisting of cans, glass, metal, and wood, throughout site and within 1 historic refuse locus. | Lithic Quarry; DTC Maneuvers | Qa6 | Additional information required; Eligible contributor to DTCCL |
| PVM-MN-005 | New | URS Corp. 2011 | Historic | Historic. 0.5 acres. DTC refuse, 12 cans and glass | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-006 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. Historic refuse (n= 5) includes 4 cans and 1 glass. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-007 | New | URS Corp. 2011 | Historic | Historic. 1 acre. DTC refuse, 10 cans | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-010 | New | URS Corp. 2011 | Historic | Historic. 1.6 acres. Historic DTC refuse (n= 55) consisting of cans, metal, glass, and bottle caps. Primarily located outside of the 1 locus. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-011 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Historic refuse (n= 27) consisting of cans, lids, glass, bottle caps, metal, wood, bike and auto parts. Includes 2 loci. | Historical refuse (non-military) | Qa6 | Not eligible |
| PVM-MN-013 | New | URS Corp. 2011 | Multi-component | Multi-component. 20.3 acres. Prehistoric artifact scatter consists of 2 lithics and 1 ceramic. Historic component consists of a low density WWII era refuse scatter (n=56), including lapel pin from 307th Infantry Regiment. | Isolated Artifacts; DTC Maneuvers | Qa6 | Not eligible; Eligible contributor to DTCCL |
| PVM-MN-015 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with low density artifact scatter (n=26). 1 lithic concentration, 1 ceramic concentration/pot drop (n=9), and 1 biface. | Lithic Quarry/Pot Drop | Qa6 | Additional information required |
| PVM-MN-016 | New | URS Corp. 2011 | Multi-component | Multi-component. 4.2 acres. Prehistoric component consists of lithic quarry/workshop; lithic scatter (n= 5) consists of flakes and cobble. Historic DTC refuse (n= 40) consists of metal, cans, and glass. 1 historic rock cluster feature. | Lithic Quarry; DTC Maneuvers | Qa6, Qw | Additional information required; Eligible contributor to DTCCL |
| PVM-MN-017 | New | URS Corp. 2011 | Historic | Historic. 6 acres. DTC refuse (n= 278) consisting cans, glass, and metal. Located within and surrounding 2 historic refuse loci. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-018 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. DTC refuse (n= 19) including cans, battery, and a bottle cap. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-019 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. DTC refuse (n=7) including cans and a bottle cap. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-020 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse (n= 8) including cans, glass, and ammunition. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-021 | New | URS Corp. 2011 | Historic | Historic. 1.4 acres. DTC refuse (n= 73) including cans, glass, and metal. 4 features, well-heads with steel pipes. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-023 | New | URS Corp. 2011 | Historic | Historic. 1.0 acre. DTC refuse (n= 26) consisting of cans, lids, and metal. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-024 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse, 1 can. 1 steel pole and wood stake feature, possibly from surveyors | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-026 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse (n= 7) including cans and shell casings. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-027 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. DTC refuse (n= 19) including cans and can parts. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-028 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse, 3 metal artifacts. 1 feature consisting of a metal pole in ground. | Historical refuse (non-military) | Qa6 | Not eligible |
| PVM-MN-029 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. DTC refuse (n= 17) consisting of cans and metal. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-031 | New | URS Corp. 2011 | Multi-component | Multi-component. 4 acres. Prehistoric component consists of 3 lithics (core, cobble, and hammerstone) and 14 ceramics (13 body and 1 rim sherd), with 1 ceramic loci (n= 11). Historic component consists WWII era refuse (n= 154) containing cans, can parts, blank ammunition, metal, and c-ration wrapping; 1 historic refuse scatter locus. | Lithic Quarry; DTC Maneuvers | Qa6 | Additional information required; Eligible contributor to DTCCL |
| PVM-MN-032 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse (n= 8) consisting of cans and a pocket knife. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-033 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. DTC refuse, consisting of 20 cans. Modern weather balloon remains also present. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-034 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. 1 isolated prehistoric lithic flake. DTC refuse (n= 51) including cans and glass; 1 historic refuse scatter locus. | Isolated Lithic Artifacts; DTC food related refuse | Qa6 | Not eligible; Eligible contributor to DTCCL |
| PVM-MN-035 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with lithic scatter (9 flakes) and 1 lithic scatter locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-MN-036 | New | URS Corp. 2011 | Multi-component | Multi-component. 2.1 acres. Prehistoric component consists of 1 ceramic concentration/pot drop (n=4). Historic component consists of a low density artifacts scatter (n=45), and 2 features including 1 metal rod and 1 ironwood tree with wire. | Pot Drop; DTC food related refuse | Qa6 | Additional information required; Eligible contributor to DTCCL |
| PVM-MN-038 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. DTC refuse, 23 cans. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-039 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; 7 lithics include flakes, core, and hammerstone. | Lithic Quarry | Qa6 | Additional information required |
| PVM-MN-041 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse (n= 6) consisting of cans and can parts. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-055 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Historic refuse (n= 35) consisting of cans, metal, glass. | Mid-20th century refuse | Qa6 | Not eligible |
| PVM-MN-058 | New | URS Corp. 2011 | Historic | Historic. 26.6 acres. Historic DTC food related refuse (n= 59) including cans, glass, bottle caps, and metal; 1 non-DTC refuse locus. 1 feature of a cut ironwood tree. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-059 | New | URS Corp. 2011 | Historic | Historic. 1.6 acres. 1 feature, potentially of a DTC foxhole. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-060 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.4 acres. Prehistoric component consists of 1 hammerstone and 2 pieces of groundstone. Historic component consists of 3 quartz shatter loci likely associated with historic gold prospecting, WWII era excavated depressions (2), pit (1), and trench (1). 21 cleared circles of unknown function and temporal association. | Artifact Scatter/Cleared Circle; DTC Maneuvers | Qa3 | Additional information required; Eligible contributor to DTCCL |
| PVM-MN-061 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 1 rock cluster feature. | Cairn | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-062 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with flakes, cobble, and hammerstone (n= 11) and 1 segregated reduction locus | Lithic Quarry | Qa3 | Additional information required |
| PVM-MN-063 | New | URS Corp. 2011 | Undetermined | Undetermined. < 0.1 acre. 1 rock cairn feature. | Cairn | Qa3 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-064 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. DTC can and glass refuse (n= 27). | DTC food related refuse | Qw | Eligible contributor to DTCCL |
| PVM-MN-066 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 466m long, northwest to southeast. | Trail | Qa3 | Eligible contributor to PTNCL |
| PVM-MN-067 | New | URS Corp. 2011 | Multi-component | Multi-component. 2.4 acres. 2 prehistoric lithic flakes. 6 historic artifacts (5 cans and 1 glass). WWII era features include 32 excavated depressions, 1 metal spike, and 1 other associated feature. | Isolated Lithic Artifacts; DTC Maneuvers | Qa3 | Not eligible; Eligible contributor to DTCCL |
| PVM-MN-068 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Historic DTC refuse (n= 9) including 8 cans and 1 metal, with 1 historic refuse scatter locus. 2 rock ring features. | DTC Maneuvers | Qa3 | Eligible contributor to DTCCL |
| PVM-MN-074 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with lithic scatter (n= 9) including flakes, cobbles, core. | Lithic Quarry | Qa3 | Additional information required |
| PVM-MN-083 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. 8 DTC maneuver (foxhole) features. 1 isolated can (DTC refuse). | DTC Maneuvers | Qa3 | Eligible contributor to DTCCL |
| PVM-MN-096 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with scatter (n= 12) including flakes, cores, and cobbles. | Lithic Quarry | Qa3 | Additional information required |
| PVM-MN-097 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with lithic scatter (n= 12) including flakes, shatter, cores, and cobbles. | Lithic Quarry | Qa3 | Additional information required |
| PVM-MN-098 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with lithic scatter (n= 4) consisting of flakes and cobble. | Lithic Quarry | Qa3 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-099 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; scatter (n= 4) consists of flakes. | Lithic Quarry | Qa3 | Additional information required |
| PVM-MN-100 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 3.3 acres. Cobble pavement quarry with 4 segregated reduction loci, 5 larger lithic scatter loci, 1 tool and 3 pestle blanks surrounded by a low density lithic scatter (n= 1,172). Evidence of groundstone manufacture. | Groundstone Quarry | Qa3, QTmw | Additional information required |
| PVM-MN-101 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Low density artifact concentration with 2 ceramic concentrations/pot drops including Salton Brown Ware (n= 120) prehistoric ceramic sherds. | Pot Drop | Qa3 | Additional information required |
| PVM-MN-105 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse consisting of 5 cans. | Historical refuse (non-military) | Qw | Not eligible |
| PVM-MN-106 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Refuse (n= 4) including cans and metal. 1 rock pile feature and 1 bulldozer scar/push pile feature also present. | DTC Maneuvers | Qa3, Qa5 | Not eligible |
| PVM-MN-116 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse scatter (n= 20) includes 7 cans (primarily food and beverage), 1 metal, 1 barbed wire, and 11 glass shards. The Bradshaw Trail passes through site. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-MN-117 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse including 4 cans. | DTC food related refuse | Qw | Eligible contributor to DTCCL |
| PVM-MN-118 | New | URS Corp. 2011 | Historic | Historic. 0.1 acre. DTC refuse including 4 cans. 1 rock cluster feature. | DTC Maneuvers | Qw | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-MN-121 | New | URS Corp. 2011 | Historic | Historic. 10.1 acre. Historic DTC refuse (n= 59) including cans, nail, and glass. 6 DTC maneuver features consist of foxholes and trenches. | DTC Maneuvers | TRqm, Qa6, Qw | Eligible contributor to DTCCL |
| PVM-MN-122 | New | URS Corp. 2011 | Historic | Historic. 4.4 acres. Refuse (n= 288) includes cans, can lids, battery, transportation items, ceramics, housewares, glass bottle shards and bases, and various metal items. Over half of the artifacts are located within 1 historic refuse scatter locus. 2 features include 1 modern rock pit (prospecting) and 1 historic or modern rock ring. | DTC food related refuse | Qa3, Qw | Eligible contributor to DTCCL |
| PVM-MN-124 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.7 acres. Lithic quarry/workshop; 149 lithics include flakes, shatter, cobbles, and hammerstones. Distributed within and surrounding 7 loci (5 lithic scatter and 2 segregated reduction). 1 rock ring feature. | Lithic Quarry/Rock Ring | Qa6 | Additional information required |
| PVM-MN-138 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Groundstone artifact scatter (n= 20), with evidence of groundstone manufacture. | Groundstone Quarry | TRqm | Eligible |
| PVM-MN-139 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse, 12 glass artifacts. | Historical refuse (non-military) | TRqm | Not eligible |
| PVM-MN-153 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic scatter (n= 3) including cobbles and hammerstone. 1 thermal feature. | Processing | Qpv | Additional information required |
| PVM-MN-154 | New | URS Corp. 2011 | Prehistoric | Prehistoric.1.5 acres. Lithic quarry/workshop, with 284 lithic artifacts and 4 lithic scatter loci. | Lithic Quarry | Qpv | Not eligible |

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## CULTURAL RESOURCES TABLE A-4
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|---|---|---|---|---|---|---|---|
| PVM-MN-160 | New | URS Corp. 2011 | Historic | Historic. 1.2 acres. WWII era refuse (n= 17) including cans, glass, metal, and bullet. | DTC Maneuvers | Qa3, Qa6 | Eligible contributor to DTCCL |
| PVM-MN-163 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. WWII era refuse (n= 13) including cans and glass | DTC food related refuse | Qw | Eligible contributor to DTCCL |
| PVM-MN-502 | New | URS Corp. 2012 | Historic | Historic. 1.1 acres. Historic refuse (n= 50) including cans and glass | Mid-20th century refuse | Qpv | Not eligible |
| PVM-MN-505 | New | URS Corp. 2012 | Historic | Historic. 0.2 acres. Refuse, 19 cans | Mid-20th century refuse | Qpv | Not eligible |
| PVM-MN-506 | New | URS Corp. 2012 | Prehistoric | Prehistoric. 0.6 acres. Lithic quarry/workshop, with scatter (n= 44) including flakes, shatter, cores, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-MN-507 | Updated | URS Corp. 2011 & 2012 | Multi-component | Multi-component. 3 acres. Prehistoric component consists of 3 segregated reduction loci, 1 lithic scatter loci, 2 ceramic concentration/pot drops surrounded by a low density artifact scatter including groundstone production debris. Probable evidence of groundstone manufacture. Historic component consists of 4 refuse scatter loci and surrounded by a low density historic artifact scatter. | Lithic Quarry/Pot Drop; Historical refuse (non-military) | Qpv | Additional information required; Not eligible |
| PVM-MN-508 | New | URS Corp. 2012 | Historic | Historic. 0.1 acre. Historic refuse (n= 19) including metal, glass, and cans. | Mid-20th century refuse | Qpv | Not eligible |
| PVM-PM-010 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.4 acres. Lithic quarry/workshop, with 127 lithics (flakes, shatter, cores, tested cobbles, and hammerstone) and 4 loci (2 single reduction and 2 lithic scatter). | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-011 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 26 lithics and 1 segregated reduction locus. 1 ceramic concentration/pot drop (n= 31) consisting of Colorado buffware sherds. | Lithic Quarry/Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-PM-014 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.6 acres. Prehistoric component consists of lithic quarry/workshop, with 73 lithics (flakes, tested cobbles, shatter, cores, and a hammerstone). Historic component consists of 3 depression features, likely foxholes. | Lithic Quarry; DTC Maneuvers | Qpv | Not eligible; Eligible contributor to DTCCL |
| PVM-PM-015 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 13 lithics artifacts (flakes, core, and cobbles) and with 1 segregated reduction locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-018 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.0 acre. Lithic quarry/workshop, with 73 lithic artifacts and 2 loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-019 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with lithics including 5 flakes, 1 core, and 1 cobble. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-023 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.7 acres. Lithic quarry/workshop, with 100 lithics (flakes, shatter, cobbles, and core) and 6 loci (3 segregated reduction and 3 lithic scatter). | Lithic Quarry | Qa6 | Additional information required |
| PVM-PM-024 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 19 lithics (flakes, cobbles, and cores). | Lithic Quarry | Qa6 | Additional information required |
| PVM-PM-025 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 62 lithics (flakes, shatter, cobbles, and core) and 3 loci (2 lithic scatter and 1 segregated reduction). | Lithic Quarry | Qa6 | Additional information required |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-PM-026 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 10 lithics (cobbles, flakes and shatter). | Lithic Quarry | Qa6 | Additional information required |
| PVM-PM-027 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.9 acres. Lithic quarry/workshop. Lithic scatter (n= 50) includes flakes, cores, cobbles, and core tool. | Lithic Quarry | Qa6 | Additional information required |
| PVM-PM-028 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.9 acres. Lithic quarry/workshop, with 24 lithics (flakes, cores, cobbles, hammerstone, and chopper) and 1 segregated reduction locus. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-030 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 1 rock feature with more than 21 clustered boulders. | Rock boulders | Qpv | Not eligible |
| PVM-PM-032 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with lithic scatter (n= 6) consisting of flakes, core, and cobble. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-033 | New | URS Corp. 2011 | Historic | Historic. 0.4 acres. Refuse (n= 10) consisting of metal, household items, personal items, glass, and cans. | Historical refuse (non-military) | Qa6 | Not eligible |
| PVM-PM-034 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with 27 flakes and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-035 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.0 acre. Lithic quarry/workshop, with 145 lithics (flakes, shatter, cores, cobbles, hammerstone, and core tools) artifacts and 6 loci (4 segregated reduction and 2 lithic scatter). | Lithic Quarry | Qpv | Additional information required |
| PVM-PM-036 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop. Lithic scatter (n= 11) includes flakes, shatter, and cobbles. | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-037 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop. Lithic scatter (n= 7) includes flakes and shatter. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-038 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 3.3 acres. Lithic quarry/workshop, with 227 lithic artifacts (flakes, shatter, cores, cobbles, hammerstones) and 3 loci (2 segregated reduction and 1 lithic scatter). 3 cleared circles or foxholes, with unknown function and temporal association. | Lithic Quarry | Qpv | Additional information required |
| PVM-PM-040 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. DTC refuse, 7 cans. | DTC food related refuse | Qpv | Eligible contributor to DTCCL |
| PVM-PM-041 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Refuse (n= 41) including cans and household metal. | Historical refuse (non-military) | Qpv | Not eligible |
| PVM-PM-042 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 20 lithics including flakes, shatter, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-042B | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 178 meters, north-south. Passes through PVM-PM-042. | Trail | Qpv | Eligible contributor to PTNCL |
| PVM-PM-043 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 ceramic concentration/pot drop of Tizon Brown Ware surrounded by a low density artifact scatter (n=22). | Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-PM-044 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Artifact scatter (n= 113). Lithic scatter (flakes, shatter, and cobble) includes 1 locus. 4 ceramic concentrations/pot drops of Black Mesa or Tumco Bluff sherds (n= 85). | Lithic Quarry/Pot Drop | Qpv | Eligible contributor to PTNCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-045 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 2 segregated reduction loci. 58 lithics include flakes, shatter, cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-046 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.1 acre. Lithic quarry/workshop, with 18 lithics including flakes, shatter, cobbles, and hammerstone. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-048 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.7 acres. 4 ceramic concentrations/pot drops of Tizon Brown and Tumco Buff Wares surrounded by a low density lithic scatter, likely a lithic procurement and initial reduction locality. No intact lithic loci (n=81). | Lithic Quarry/Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-PM-051 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with 16 lithics (flakes and cobbles) and 1 locus, impacted by 1 set of tank tracks. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-055 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Ceramic concentration/pot drop; Colorado Buff Ware (n=150). Possible deflated thermal feature. | Pot Drop | Qpv | Eligible contributor to PTNCL |
| PVM-PM-056 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 1 thermal feature located within 1 lithic scatter loci surrounded by a low density lithic scatter (n= 62). | Lithic Quarry/Processing | Qpv | Additional information required |
| PVM-PM-058 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.6 acres. Prehistoric lithic quarry/workshop (flakes, cores, cobbles, and cobble tool) with 1 thermal feature. 1 historic refuse scatter locus (n= 26, including metal, glass, and shell button). 1 cairn with no clear temporal association. | Lithic Quarry/Processing; Historical refuse (non-military) | Qpv | Additional information required; Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-061 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 2.8 acres. Lithic quarry/workshop, with 274 lithic artifacts and 4 loci (3 lithic scatter and 1 segregated reduction). | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-063 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. Lithic scatter (n= 10) includes flakes, core, hammerstones, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-064 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with lithic scatter (n= 12) consisting of flakes and cobbles. | Lithic Quarry | Qa6 | Additional information required |
| PVM-PM-065 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.3 acres. Lithic quarry/workshop, with lithic scatter (n= 13) consisting of core, cobble, and flakes. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-066 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, 6 flakes. 1 thermal feature present. | Lithic Quarry/Processing | Qa6 | Additional information required |
| PVM-PM-069 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, 5 cobbles. | Lithic Quarry | Qa6 | Additional information required |
| PVM-PM-070 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, 5 flakes. 2 thermal features. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-071 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1 acre. Lithic quarry/workshop, with 49 lithics (flakes, cobbles, hammerstone) and 2 loci (2 segregated reduction), impacted by 1 set of tank tracks. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-074 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. 6 lithics include flakes, core, scatter, and cobble. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-076 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop. Flakes and cobble (n= 14). | Lithic Quarry | Qpv | Not eligible |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-PM-079 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. Historic refuse, 11 cans and glass bottles. | Historical refuse (non-military) | Qpv, Qw | Not eligible |
| PVM-PM-082 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 1.0 acres. Lithic quarry/workshop. 291 lithics (flakes, shatter, cores, cobbles, and hammerstones) and 6 loci (4 lithic scatter and 2 segregated reduction). | Lithic Quarry | Qpv | Additional information required |
| PVM-PM-083 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop; lithics (n= 7) include flakes, shatter, and cobbles. | Lithic Quarry | Qpv | Not eligible |
| PVM-PM-089 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 2.3 acres. Lithic quarry/workshop, with 278 lithics (flakes, cores, cobbles, core tool, shatter, and hammerstones) and 7 loci (5 segregated reduction and 2 lithic scatter). | Lithic Quarry | Qpv | Additional information required |
| PVM-PM-090 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.4 acres. Lithic quarry/workshop, with 62 lithics (flakes, cobbles, cores, hammerstones, and anvils) and 2 lithic scatter loci. | Lithic Quarry | Qpv | Not eligible |
| PVM-SM-001 | New | URS Corp. 2011 | Historic | Historic. 0.3 acres. Historic and DTC refuse scatter (n= 33) including blanks, cans and a canteen, primarily located in 1 military refuse locus. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-SM-009 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.4 acres. 1 isolated prehistoric flake. WWII era artifact scatter (n=16) and alterations from vehicular traffic. | Isolated Lithic Artifacts; DTC Maneuvers | Qa6 | Not eligible; Eligible contributor to DTCCL |
| PVM-SM-010 | New | URS Corp. 2011 | Historic | Historic. 0.2 acres. Refuse, food cans (n=5). | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |

## Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-011 | New | URS Corp. 2011 | Multi-component | Multi-component. < 0.1 acre. 1 isolated prehistoric lithic flake. WWII era refuse scatter, 7 cans. | Isolated Lithic Artifacts; DTC food related refuse | Qa6 | Not eligible; Eligible contributor to DTCCL |
| PVM-SM-013 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.2 acres. Prehistoric component (n= 2) includes 1 flake and 1 cobble. WWII era refuse scatter (n= 7), including 6 can parts and 1 leaf spring fragment. | Isolated Lithic Artifacts; DTC Maneuvers | Qa3 | Not eligible; Eligible contributor to DTCCL |
| PVM-SM-014 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. WWII era refuse scatter (n= 5) consisting of 3 glass and 2 cans. | DTC Maneuvers | Qa6 | Eligible contributor to DTCCL |
| PVM-SM-016 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. WWII era refuse (n= 6) consisting of 4 cans and 2 metal bands. | DTC food related refuse | Qa6 | Eligible contributor to DTCCL |
| PVM-SM-019 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 168 lithics (consisting of flakes, shatter, core, and hammerstones) primarily located in 7 segregated reduction loci. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-023 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 23 lithics (flakes, cores, and hammerstones) located within 3 segregated reduction loci. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-028 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 7 lithics (flakes, hammerstone, and core) located within 1 segregated reduction locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-SM-029 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Prehistoric trail, 446 meters in length. DTC-related tank tracks are present. | Trail | Qa3 | Eligible contributor to PTNCL |

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## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

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|---|---|---|---|---|---|---|---|
| PVM-SM-032 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 11 lithics and groundstone (flakes, cobbles, cores, hammerstone, milling slab, metate fragment) and 1 segregated reduction locus. | Lithic Quarry | Qa6 | Additional information required |
| PVM-SM-037 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 63 lithics (flakes, shatter, core, hammerstone) located within 1 segregated reduction locus. | Lithic Quarry | Qa5 | Additional information required |
| PVM-SM-049 | New | URS Corp. 2011 | Multi-component | Multi-component. Prehistoric trail, 501 meters, northeast-southwest. Possible DTC bulldozer scars are present. | Trail; Unknown Historic | Qa3 | Eligible contributor to PTNCL; not eligible |
| PVM-SM-051 | New | URS Corp. 2011 | Historic | Historic. 0.4 acres. WWII era refuse site featuring glass bottle, canister lid, and food and beverage cans (n=17) as well as pit features (n=5). | DTC Maneuvers | Qa3 | Eligible contributor to DTCCL |
| PVM-SM-053 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. 6 lithic artifacts (flakes, cores, cobbles, hammerstone, and core tools) located within 1 lithic scatter locus. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-054 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.6 acres. Lithic quarry/workshop, with 29 lithics (flakes, core, core tools, cobbles, and hammerstone) and 2 segregated reduction loci. | Lithic Quarry | Qa5 | Additional information required |
| PVM-SM-057 | New | URS Corp. 2011 | Historic | Historic. < 0.1 acre. 3 rock cluster/cairn features. | Cairn | Qa5 | Eligible contributor to DTCCL |

# Rio Mesa SEGF Cultural Resources PSA Appendix A
## CULTURAL RESOURCES TABLE A-4
## Archaeological Resources in the Rio Mesa SEGF Archaeological PAA

| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-058 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 13 lithics (including flakes, core tool, cobbles, and hammerstone) and 1 segregated reduction loci. | Lithic Quarry | Qa5 | Additional information required |
| PVM-SM-060 | New | URS Corp. 2011 | Multi-component | Multi-component. 63.3 acres. 4,031 artifacts and 210 loci. Prehistoric component consists of lithic quarry/workshop (190 segregated reduction loci, 19 lithic scatter loci), 1 prehistoric thermal feature and evidence of groundstone manufacture. Historic component consists of WWII era refuse (cans, glass, metal, wood, and household refuse) and 9 maneuver features (foxholes, upright buried cans, bulldozed trench, and defense position). | Lithic Quarry/Processing/Pot Drop; DTC Maneuvers | Qa5 | Additional information required; Eligible contributor to DTCCL |
| PVM-SM-061 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 39 lithics (including flakes, cores, cobble, and hammerstone) 3 segregated reduction loci. | Lithic Quarry | Qa5 | Additional information required |
| PVM-SM-071 | New | URS Corp. 2011 | Multi-component | Multi-component. 0.3 acres. 71 artifacts. Prehistoric component consists of lithic quarry/workshop, with 2 segregated reduction loci. Lithic scatter includes flakes, shatter, core, cobbles, and hammerstone. Historic refuse consists of a shoe sole, glass, and cans. | Lithic Quarry; Historical refuse (non-military) | Qa6 | Additional information required; Not eligible |
| PVM-SM-073 | New | URS Corp. 2011 | Prehistoric | Prehistoric. Trail segment, 171 meters, northeast-southwest. | Trail | Qa3, Qa6 | Eligible contributor to PTNCL |

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| Resource Identifier | When Recorded | Information Source | Era / Resource Type | Description | Site Type | Geological Context | CRHR Eligibility (Staff) |
|---|---|---|---|---|---|---|---|
| PVM-SM-075 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.2 acres. Lithic quarry/workshop, with 84 lithics (including flakes, shatter, core, cobbles, and hammerstones) and 6 segregated reduction loci. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-076 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 78 lithics (including flakes, cores, cobbles, hammerstones) primarily located within 3 segregated reduction loci. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-077 | New | URS Corp. 2011 | Prehistoric | Prehistoric. < 0.1 acre. Lithic quarry/workshop, with 30 lithics (including flakes, shatter, cores, hammerstones, and cobbles) and 2 segregated reduction loci. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-079 | New | URS Corp. 2011 | Prehistoric | Prehistoric. 0.7 acres. Lithic quarry/workshop, with 93 lithics (including flakes, cores, cobbles, and hammerstone) within and surrounding 5 segregated reduction loci.1 thermal feature. | Lithic Quarry | Qa3 | Additional information required |
| PVM-SM-109 | New | URS Corp. 2011 | Multi-component | Multi-component. 35.8 acres. Prehistoric component includes ~12,556 artifact (projected). Lithic quarry/workshop, with lithic scatter including flakes, cobbles, core tools, hammerstone. No reduction loci. Evidence of groundstone manufacture; utilized groundstone also present. Historic component consists of DTC refuse (n= 226; including cans, hardware, metal, shell casings, wire, and glass). 2 loci of historic DTC refuse.. | Camp; DTC Maneuvers | Qpv | Additional information required; Eligible contributor to DTCCL |

**CULTURAL RESOURCES - FIGURE 1**

Rio Mesa Solar Electric Generating Facility - View from Palo Verde Mesa toward Palo Verde Valley and the Colorado River

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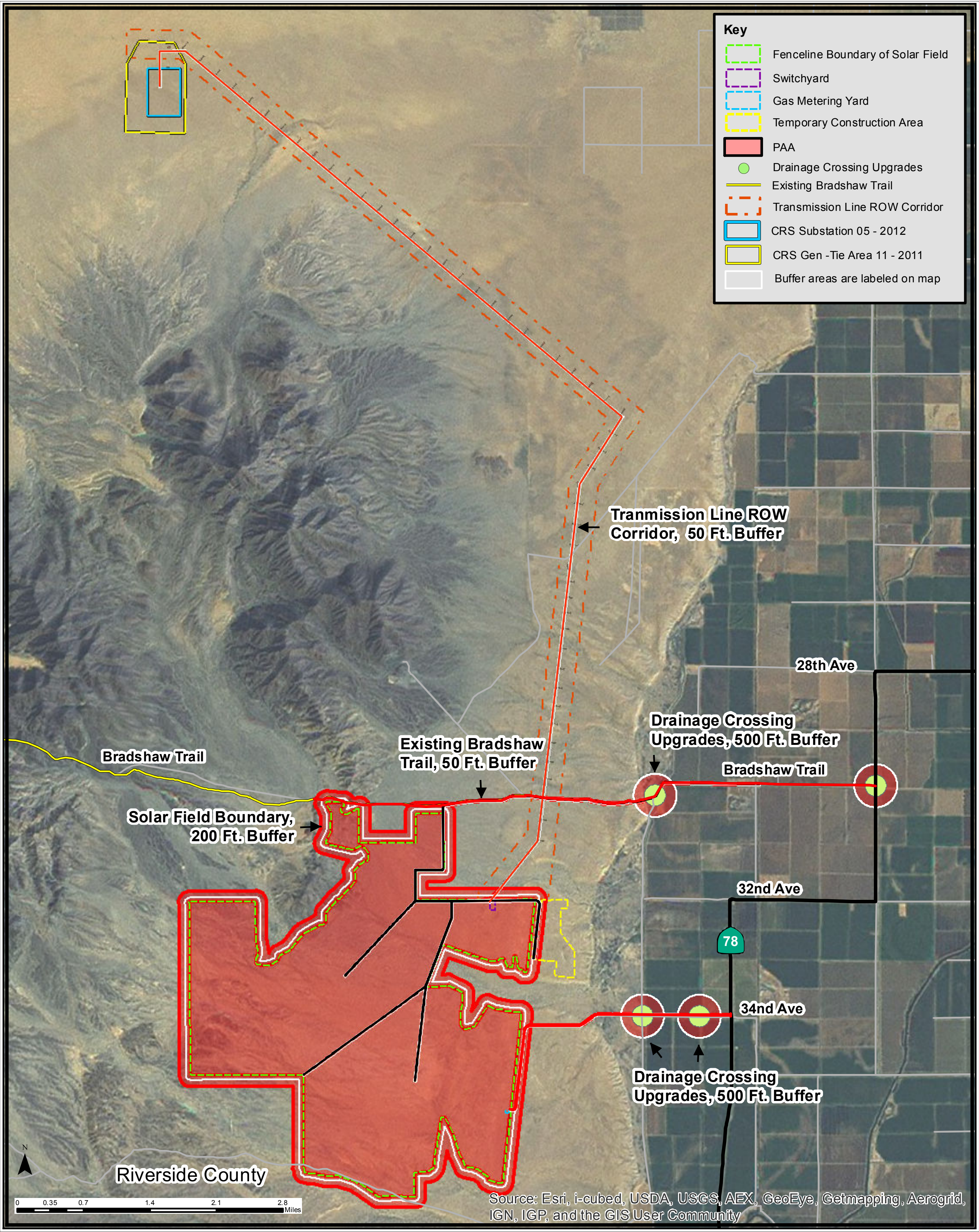
SOURCE: Staff photos, May 2012

**CULTURAL RESOURCES - FIGURE 2**

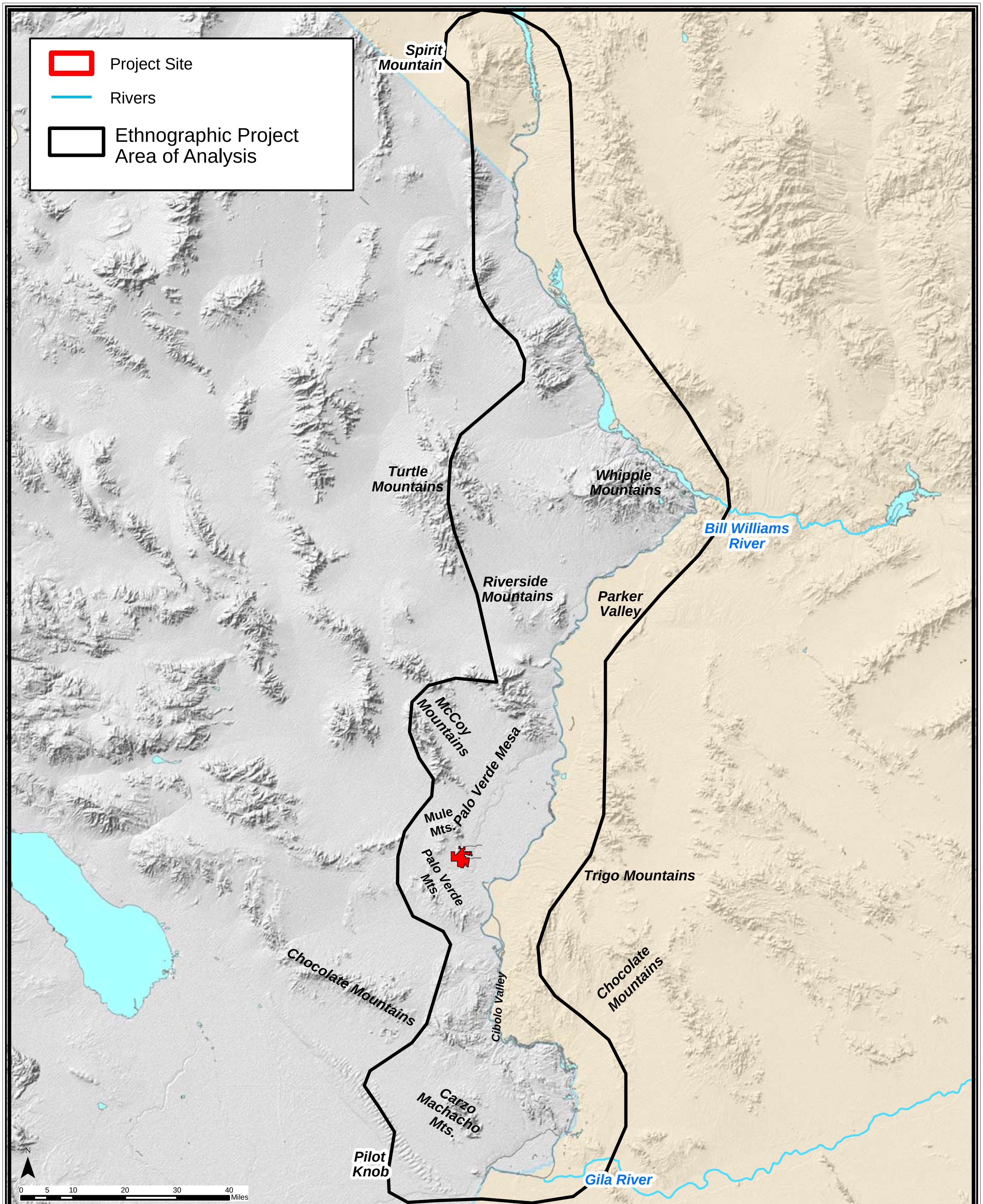
Rio Mesa Solar Electric Generating Facility - Archaeological (Prehistoric and Historic) PAA




**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**
**SOURCE: SOURCE:URS - URS Consulting, ESRI, Bing Aerial Image**

**CULTURAL RESOURCES - FIGURE 3**

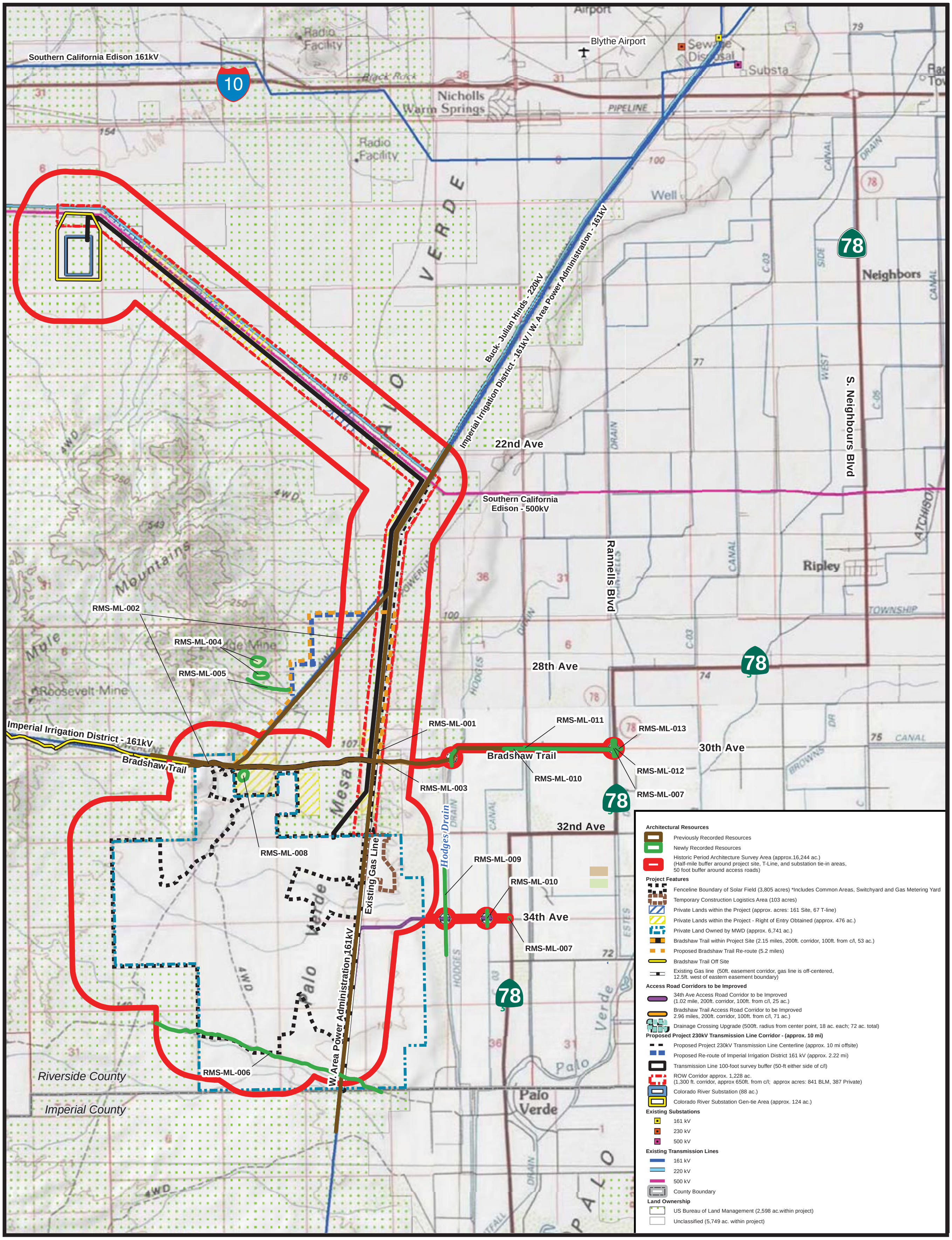
Rio Mesa Solar Electric Generating Facility - Ethnographic Project Area of Analysis




CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

**CULTURAL RESOURCES - FIGURE 4**

Rio Mesa Solar Electric Generating Facility - Historic Period Architectural Resouces

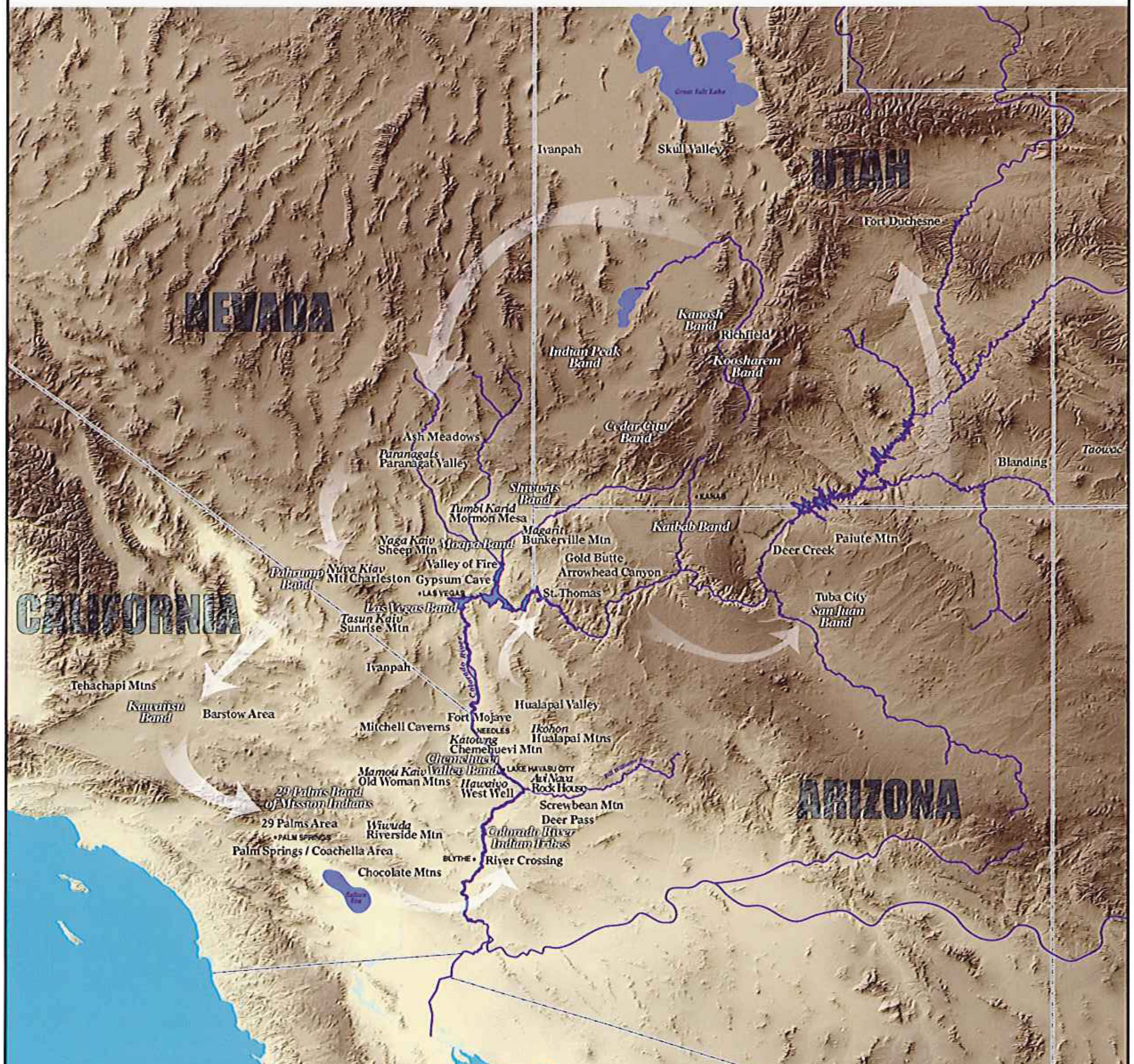



**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: Revised Newly Recorded and Updated Historic Period Architectural Resouces, Figure 5-4, URS

Rio Mesa Solar Electric Generating Facility - Salt Song Trail Map of Nuwuvi (Southern Paiute) Sacred Landscapes, Culture Areas and Bands

# Salt Song Trail Map of *Nuwuvi* (Southern Paiute) Sacred Landscapes, Culture Areas and Bands




This map shows *Nuwuvi* (Southern Paiute) holy lands spanning ocean and desert, mountains and rivers and across four states. These landmarks are described in the *Nuwuvi* Salt Songs and represent ancient villages, gathering sites for salt and medicinal herbs, trading routes, historic sites, sacred areas, ancestral lands and pilgrimages in a physical and spiritual landscape of stories and songs. The Salt Songs are a cultural and spiritual bond between the *Nuwuvi* and the land, and represent a renewal and healing of a *Nuwuvi's* spiritual journey.

The Salt Songs are sung at memorial ceremonies and follow a trail that begins at *Avi Nava/Ting-ai-ay* (Rock House), the sacred cave at the Bill Williams River, and travels to the Colorado River north to the Colorado Plateau, west to *Nuva Kaiv* (Mt. Charleston), through mountain passes to the Pacific Ocean and then back east through the desert to the Colorado River and to its place of origin.

The trail visits the fourteen bands of *Nuwuvi* people including: *Cedar City, Chemehuevi Valley, Colorado River Indian Tribes, Indian Peak, Kaibab, Kanosh, Kawaiisu, Kaiparowits, Las Vegas, Moapa, Koosharem, Pahrump, San Juan, Shivwits, and Twentynine Palms Band of Mission Indians.*

For more information, copies of this poster and the film *The Salt Song Trail* contact Philip M. Klasky, director of The Storyscape Project of The Cultural Conservancy at www.nativeland.org, (415) 561-6594, Salt Song Trail directors Matthew Leivas (760) 858-4049 and Vivienne Jake (928) 643-7210.



Map Key


Sites
Bands
CITIES
STATES

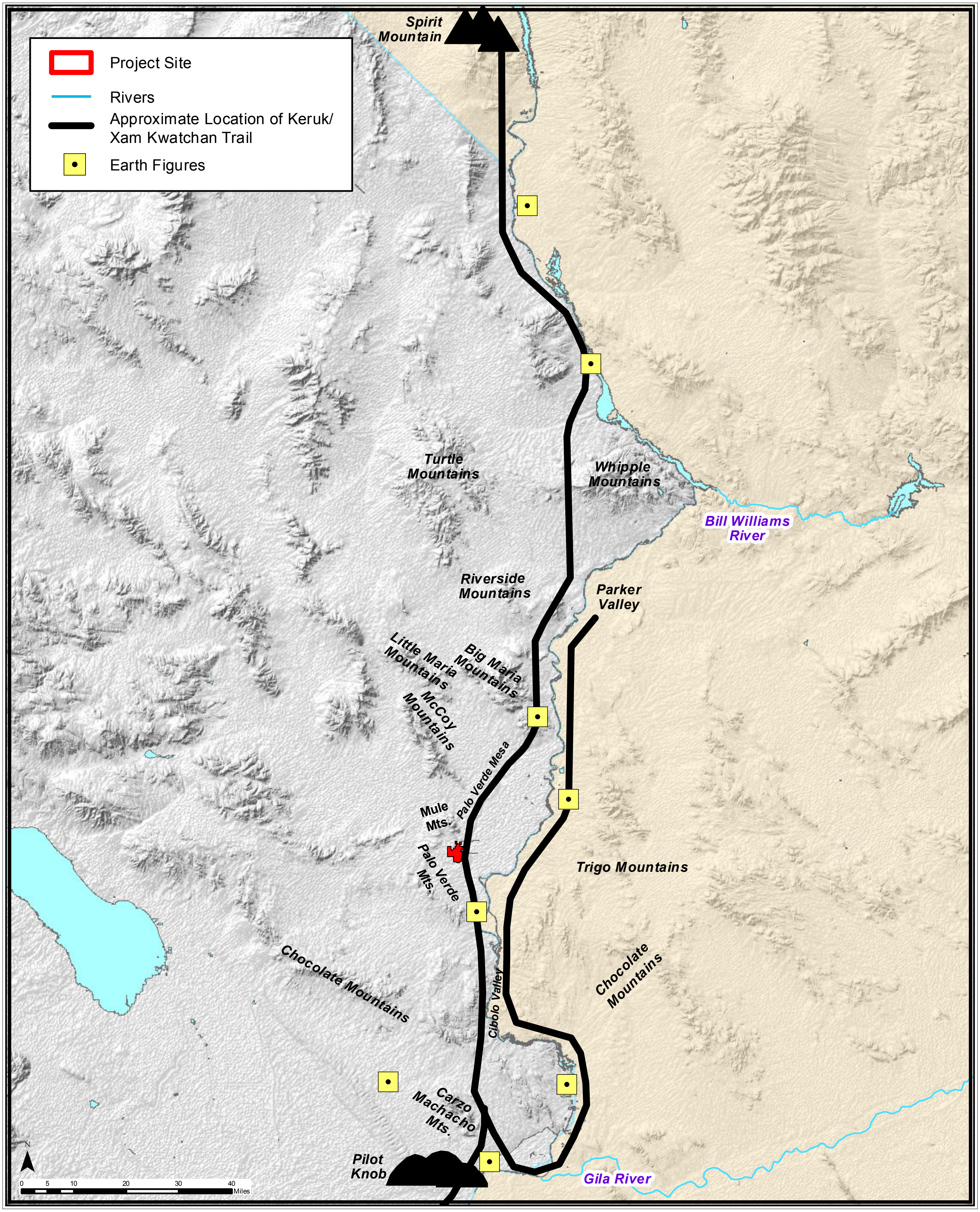
Sources: M. Leivas, Sr. (*Chemehuevi*), V. Jake (*Kaibab Paiute*), the Salt Song Trail Project; Southern Paiute cultural consultants; P. Klasky and M. Nelson, field research, The Cultural Conservancy, San Francisco State University Department of American Indian Studies; Center for Applied Spatial Analysis (CASA), University of Arizona.



SOURCE: The Salt Song Trail Project (c) 2009 all rights reserved. Design by Dana F. Smith and Philip M. Klasky

**CULTURAL RESOURCES - FIGURE 6**

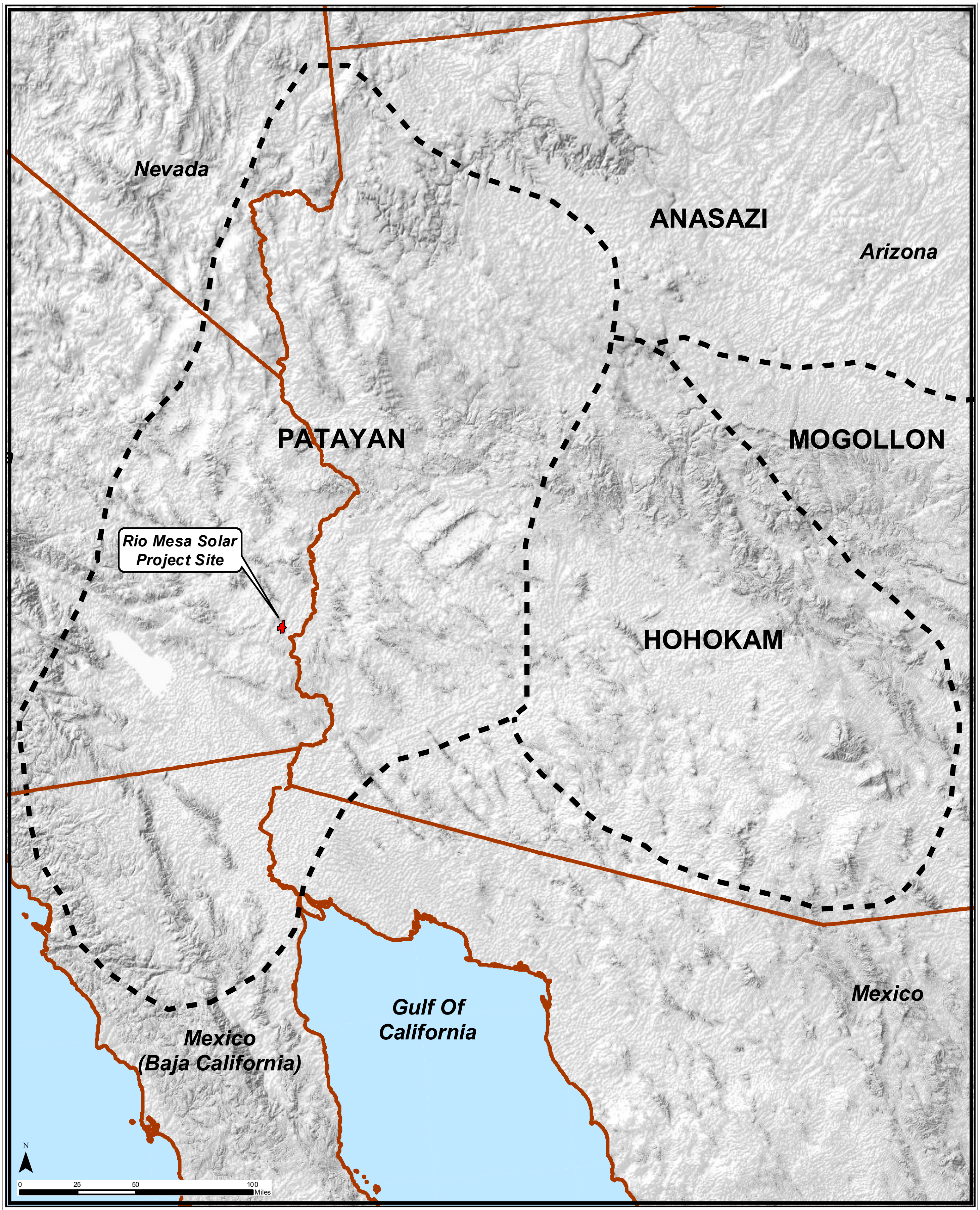
Rio Mesa Solar Electric Generating Facility - Keruk/Xam Kwatchan Trail/Earth Figures Landscape




CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Geoglyphs Associated with the Xam Kwatcan Trail in the Palo Verde Point Area, South of Blythe, CA. By Boma Johnson - Chapter 11 - Figure 11-2

**CULTURAL RESOURCES - FIGURE 7**
Rio Mesa Solar Electric Generating Facility - Patayan Culture Area




**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**
**SOURCE: Geoglyphs Associated with the Xam Kwatcan Trail in the Palo Verde Point Area, South of Blythe, CA. By Boma Johnson - Chapter 11- Figure 11-2**

**CULTURAL RESOURCES - FIGURES 8 - 9**
Rio Mesa Solar Electric Generating Facility - General Tribal Occupation Lands


Figure 5: California 17th Century AD


Figure 6: California Pre-1827

CULTURAL RESOURCES

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: Tele Atlas Data, and Bing Aerial Image.

CULTURAL RESOURCES - FIGURES 10 - 11

Rio Mesa Solar Electric Generating Facility - General Tribal Occupation Lands and Current Tribal Reservation Lands


Figure 7: California Post-1827

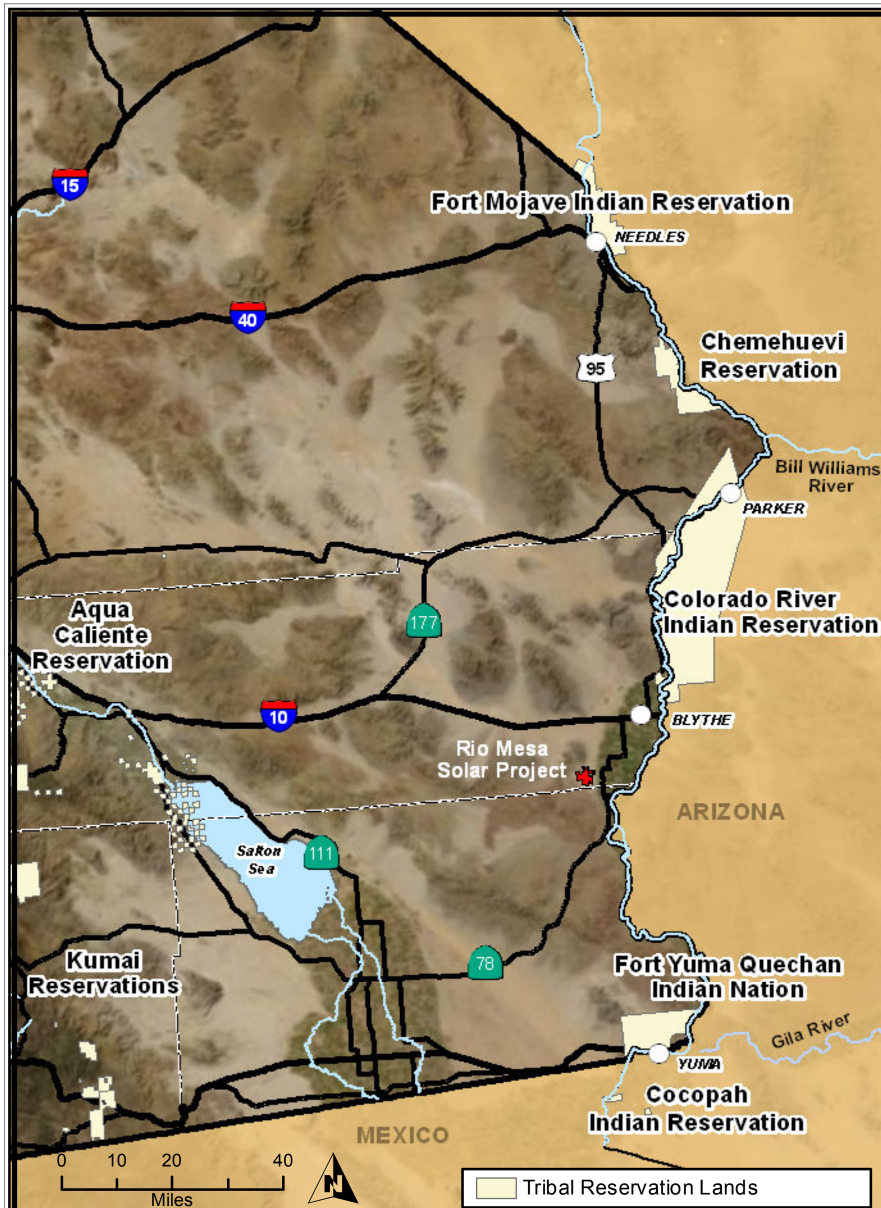



Figure 8: California Post 19 Century

CULTURAL RESOURCES

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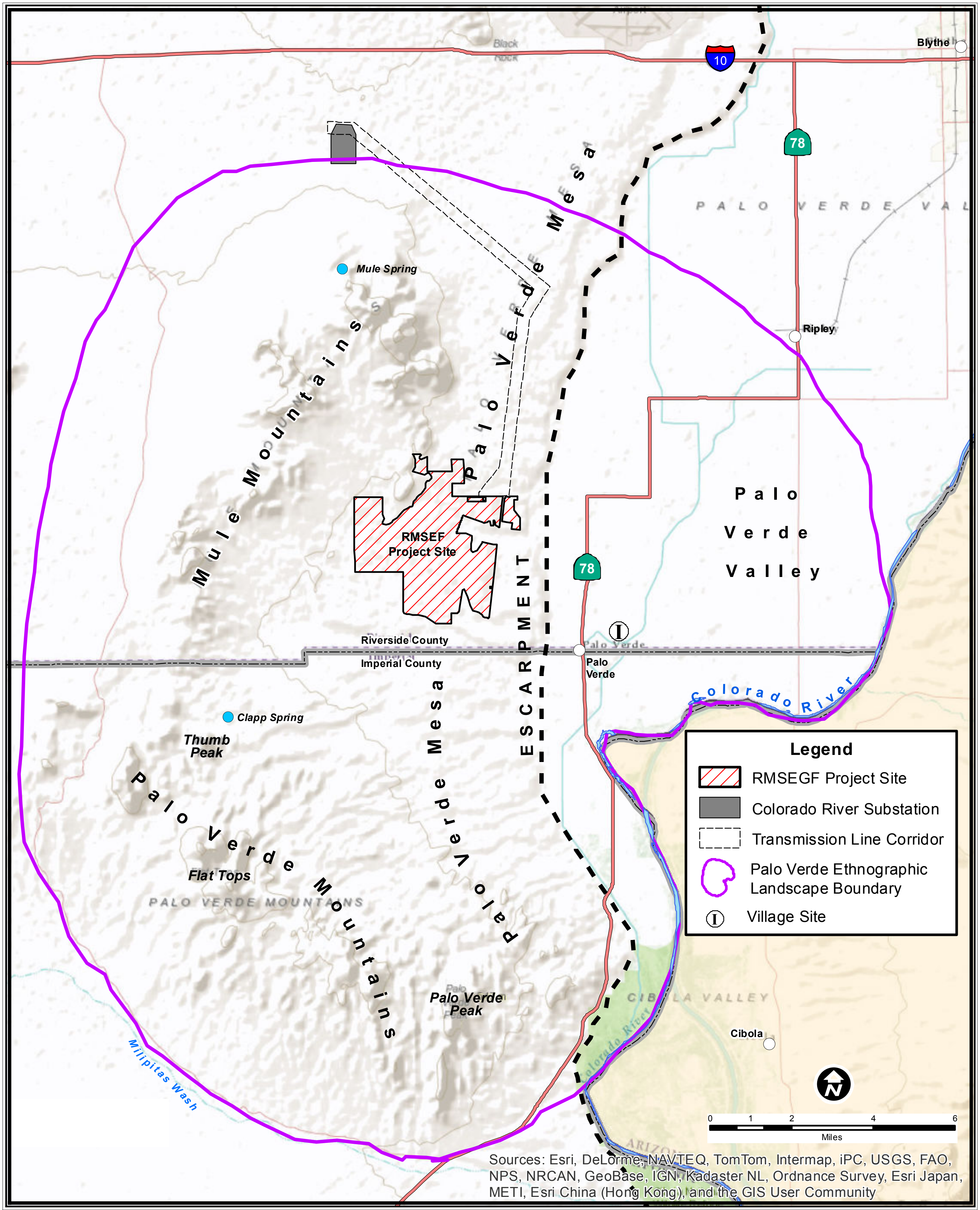
SOURCE: Tele Atlas Data, and Bing Aerial Image.

**CULTURAL RESOURCES - FIGURE 12**
Rio Mesa Solar Electric Generating Facility - Palo Verde Ethnographic Landscape




CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: ESRI GIS data and Aerial Imagery

**CULTURAL RESOURCES - FIGURE 13**

Rio Mesa Solar Electric Generating Facility - View of Bradshaw Trail Borrow Pit from Bradshaw Trail

**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: Staff photos, May 2012

**CULTURAL RESOURCES - FIGURE 14**

Rio Mesa Solar Electric Generating Facility - Parker-Davis Project: The Niland to Blythe 161kV Transmission Lines and Pilot Knob to Blythe 161 kV

Niland to Blythe 161kV Transmission Lines ▶

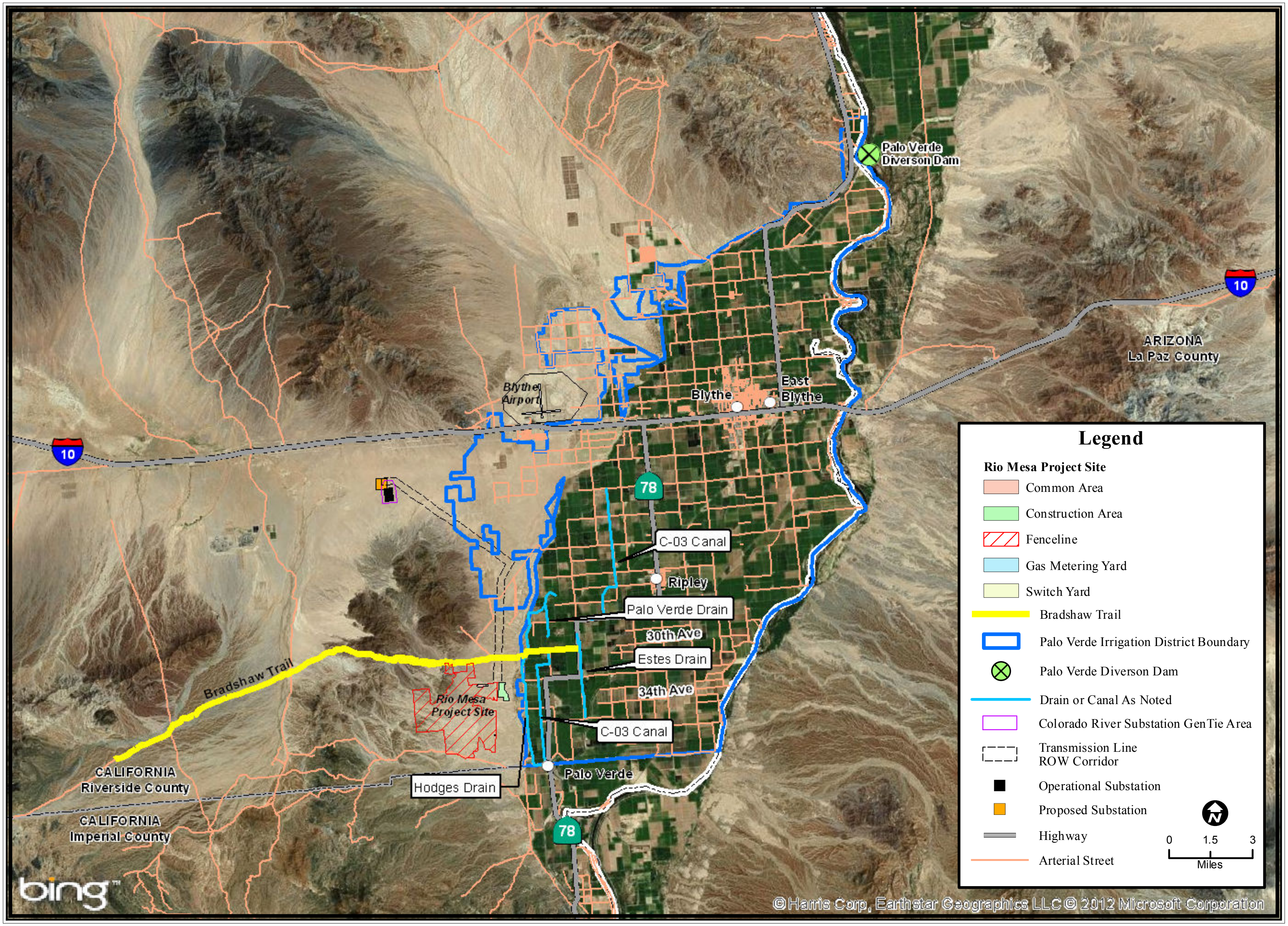
Pilot Knob to Blythe 161 kV ▼

**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: Staff photos, May 2012

**CULTURAL RESOURCES - FIGURE 15**

Rio Mesa Solar Electric Generating Facility - Palo Verde Irrigation District

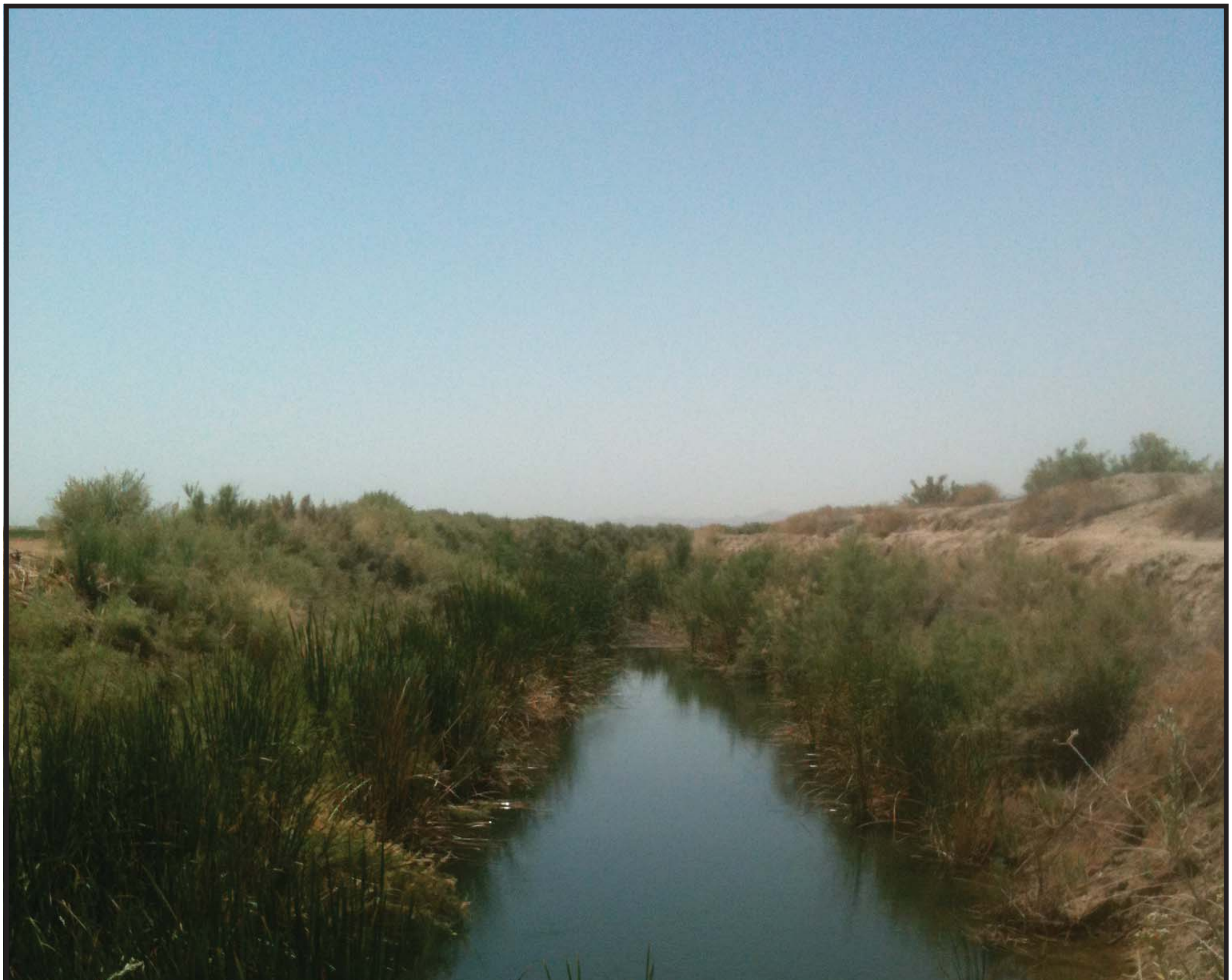



CULTURAL RESOURCES

**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: ESRI, SolarMillennium, Tetratech, URS Corp., CA. Department of Conservation & Tele Atlas Data. Bing Aerial Image

**CULTURAL RESOURCES - FIGURE 16**
Rio Mesa Solar Electric Generating Facility - View of Hodges Drain at Bradshaw Trail



**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**
SOURCE: Staff photos, May 2012.

**CULTURAL RESOURCES - FIGURE 17**

Rio Mesa Solar Electric Generating Facility - Opal Hill Mine Access Road (Jeep Trail)

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Staff photos, May 2012

# LAND USE

Mark R. Hamblin

## SUMMARY OF CONCLUSIONS

Staff concludes the proposed Rio Mesa Solar Energy Generation Facility would not create a “significant effect” on the environment according to the California Environmental Quality Act (CEQA) and the CEQA Guidelines based on the identified land use and planning, agriculture and forestry resources criteria; and, the proposed project would be consistent with federal, state, or local laws, ordinances, regulations, and standards (LORS) that control building on the project site with the implementation of the proposed conditions of certification.

## INTRODUCTION

Staff evaluates if the Rio Mesa Solar Energy Generation Facility (Rio Mesa SEGF) would create a “significant effect” on the environment according to provisions in the CEQA and the CEQA Guidelines pertaining to land use and planning, and agriculture and forestry resources criteria; and, if the proposed project would be consistent with federal, state, or local LORS that control building on the project site (building and design, land use and planning).

## LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

**Land Use Table 1** lists the local land use LORS applicable to the proposed project. The proposed project’s consistency with these LORS is analyzed in the “Compliance With LORS” subsection.

**Land Use Table 1**
**Applicable Laws, Ordinances, Regulations, and Standards**

| LORS | General Description |
|---|---|
| **Federal** | |
| Title 43 Code of Federal Regulations, Parts 2800 and 2880 – Rights of Way Under The Federal Land Policy Management Act | Requires a right of way grant from United States Bureau of Land Management when a project plans to use public lands for systems or facilities over, under, on, or through public lands. |
| California Desert Conservation Area Plan 1980 as amended | The Plan is a comprehensive, long-range plan with goals and specific actions for the management, use, development, and protection of the resources and public lands within the California Desert Conservation Area. The planning area encompasses 25 million acres. |

| LORS | General Description |
|---|---|
| Northern and Eastern Colorado Desert Coordinated Management Plan, 2002 | The Plan is a landscape-scale, multi-agency planning effort that protects and conserves natural resources while simultaneously balancing human uses of the California portion of the Colorado Desert ecosystem. The planning area encompasses over five million acres and hosts 60 sensitive plant and animal species. |
| **State** | |
| California Government Code Sections 66410 – 66499.29 (State Subdivision Map Act) - Chapter 6. Reversions and Exclusions | Regulation and control of the design and improvement of subdivisions are vested in the legislative bodies of local agencies. Each local agency shall by ordinance regulate and control the initial design and improvement of common interest developments as defined in Section 1351 of the Civil Code and subdivisions for which this division requires a tentative and final or parcel map. |
| **Local** | |
| County of Riverside General Plan | The General Plan describes the future growth and development within the County over the long term. It acts as a constitution for both public and private development, and provides the foundation upon which county leaders will make growth and use related decisions. |
| General Plan - Chapter 3 Land Use Element - Fiscal Impacts | Land Use Policy 9.1. Requires that new development contributes its fair share to fund infrastructure and public facilities such as police and fire facilities. |
| General Plan - Chapter 3 Land Use Element - Solar Energy Resources | Land Use Policy15.15. Permits and encourages, in an environmentally and fiscally responsible manner, the development of renewable energy resources and related infrastructure, including but not limited to, the development of solar power plants in the County of Riverside. |
| County of Riverside Ordinance 348 Land Use Ordinance of Riverside County | The ordinance establishes zone classifications in the unincorporated areas of the county regulating the use of land, height of buildings, area of lots and building site. |
| County of Riverside Ordinance No. 460 Regulating The Division Of Land Of The County Of Riverside As Amended through Ordinance No. 460.147, effective February 1, 2007 | All land divisions in the unincorporated area of the county of Riverside are subject to the applicable provisions of the State Subdivision Map Act and this ordinance. All land divisions shall conform to the Riverside County General Plan, with all applicable specific plans, with the requirements of the Land Use Ordinance and other ordinances, and the requirements of this ordinance. |
| County of Riverside Ordinance No. 659 An Ordinance of The County of Riverside, Amending Ordinance No. 659 (as amended through 659.8) Establishing A Development Impact Fee Program | The ordinance establishes and sets forth policies, regulations, and fees relating to the funding and installation of facilities and the acquisition of open space and habitat necessary to address the direct and cumulative environmental effects generated by new development projects described and defined in this ordinance. It establishes the authorized uses of the fees collected. |

| LORS | General Description |
|---|---|
| Riverside County Board of Supervisors Policy No. B-29 | On November 8, 2011, the Riverside County Board of Supervisors adopted/approved the following: General Plan Amendment No. 1080 Board of Supervisors Resolution No. 2011-273, Ordinances 348.4705 and 348.4734, and Board of Supervisors Policy No. B-29 (collectively the "Solar Power Plant Program"). Board of Supervisors Policy No. B-29 provides that the County of Riverside will not issue certain permits or approvals unless the Board of Supervisors first approves a franchise, real property interest or development agreement with the owner of a solar power plant. The permits or approvals involve (1) use of county rights of way, (2) use of other County property, or (3) land development under the County's zoning and subdivision ordinances. |

## SETTING

The proposed Rio Mesa SEGF would be located in an undeveloped portion of the Colorado Desert (a subdivision of the Sonoran Desert) between the Mule Mountains and the Colorado River on the Palo Verde Mesa, near the southern portion of the Palo Verde Valley in unincorporated Riverside County, California (see **Land Use Figure 1** - Regional and Vicinity Map and **Land Use Figure 2** – Aerial Photograph of Project Site and Vicinity).

The area is interspersed with large acreages of public land administered by the United States Department of Interior, Bureau of Land Management (BLM) (Palo Verde Mountains Wilderness [30,562 acres], Area 352 Wilderness Study Area [16,000 acres]), and includes large acreages of land owned by the Metropolitan Water District of Southern California.

"The Palo Verde Valley has experienced relatively little growth over the past 20 years, and is projected to experience little to moderate growth over the next 20 years. Much of the desert and mountain land is untouched and is not served by any infrastructure" (RCGPPVVA 2003, p. 38).

## PROJECT SITE

The proposed project site is undeveloped land dominated by deposits of sand, pebbly sand and clay, Sonoran creosote brush scrub and has several desert dry wash and unvegetated ephemeral dry wash areas.

The project site is shown within the boundary of the Riverside County General Plan's Palo Verde Valley Area Land Use Plan. The Palo Verde Valley Area Land Use Plan designates the project site as "Open Space-Rural" (OS-RUR) and "Agriculture" (AG). The Open Space-Rural designation is applied to remote privately owned open space areas with limited access and a lack of public services. The Agriculture designation is applied to lands that generally lack infrastructure that is supportive of urban development.

The proposed project is a large-scale solar concentrating thermal electric generating facility that would produce 500 megawatts. The project would have two power generating units each with a solar receiver steam generator tower (a 750-foot tall concrete tower plus a 10-foot lighting rod) energized by solar energy provided from 170,000 heliostats covering approximately 3,805 acres (project site) leased from the Metropolitan Water District of Southern California (MWD) (refer to the **Project Description** section of the Preliminary Staff Assessment (PSA)-Part A for a detailed description of the proposed project).

Rio Mesa Solar Holdings, LLC holds a lease option agreement with the MWD for approximately 6,741 acres. The project is proposed to be constructed on approximately 3,805 acres of this land. The proposed project's generation interconnection tie line, emergency and construction electrical power supply line, and vehicle access road are proposed to be located on a 1,300-acre right-of-way on public land administered by the BLM.

## ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

## METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Staff analyzes the information provided in the Application for Certification (AFC) and information from other sources to determine if the proposed project would create a significant land use impact according to provisions in CEQA and CEQA Guidelines.

CEQA related significance criteria used in this analysis are based on Appendix G of the CEQA Guidelines (California Code of Regulations, Title 14, Chapter 3, Article 20, Appendix G, IX and II [a.k.a., CEQA Checklist]) and performance standards or thresholds identified by Energy Commission staff listed below.

**I. A proposed project potentially creates a significant impact under "*Land Use and Planning*" if any of the following occur:**

- Would the project physically divide an established community?
- Would the project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?
- Would the project conflict with any applicable habitat conservation plan or natural community conservation plan?

**II. A proposed project potentially creates a significant impact under "*Agriculture and Forestry Resources*" if any of the following occur:**

- Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?
- Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?
- Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?
- Would the project result in the loss of forest land or conversion of forest land to non-forest use?
- Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of farmland, to non-agricultural use or conversion of forest land to non-forest use?

## DIRECT/INDIRECT IMPACTS AND MITIGATION

## <u>Land Use and Planning</u>

### A. Would the project physically divide an established community?

The proposed project would be constructed in an undeveloped portion of the Colorado Desert on the Palo Verde Mesa in the southern portion of the Palo Verde Valley. The closest community is Palo Verde, population 176 according to the 2010 census. Palo Verde is approximately two miles east of the southern boundary of the project (see **Land Use Figure 2**). The proposed project would not physically divide Palo Verde and, therefore, would not create a significant effect on the environment under this CEQA criterion.

### B. Would the project conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect?

I. Federal Land Use Plans

<u>California Desert Conservation Area Plan 1980 as amended</u>

The proposed project's generation interconnection tie line, emergency and construction electrical power supply line, and access road would be located on public land administered by the BLM (ESH 2012e, p. 2-1-3). The applicant filed a Plan of Development (POD) and Standard Form-299 (*Application for*

*Transportation and Utility Systems and Facilities on Federal Lands*) grant application with the BLM California Desert District office on June 20, 2012 requesting use of BLM administered land. As part of this process, the BLM would need to amend the California Desert Conservation Area (CDCA) for a gen-tie line greater than 161 kV.

CDCA Plan is a comprehensive, long-range plan with goals and specific actions for the management, use, development, and protection of the resources and public lands within the CDCA. It is based on the concepts of multiple use, sustained yield, and maintenance of environmental quality (see **Land Use Figure 3** – California Desert Conservation Area).

The CDCA Plan designates distinct multiple use classes for the lands involved and establishes a framework for managing the various resources within the classes. The four major multiple-use classes include: Multiple-Use Class C, Multiple-Use Class L, Multiple-Use Class M, Multiple-Use Class I, and unclassified lands (see **Land Use Figure 4** – CDCA Multiple-Use Classes).

Some linear components of the project are located on BLM lands designated "Multiple-Use Class L" (Limited Use) and "Multiple-Use Class M" (Moderate Use). Multiple-Use Class L protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. Within Class L solar electric generation plants may be allowed (USBLM 1980, p.13 and p.15). The Multiple-Use Class M is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety or present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources which permitted uses may cause. Within Class M all types of electrical generation plants may be allowed in accordance with state, federal, and local laws (Ibid).

The project appears to be consistent with the allowable uses identified above. The BLM is currently preparing an Environmental Impact Statement for the proposed project. With the BLM's approval, the proposed project components would not conflict with the CDCA Plan, and would not create a significant effect on the environment under this CEQA criterion.

Northern and Eastern Colorado Desert Coordinated Management Plan

The proposed project site, access road, power and transmission line routes are not shown to be within a designated NECO Desert Wildlife Management Area (DWMA), Wildlife Habitat Management Area (WHMA), or existing restricted area (e.g., BLM wilderness lands, Joshua Tree National Park) (CTTC 2012). A segment of the access road, power and transmission lines to serve the project site would cross public land administered by the BLM and requires their approval.

The Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) is a landscape-scale, multi-agency planning effort that protects and conserves natural resources while simultaneously balancing human uses of the California portion of the Colorado Desert ecosystem. The planning area encompasses over five million acres and hosts 60 sensitive plant and animal species. The majority of the planning area land, 3,823,194 acres, is public land administered by the BLM. NECO Plan decisions apply only to federal lands (USBLM 1980a, p. ES-1).

Route designations by the BLM are based on the protection of the resources on the public lands, the promotion of the safety of all the users of the public lands, and the minimization of conflicts among various uses of the public lands, as required by Title 43 Code of Federal Regulations section 8342.1.

Because the project is not located within a DWMA or WHMA, the proposed project appears to be consistent with the NECO Plan. With the BLM's approval, the proposed project would not conflict with the NECO Plan and would not create a significant effect on the environment under this CEQA criterion.

II. County Land Use Plans

Riverside County General Plan – Palo Verde Valley Area Plan

The 3,805-acre project site is located within the unincorporated area of Riverside County. Land uses on this acreage are governed by the County's adopted General Plan diagrams and policies, and zone regulations.

The project site is shown within the boundary of the County General Plan's Palo Verde Valley Area Land Use Plan (see **Land Use Figure 5**). The Palo Verde Valley Area Land Use Plan designates the county's jurisdictional land "Open Space-Rural" (OS-RUR) and "Agriculture" (AG). The Open Space-Rural designation is applied to remote privately owned open space areas with limited access and a lack of public services. The Agriculture designation is applied to lands that generally lack infrastructure that is supportive of urban development.

Riverside County General Plan, Land Use Policy (LU) 15.15 states the County is to "permit and encourage, in an environmentally and fiscally responsible manner, the development of renewable energy resources and related infrastructure, including but not limited to, the development of solar power plants in the County of Riverside."

The County of Riverside has zoned the project area N-A (Natural Assets) and W-2 (Controlled Development) (see **Land Use Figure 6**). Ordinance No. 348.4705 of the Riverside Zoning Ordinance permits solar power plants on lots ten (10) acres or larger in the N-A and W-2 Zones with the approval of a conditional use permit.

The project appears to be consistent with the allowable uses identified above; therefore, the project would not create a significant effect on the environment under this CEQA criterion.

**C. Would the project conflict with any applicable habitat conservation plan or natural community conservation plan?**

The proposed project site is not within the boundary of an approved United States Fish and Wildlife Service habitat conservation plan prepared in accordance with section 10 of the Endangered Species Act, or within the boundary area of an approved California Department of Fish and Game natural community conservation plan prepared in accordance with section 2800 of the Natural Communities Conservation Act. Therefore, the proposed project would not create a significant effect on the environment under this CEQA criterion.

## Agriculture and Forestry Resources

**A. Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?**

The project site is located in an undeveloped portion of the Colorado Desert between the Mule Mountains and the Colorado River on the Palo Verde Mesa in the southern portion of the Palo Verde Valley, Riverside County, California (see **Land Use Figure 2**, and **Land Use Figure 7** - View of a Portion of the Project Site).

The Soil Conservation Service, Soil Survey of Palo Verde Area, California, General Soil Map shows project site soils as Rositas-Aco-Carrizo association and Rositas-Gilman association. The California Department of Conservation, Farmland Mapping and Monitoring Program, “Soil Candidate Listing for Prime Farmland and Farmland of Statewide Importance – Riverside County – Palo Verde Area” does not list these soils as prime, unique, or farmland of statewide importance. Therefore, building on the project site would not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance and would not create a significant effect on the environment under this CEQA criterion.

Approximately 1.55 acres of Prime Farmland and 0.67 acre of Farmland of Statewide Importance would be converted to nonagricultural use as a result of the access road. The applicant states:

> ". . . a new access road will be required (and may potentially be paved) directly north and parallel of 34th Avenue ROW, which is an existing dirt road. The proposed access road alignment north of 34th Avenue will convert approximately 1.55 acres of Prime Farmland and approximately 0.67 acres of Farmland of Statewide Importance (2.2 acres total) to nonagricultural uses (access road acreages are based on a 24 foot-wide ROW). During a site visit on June 12, 2012, URS (*applicant*) determined that the 2.2 acres of agricultural lands west of State Route 78 and north and parallel to 34th Avenue towards the project site, are both fallow and active" (BS 2012v, p. 5.6-17).

> "In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland" (CCOR 2012, Appendix G).

Staff completed a California Agricultural Land Evaluation and Site Assessment Model (LESA) for each of the proposed four drainage crossing upgrade (e.g., bridges and culverts) locations; shown on **Land Use Figure 8** as dashed circles. The applicant states on Figure 8 that each of the drainage crossing upgrade would involve 18 acres of land. The LESA score for two of the proposed drainage crossing upgrades with the permanent removal of 18 acres of agricultural land is considered a significant conversion of agriculture land.

The California Agricultural LESA Model was developed by the California Department of Conservation to provide lead agencies with an optional methodology to ensure that potentially significant effects on the environment of agricultural land conversions are quantitatively and consistently considered in the environmental review process (Public Resources Code Section 21095), including CEQA reviews. The LESA Model evaluates measures of soil resource quality, a given project's size, water resource availability, surrounding agricultural lands, and surrounding protected resource lands. For a given project, the factors are rated, weighted, and combined, resulting in a single numeric score. The project score becomes the basis for making a determination of a project's potential significance.

The LESA Model is composed of six different factors. Two Land Evaluation factors are based upon measures of soil resource quality. Four Site Assessment factors provide measures of a given project's size, water resource availability, surrounding agricultural lands, and surrounding protected resource lands. For a given project, each of these factors is separately rated on a 100 point scale. The factors are then weighted relative to one another and combined, resulting in a single numeric score for a given project, with a maximum attainable score of 100 points. It is this project score that becomes the basis for making a determination of a project's potential significance, based upon a range of established scoring thresholds (CDOC 1997, p. 1)

The LESA Model is designed to make determinations of the potential significance of a project's conversion of agricultural lands. Scoring thresholds are based upon both, the total LESA score as well as the component Land Evaluation (LE) and Site Assessment (SA) subscores. In this manner the scoring thresholds are dependent upon the attainment of a minimum score for the LE and SA subscores so that a single threshold is not the result of heavily skewed subscores (i.e., a site with a very high LE score, but a very low SA score, or vice versa). A single LESA score is generated for a given project after all of the individual Land Evaluation and Site Assessment factors have been scored and weighted (CDOC 1997, p. 31).

| **California LESA Model Scoring Thresholds** | |
|---|---|
| Total LESA Score | Scoring Decision |
| 0 to 39 points | Not Considered Significant |
| 40 to 59 points | Considered Significant only if LE and SA subscores are each greater than or equal to 20 points. |
| 60 to 79 points | Considered Significant unless either LE or SA subscore is less than 20 points. |
| 80 to 100 points | Considered Significant |
| Source: California Agricultural Land Evaluation and Site Assessment Model Instruction Manual, p. 31. | |

The proposed drainage crossing upgrade near the corner of 30th Avenue and State Highway 78 had a LESA score 59.15, and the upgrade location on 34th Avenue closest to State Highway 78 had a LESA score 68.73. The model shows this as significant. Therefore, staff has proposed Condition of Certification **LAND-1** which requires the applicant to restore and replant agricultural land outside of the county public right of way where removed during the construction of the drainage crossing upgrade. With the implementation of the proposed condition of certification the potential impact would create a less than significant effect on the environment under this CEQA criterion.

## B. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

The project site is zoned N-A (Natural Assets) and W-2 (Controlled Development). Ordinance No. 348.4705 amended the county Zoning Ordinance to permit solar power plants on lots ten (10) acres or larger in the N-A and W-2 Zones with the approval of a conditional use permit.

The 3,805-acre proposed project site does not include any Williamson Act contracted land and would not conflict with existing zoning for agricultural use.

Therefore, the proposed project would not create a significant effect on the environment under this CEQA criterion.

## C. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

Public Resources Code section 4526 defines “forest land," timberland,” and “timberland production zone or TPZ” as the following:

- “Forest land” is land that can support 10-percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits.
- "Timberland" means land, other than land owned by the federal government and land designated by the board, as experimental forest land, which is available for, and capable of, growing a crop of trees of a commercial species used to produce lumber and other forest products, including Christmas trees. Commercial species shall be determined by the State Board of Forestry and Fire Protection on a district basis.
- "Timberland production zone" or "TPZ" means an area which has been zoned pursuant to Government Code section 51112 or 51113 and is devoted to and used for growing and harvesting timber, or for growing and harvesting timber and compatible uses, as defined in subdivision (h).

The 3,805-acre project site does not include any forest land, timberland, or timberland zoned Timberland Production. Therefore, the proposed project would not create a significant effect on the environment under this CEQA criterion.

## D. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

No forest lands exist on the project site, so the proposed project would not create a significant effect on the environment under this CEQA criterion.

**E. Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?**

As discussed under A. above, the applicant is proposing to build/upgrade four off-site drainage crossings shown on **Land Use Figure 8** in dash circles.

Staff has proposed a condition of certification requiring the applicant to restore and replant agricultural land outside of the county public right of way removed during the construction of the road crossing upgrade; see Condition of Certification **LAND-1**. The proposed project with the implementation of the proposed condition of certification would create a less than significant effect on the environment under this CEQA criterion.

## CUMULATIVE IMPACTS AND MITIGATION

Under the CEQA Guidelines, "a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR [environmental impact report] together with other projects causing related impacts" (14 Cal. Code Regs. §15130(a)(1)). Cumulative impacts of the project must be discussed if the incremental effect of a project, combined with the effects of other projects is 'cumulatively considerable' (14 Cal. Code Regs. §15130(a)). Such incremental effects are to be 'viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects'" (14 Cal. Code Regs. §15164(b)(1)). Together, these projects comprise the cumulative scenario that forms the basis of the cumulative impact analysis.

## CUMULATIVE SCENARIO GEOGRAPHIC SCOPE OF ANALYSIS

Staff considered the potential for cumulative impacts due to construction and operation of the proposed Rio Mesa SEGF with other existing or foreseeable nearby facilities shown in **Executive Summary Figure 1**. For the land use analysis staff used a six (6) mile distance zone around the proposed project site. This distance zone is based on distance zone classifications used by the BLM and the U.S. Department of Agriculture, Forest Service. **Land Use Figure 9** shows a six-mile radius from the project site and also shows those projects within that radius from Table 1.

## CUMULATIVE SCENARIO IMPACT ISSUES

A cumulative scenario impact would potentially create a significant effect under CEQA and the CEQA Guidelines if one of the identified issues occurs:

### <u>Land Use and Planning</u>

**A. Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope physically divide an established community?**

Palo Verde is the closest community to the project site. It is approximately two miles east of the project site. Because the proposed project would not directly divide an established community, it would not combine with the effects of the other projects within the geographic scope of the cumulative analysis to create a significant cumulative effect on the environment under this criterion.

**B. Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect?**

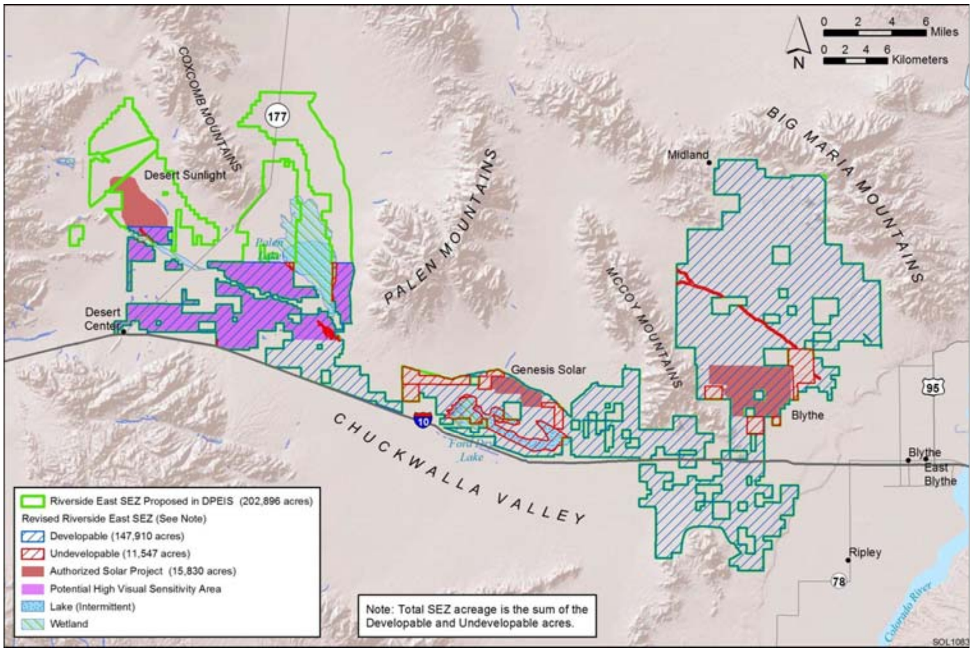
The CDCA Plan is a comprehensive, long-range plan with goals and specific actions for the management, use, development, and protection of the resources of public lands within the CDCA, based on the concepts of multiple use, sustained yield, and maintenance of environmental quality.

With the BLM's approval of the project, it would conform to the CDCA Plan and with the applicable sections of the Code of Federal Regulations. Because the project would not conflict with the CDCA, it would not contribute to cumulative impacts under this criterion.

The NECO is a landscape-scale, multi-agency planning effort that protects and conserves natural resources while simultaneously balancing human uses of the California portion of the Colorado Desert ecosystem. The planning area encompasses over five million acres and hosts 60 sensitive plant and animal species. NECO land use planning restrictions may preclude opportunities to acquire new rights of way for utilities, transmission lines, and vehicle access. Route designations that cross public land administered by the BLM requires their approval and are based on the protection of the resources on the public lands, the promotion of the safety of all the users of the public lands, and the minimization of conflicts among various uses of the public lands, as required by Title 43 Code of Federal Regulations section 8342.1.

<u>Riverside East Solar Energy Development Zone</u>

The BLM designated Riverside East Solar Energy Zone (SEZ) is located in eastern Riverside County within Chuckwalla Valley, the southern portion of Palen Valley, and the California Desert Conservation Area (see energy zone map below).




Source: U.S. Department of the Interior Bureau of Land Management, Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States, Vol. 2, Arizona and California Proposed Solar Energy Zones, Chapters 8 and 9, FIGURE 9.4.1.1-2 Developable and Non-development Areas for the Proposed Riverside East SEZ as Revised, July 2012., p.9.4-3.

A solar energy zone is defined by the BLM as an area with few impediments to utility-scale production of solar energy where BLM would prioritize solar energy and associated transmission infrastructure development. The BLM has determined that the Riverside East SEZ has generally low resource conflict and high potential for solar energy development including access to transmission lines.[1]

Because the project would not conflict with the NECO plan, it would not contribute to cumulative impacts under this criterion. The incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope of the cumulative analysis would not create a project conflict with any applicable land use plan, policy or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.

**C. Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope conflict with any applicable habitat conservation plan or natural community conservation plan?**

Because the project would not conflict with a habitat conservation plan or natural conservation plan, it would not contribute to cumulative impacts under this criterion.

[1] USBLM/DOE 2012.

## Agriculture and Forestry Resources

**A. Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?**

The projects are located in undeveloped areas of the Colorado Desert.

The Soil Conservation Service, Soil Survey of Palo Verde Area, California, General Soil Map shows soils to largely be Rositas-Aco-Carrizo association and some Rositas-Gilman association. The California Department of Conservation, Farmland Mapping and Monitoring Program, "Soil Candidate Listing for Prime Farmland and Farmland of Statewide Importance – Riverside County – Palo Verde Area" does not list these soils as prime, unique, or farmland of statewide importance.

The project's contribution to any significant cumulative impacts to agricultural resources would not be cumulatively considerable with the implementation of Condition of Certification **LAND-1**.

**B. Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope conflict with existing zoning for agricultural use, or a Williamson Act contract?**

The identified projects within the geographic scope are not located on land zoned by the County for agricultural use.  Several projects identified are on public lands (federal land) administered by the BLM within the Riverside East SEZ. The incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope of the cumulative analysis would not conflict with existing county zoning for agricultural use or a Williamson Act contract.

**C. Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?**

The County of Riverside has not zoned land in the unincorporated area within the geographic scope of the cumulative analysis as forest land, timberland or Timberland Production. Therefore, the incremental effect of the project combined with the effects of the other projects within the geographic scope of the cumulative analysis would not conflict with zoning for, or cause rezoning of forest land, timberland or timberland zoned Timberland Production.

**D**. **Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope result in the loss of forest land or conversion of forest land to non-forest use?**

The geographic scope of the cumulative analysis is in a portion of the Colorado Desert that has no forest land. Therefore incremental effect of the project, combined with the effects of the other projects within the geographic scope of the cumulative analysis would not result in the loss of forest land or conversion of forest land to non-forest use, and would not create a significant effect on the environment under this criterion.

**E. Would the incremental effect of the proposed project, combined with the effects of the other projects within the geographic scope involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?**

The project's contribution to any significant cumulative impacts to agricultural resources would not be cumulatively considerable with the implementation of Condition of Certification **LAND-1**.

## COMPLIANCE WITH LORS

Staff evaluates if the siting and operation of a proposed project would be consistent or in compliance with identified federal, state, and local government LORS that control building on the project site (building and design, land use and planning, et cetera). Where determined to be inconsistent or noncompliant, staff drafts a condition of certification to ensure the proposed project is consistent with the identified LORS.

## PROPOSED PROJECT'S CONSISTENCY WITH LORS

Staff has identified the following LORS as relevant to the proposed project and a consistency discussion.

## I. IDENTIFIED FEDERAL LORS

### A. Title 43 Code of Federal Regulations (CFR), Parts 2800 and 2880 – Rights of Way Under The Federal Land Policy Management Act

A project must have a right-of-way grant for use of public lands for systems or facilities over, under, on, or through public lands.

<u>Consistency Discussion</u>

The proposed project's generation interconnection tie line, emergency and construction electrical power supply line, and access road are to be located on public land administered by the BLM and are subject to their approval.

The applicant filed a Plan of Development (POD) and Standard Form-299 application with the BLM California Desert District office on June 20, 2012 requesting use of BLM administered land for the proposed project's access road and linear facilities (BS 2012v, p. 2-2).

Standard Form (SF) - 299 Application for Transportation and Utility Systems and Facilities on Federal Lands (a.k.a. right of way [ROW] grant) is an authorization to use a specific piece of public land for a certain project, such as roads, pipelines, transmission lines, and communication sites.

The proposed project appears to be consistent with Title 43 CFR Parts 2800 – 2880 if the BLM approves SF-299. With the BLM's approval, the proposed project components would be consistent with the CDCA Plan.

### B. California Desert Conservation Area Plan 1980 as amended

The purpose of the California Desert Conservation Area (CDCA) Plan was to establish guidance for the management of 25 million acres of public lands in the California desert. The BLM administers 12 million acres of the CDCA. The proposed 3,805 acre project site is located within both the CDCA Plan "Multiple-Use Class L" (Limited Use) and "Multiple-Use Class M" (Moderate Use).

Consistency Discussion

The proposed project's generation interconnection tie line, emergency and construction electrical power supply line, and access road will require use of public land administered by the BLM. The proposed project would be consistent with the CDCA Plan if the BLM approves a POD and Standard Form SF-299. The applicant filed a POD and Standard Form-299 application with the BLM California Desert District office on June 20, 2012 requesting use of BLM administered land.

## II. IDENTIFIED LORS OF THE STATE OF CALIFORNIA

### C. California Government Code Sections 66410 – 66499.29 (State Subdivision Map Act) - Chapter 6. Reversions and Exclusions

Regulation and control of the design and improvement of subdivisions are vested in the legislative bodies of local agencies. Each local agency shall by ordinance regulate and control the initial design and improvement of common interest developments as defined in Section 1351 of the Civil Code and subdivisions for which this division requires a tentative and final or parcel map.

Consistency Discussion

Title 20, California Code of Regulations, sections 1701-2031, Appendix B, (g) (3)(C) states "If the proposed site consists of more than one legal parcel, describe the method and timetable for merging or otherwise combining those parcels so that the proposed project, excluding the linears and temporary laydown or staging area, will be located on a single legal parcel. The merger need not occur prior to a decision on the Application but must be completed prior to the start of construction" (CEC 2008, p. 88).

A letter received from George A. Johnson, Agency Director of the County of Riverside Transportation and Land Management Agency, dated January 20, 2012 states it appears that buildings or structures would cross property lines. The applicant would be required to comply with the setback requirements of the county's N-A and W-2 Zones.  No buildings or structures are to be built across parcel lines or within the setback areas of the zone (RCTLMA 2012).

The applicant has indicated in the AFC that parcels within the project site will be merged into one parcel pursuant to Energy Commission siting regulations. A Reversionary Map in accordance with the State Subdivision Map Act will be prepared and submitted to Riverside County for review and ministerial approval (BS 2011a, p. 26).

Therefore, the proposed project would be consistent with the State Subdivision Map Act and the California Energy Commission's regulation with the filing of a Reversionary Map; see staff's proposed Condition of Certification **LAND-2**.

# III. IDENTIFIED LORS OF THE COUNTY OF RIVERSIDE

## D. Riverside County General Plan

### General Plan - Chapter 3 Land Use Element - Fiscal Impacts

Land Use (LU) 9.1. Requires that new development contribute its fair share to fund infrastructure and public facilities such as police and fire facilities.

<u>ConsistencyDiscussion</u>

The proposed project would be consistent with the intent of LU 9.1. See discussion below under Ordinance No. 659 An Ordinance of the County of Riverside Amending Ordinance No. 659 Establishing A Development Impact Fee Program.

### General Plan - Chapter 3 Land Use Element - Solar Energy Resources

LU 15.15. Permit and encourage, in an environmentally and fiscally responsible manner, the development of renewable energy resources and related infrastructure, including but not limited to, the development of solar power plants in the County of Riverside.

<u>Consistency Discussion</u>

The proposed project is a large-scale solar thermal energy generation facility to be constructed on the Palo Verde Mesa in eastern Riverside County. The proposed project would be a use consistent with the LU 15.15.

**General Plan - Palo Verde Valley Area Plan**

While the Riverside County General Plan Land Use Element and Area Plan Land Use Map guide future development patterns in the Palo Verde Valley planning area, additional policy guidance is necessary to address local land use issues that are unique to the area or that require special policies that go above and beyond those identified in the General Plan. The Palo Verde Valley Area Plan Land Use Plan (see **LAND USE – Figure 4**) shows the proposed project site designated as “Agriculture” (AG) and “Open Space-Rural” (OS-RUR).

The “Agriculture” (AG) land use designation has been established to help conserve productive agricultural lands within the county. These include row crops, nurseries, citrus groves and vineyards, dairies, ranches, poultry and hog farms, and other agricultural related uses. Areas designated for Agriculture generally lack an infrastructure that is supportive of urban development.

The “Open Space-Rural” (OS-RUR) land use designation is applied to remote privately owned open space areas with limited access and a lack of public services. Single-family residential uses are permitted at a density of one dwelling unit per 20 acres. The extraction of mineral resources subject to an approved surface mining permit may be permissible, provided that the proposed project can be undertaken in a manner that is consistent with maintenance of scenic resources and views from residential neighborhoods and major roadways and that the project does not detract from efforts to protect endangered species. The Open Space-Rural designation has the following land use policies:

- LU 20.1 Require that structures be designed to maintain the environmental character in which they are located.
- LU 20.2 Require that development be designed to blend with undeveloped natural contours of the site and avoid an unvaried, unnatural, or manufactured appearance.
- LU 20.3 Require that adequate and available circulation facilities, water resources, sewer facilities, and/or septic capacity exist to meet the demands of the proposed land use.
- LU 20.4 Ensure that development does not adversely impact the open space and rural character of the surrounding area.
- LU 20.5 Encourage parcel consolidation.

- LU 20.6 Provide programs and incentives that allow Open Space-Rural areas to maintain and enhance their existing and desired character.

<u>Consistency Discussion</u>

The proposed project is a large-scale solar thermal electric generating facility that includes approximately 170,000 individual heliostats that would be arranged in a circular pattern around two 750-foot-tall concrete towers covering 3,805 acres of undeveloped desert on the Palo Verde Mesa. Each heliostat would be an independent unit mounted on a single pylon, approximately 17 feet wide and 13 feet tall from the ground on 7-foot-tall pylons. Other project structures include a steam generation building, pump support and maintenance area, water treatment system including evaporation ponds, an on-site switchyard, and an air-cooled condenser (see **Visual Resources Figure 6**). The air cooled condenser would have a height of 120 feet. The proposed project would conflict with LU 20.1, LU 20.2, and LU 20.4.

Although the proposed project would conflict with LU 20.1, LU 20.2, and LU 20.4, the proposed project is a use permitted within the "Agriculture" and "Open Space-Rural" land use designation as per Riverside County General Plan policy LU 15.15. LU 15.15 permits and encourages, in an environmentally and fiscally responsible manner, the development of renewable energy resources and related infrastructure, including but not limited to, the development of solar power plants in the County of Riverside.

## E. Ordinance 348 Land Use Ordinance of Riverside County

### I. Zoning Classifications

#### N-A (Natural Assets) Zone

Section 15.200.c. (15) states "solar power plant on a lot 10 acres or larger" provided a conditional use permit has been granted pursuant to the provisions of section 18.28 of Ordinance No. 348.

Section 15.201 Development Standards. The following shall be the standards of development in the N-A Zone, except where a use specifically allows a lesser standard:

a. a. Minimum lot size; 20 acres with a minimum gross width of 400 feet.

b. Minimum yard depths; front 100 feet, sides 50 feet, rear 50 feet.

c. No building shall exceed 20 feet in height.

<u>Consistency Discussion</u>

The proposed project is a large–scale solar thermal electric generating facility to be constructed on a site greater than 10 acres. The use is conditionally permitted within the zone.

The applicant filed a conditional use permit application with the County of Riverside (Conditional Use Permit #03687) on June 19, 2012 (RCTLMA 2012a) for the purpose of providing county departments and the Board of Supervisors an internal review of the proposed Rio Mesa Solar Generation Facility project.

The county's conditional use permit is subsumed in the California Energy Commission's licensing process. Refer to Section 18.28 - Conditional Use Permit – <u>Consistency Discussion</u> below.

**W-2 (Controlled Development) Zone**

Section 15.1.d. (32) allows "solar power plant on a lot 10 acres or larger" provided a conditional use permit has been granted pursuant to the provisions of section 18.28 of Ordinance No. 348.

Section 15.2 Development Standards. Where a structure is erected or a use is made in the W-2 Zone that is first specifically permitted in another zone classification, such structure or use shall meet the development standards and regulations of the zone in which such structure or use is first specifically permitted, unless such requirements are hereafter modified.

a. One family residences shall not exceed forty (40) feet in height. No other building or structure shall exceed fifty (50) feet in height, unless a greater height is approved pursuant to Section 18.34 of this ordinance. In no event, however, shall a building exceed seventy-five (75) feet in height or any other structure exceed one hundred five (105) feet in height, unless a variance is approved pursuant to Section 18.27 of this ordinance.

b. Lot size shall not be less than 20,000 square feet, with a minimum average lot width of 100 feet and a minimum average lot depth of 150 feet, unless larger minimum lot area and dimensions are specified for a particular area or use.

<u>Consistency Discussion</u>

The proposed project is a large–scale solar thermal electric generating facility to be constructed on greater than 10 acres. The use is conditionally permitted within the zone.

The applicant filed a conditional use permit application with the County of Riverside (Conditional Use Permit #03687) on June 19, 2012 for the purpose of providing County departments and the Board of Supervisors an internal review of the proposed project.

The county's conditional use permit is subsumed in the California Energy Commission's licensing process.  Refer to Section 18.28 - Conditional Use Permit – Consistency Discussion below.

## II. General Provisions

### Section 18.28 - Conditional Use Permits

Provides the requirements for whenever any section of the ordinance requires that a conditional use permit be granted prior to the establishment of a use.

e. CONDITIONS. A conditional use permit shall not be granted unless the applicant demonstrates that the proposed use will not be detrimental to the health, safety or general welfare of the community. Any permit that is granted shall be subject to such conditions as shall be necessary to protect the health, safety or general welfare of the community.

### Section 18.34 - Structure Height

b. An application for a conditional use permit, public use permit, commercial WECS (*Wind Energy Conversion System*) permit or accessory WECS permit may include a request for a greater height limit in accordance with the limitations of the zone classification. The specific height limit requested shall be included in all notices regarding the permit, and if granted, the permit shall specifically state the allowed height limit.

Consistency Discussion

A county conditional use permit is required to permit the operation of a solar power plant on a lot 10 acres or larger within the N-A and W-2 Zones, and to permit several Rio Mesa SEGF buildings and structures to exceed the structure height limit of the N-A and W-2 Zones.

The county's conditional use permit is subsumed in the California Energy Commission's licensing process. The Energy Commission's exclusive permitting authority over the proposed project is found under Public Resources Code section 25500 et sequences. This permitting authority allows the California Energy Commission to consider the applicant's county conditional use permit request and the "finding(s)" the county uses for the granting of the conditional use permit. The County of Riverside uses the following "finding" found in Ordinance No. 348, Section 18.28 CONDITIONALUSE PERMITS. e:

*A conditional use permit shall not be granted unless the applicant demonstrates that the proposed use will not be detrimental to the health, safety or general welfare of the community. Any permit that is granted shall be subject to such conditions as shall be necessary to protect the health, safety or general welfare of the community* (RCLUO 2009a)

One of the key purposes of the Energy Commission's licensing process is to ensure that electrical generation facilities do not impact public health and safety. Staff proposes conditions of certification on a proposed project where necessary. Conditions of certification are written measures to mitigate a potential significant effect on the environment as per CEQA and the CEQA Guidelines, and/or ensure compliance or consistency with a federal, state, regional or local government LORS.

The maximum building height in the N-A Zone is 20 feet. In the W-2 Zone the maximum height is 75 feet for buildings and 105 feet for structures. As per Section 18.34 - Structure Height, a conditional use permit is a method to consider a request to exceed the structure height limit of an affected county zone. A conditional use permit is required to allow the construction of the project's two 760-foot tall solar receiver steam generator towers (see **Land Use Figure 10** – Project Power Block Elevation) and other structures. The proposed project's air cooled condenser is shown to be 120 feet tall. The project's gen-tie line structures spanning from the Rio Mesa Switchyard to Southern California Edison's Colorado River Substation would range from 85-120 feet in height.

Title 14, Part 77 of the Code of Federal Regulations requires a development proponent to notify the FAA, and seek approval from them, if any proposed structure exceeds 200 feet in height above ground level (AGL). On November 16, 2011 the applicant submitted Form 7460 -1 “Notice of Proposed Construction or Alteration” to the Federal Aviation Administration (FAA) for each solar tower. In addition, the applicant has requested authorization for an 820-foot height to allow high-rise cranes to be used to build the 760-foot tall towers. On February 22, 2012 the FAA issued a “Determination of No Hazard to Air Navigation” for the high-rise cranes and structures, concluding that they would have no substantial adverse effect on the safe and efficient use of navigable airspace by aircraft on the operation of air navigation facilities (URS 2012a) (refer to the **Traffic and Transportation** section in the PSA – Part A for a detailed discussion including conditions of certification).

Energy Commission staff has concluded in the applicable technical sections in the PSA that the proposed project would not result in significant unmitigable public health and safety impacts. Therefore the proposed project meets the county’s “finding” to grant a conditional use permit including a greater structure height limit.

The applicant filed a conditional use permit application with the County of Riverside (Conditional Use Permit #03687) on June 19, 2012 for the purpose of providing county departments and the Board of Supervisors an internal review of the proposed Rio Mesa SEGF project. After the County has had the opportunity to review the Energy Commission’s PSA, they will provide to Energy Commission staff the results of the County’s internal review of the project.

## F. Ordinance No. 460 Regulating The Division Of Land Of The County of Riverside As Amended through Ordinance No. 460.147, effective February 1, 2007

### Section 18.7 - Merging of Contiguous Parcels

All land divisions in the unincorporated area of the County of Riverside are subject to all of the applicable provisions of the State Subdivision Map Act and this ordinance. All land divisions shall conform to the Comprehensive General Plan of Riverside County, with all applicable specific plans, with the requirements of the Land Use Ordinance and other ordinances.

<u>Consistency Discussion</u>

Title 20, California Code of Regulations, sections 1701-2031, Appendix B, (g)(3)(C) states “If the proposed site consists of more than one legal parcel, describe the method and timetable for merging or otherwise combining those parcels so that the proposed project, excluding the linears and temporary laydown or staging area, will be located on a single legal parcel. The merger need not occur prior to a decision on the Application but must be completed prior to the start of construction” (CEC 2008, p. 88).

A letter received from George A. Johnson, Agency Director of the County of Riverside Transportation and Land Management Agency, dated January 20, 2012 states it appears that buildings or structures would cross property lines. The applicant would be required to comply with the setback requirements of the county’s N-A and W-2 Zones.  No buildings or structures are to be built across parcel lines or within the setback areas of the zone (RCTLMA 2012).

The applicant has indicated in the AFC that parcels within the project site will be merged into one parcel pursuant to Energy Commission siting regulations. A Reversionary Map in accordance with the State Subdivision Map Act will be prepared and submitted to Riverside County for review and ministerial approval (BS 2011a, p. 26).

Therefore, the proposed project would be consistent with the State Subdivision Map Act, the California Energy Commission's regulation, and county Ordinance No. 460 with the filing of a Reversionary Map; see staff's proposed Condition of Certification **LAND-2**.

## G. Ordinance No. 659 An Ordinance of The County of Riverside, Amending Ordinance No. 659 (as amended through 659.8) Establishing A Development Impact Fee Program (Year 2001 Development Impact Fee Ordinance)

The ordinance establishes and sets forth policies, regulations, and fees relating to the funding and installation of facilities and the acquisition of open space and habitat necessary to address the direct and cumulative environmental effects generated by new development projects described and defined in this ordinance. It establishes the authorized uses of the fees collected.

**Section 7 DEVELOPMENT IMPACT FEE (DIF)**

In order to assist in providing revenue to acquire or construct facilities, purchase regional parkland, and preserve habitat and open space, Development Impact Fees shall be paid for each residential unit, development project, or a portion thereof to be constructed. Four categories of fees are defined which are: Single Family Residential ("SFR"), Multi-Family Residential ("MFR"), Commercial, and Industrial. For each of these categories, the amount of the DIF will vary depending upon the location of the property upon which the development unit or a portion thereof will be constructed. Within each Area Plan, the following DIF amounts shall be paid for each Development Project within each Area Plan. The project site is within Area Plan 14 - Palo Verde Valley.

<u>Consistency Discussion</u>

Ordinance No. 659 designates the N-A Zone and the W-2 Zone as a "commercial zone" for the purposes of the development impact fee calculation (RCODIF 2010, p. 3). The current commercial zone fee for Area Plan 14 – Palo Verde Valley for a "Public Facilities" type use is $6,694 per acre. Staff has calculated the applicant's development impact fee for the proposed project to be $25,470, 670 ($6,694 x 3,805 acres = $25,470,670).

The Development Impact Fee provides revenue to acquire or construct facilities, purchase regional parkland, and preserve habitat and open space. Energy Commission staff has not identified a potential significant effect according to CEQA pertaining to public services and facilities created by the proposed project (see the **Socioeconomics** section in Part A of the PSA).

In addition, biology conditions of certification for the proposed project require the applicant to acquire compensation lands for impacts to habitat for the desert tortoise, golden eagle and burrowing owl, and for jurisdictional waters of the State of California. The acquiring of these compensation lands requires the posting of a financial security totaling approximately $30 million to guarantee completion of these acquisitions (refer to the **Biological Resources** section in this PSA for a detailed discussion including conditions of certification).

No development impact fee would be required because no new or expanded public facilities are necessary, and the proposed project will be required to offset its impacts to sensitive biological species and their habitat. The approximate $30 million mitigation cost would be substantially consistent with full payment of the approximate $25 million development impact fee.

## H. RIVERSIDE COUNTY BOARD OF SUPERVISORS POLICY NO. B-29

On November 8, 2011, the Riverside County Board of Supervisors adopted Board of Supervisors Policy No. B-29 as part of the county's Solar Power Plant Program. Board of Supervisors Policy No. B-29 provides that the County of Riverside will not issue certain permits or approvals unless the Board of Supervisors first approves a franchise, real property interest or development agreement with the owner of a solar power plant. The permits or approvals involve (1) use of county rights of way, (2) use of other County property, or (3) land development under the County's zoning and subdivision ordinances. As a term of such agreements, the owner of a solar power plant would annually pay a fixed amount per acre of land devoted to the power production process (RCBOS 2011). The current county annual fee is $450.00 per acre.
The stated purpose of this policy is to "ensure that the County does not disproportionately bear the burden of solar energy production, to ensure the County is compensated in an amount it deems appropriate for the use of its real property, and to give solar power plant owners certainty as to the County's requirements" (RCBOS 2011).

<u>Consistency Discussion</u>

Staff notes that this is a Board policy and there is some question as to whether this is a law, ordinance, standard or regulation necessitating a consistency determination pursuant to the Warren-Alquist Act. A letter received from the county dated March 7, 2012 states that it is "unclear at the present time whether an additional agreement or agreements would be required based upon the Project's planned use of other County-owned real property or rights-of-way" (RC 2012a, p.2). Nevertheless, staff has analyzed the project's consistency with Board Policy B-29.

It appears that the project would not include work within the county's rights-of-way, but rather on private land and within state highway property. The applicant states “a new access road will be required (and may potentially be paved) directly north and parallel of 34th Avenue ROW, which is an existing dirt road” (BS 2012v, p. 5.6-17) connecting to State Highway 78 (see **Land Use Figure 8**) However, project-related traffic would use county rights-of-way.

Staff’s analysis in the **Socioeconomics** section in PSA – Part A concluded that the proposed project will not result in any need for new or expanded public facilities. The use of the county public right of way has been analyzed in the **Traffic and Transportation** section and mitigation identified to ensure the county roads are restored to their previous condition, thus ensuring the county would not be disproportionately burdened and would be adequately compensated for the use of its ROW. Therefore, the project is consistent with the intent of Board of Supervisors Policy No. B-29.

### Riverside County Board of Supervisors Policy B-29 Litigation

On November 8, 2011, the Riverside County Board of Supervisors adopted General Plan Amendment 1080, Board Resolution 2011-273, Ordinance 348.4705, and Board of Supervisors Policy No. B-29 to facilitate the development of large scale solar plants on 10 acres or larger within the unincorporated area of the County of Riverside. In adopting these measures, the Board of Supervisors stated in its decisional documents that should any one of the above measures be determined invalid or unenforceable, the rest would be deemed invalid as well (RCBOS 2011, p. 4).

On February 3, 2012, the Independent Energy Producers Association and the Large-Scale Solar Association filed suit in Superior Court of California, County of Riverside (Superior Court) (CJ 2012) challenging the provision of Board of Supervisors Policy No. B-29 that requires the owner of a solar power plant to annually pay a fixed amount per acre of land devoted to the power production process. The current payment per acre is $450.00. The suit alleges the payment of a fee violates California Proposition 26 (approved November 2010; increases legislative vote requirement to two-thirds for State levies and charges, and imposes additional requirement for voters to approve local levies and charges with limited exceptions), and fails to conform to the California Mitigation Fee Act (California Government Code section 66000 et sequences). As of this writing, the Superior Court has scheduled a hearing for January 25, 2013, on this matter. Staff will include any relevant updates in the FSA.

Staff concludes if the Superior Court rules that the Solar Power Plant Program is invalid or unenforceable in its entirety, the applicant would be required to file the following applications with the County of Riverside for the proposed project:

- a General Plan Amendment to allow a solar thermal electric generation facility within both the “Agriculture” and “Open Space-Rural” land use designations; and,
- a change of zone to permit a solar thermal electric generation facility in the “N-A” Zone and the “W-2” Zone.

Rio Mesa Solar Holdings, LLC, submitted an application to the County of Riverside for a change of zone for certain parcels on the project site in July 2011. The filing of the change of zone application pre-dates the County of Riverside’s adoption of the “Solar Power Plant Program” on November 8, 2011. There are approximately 2,558 acres of parcels zoned N-A on the project site for which the application for change of zone would change to W-2-10 (BS 2012v, p. 5.6-8). It is staff’s understanding that due to adoption of the “Solar Power Plant Program,” the application for zone change is no longer being processed.

## NOTEWORTHY PUBLIC BENEFITS

While the development of the proposed project is intended to address the requirements of federal and state mandates to develop renewable energy sources, no noteworthy public benefits created by it have been identified by staff in this analysis.

## CONCLUSIONS

Staff concludes that the proposed Rio Mesa Solar Energy Generation Facility would not result in a significant adverse effect on the environment according to CEQA and the CEQA Guidelines based on the identified land use and planning, agriculture and forestry resources criteria; and, that the proposed project would be consistent with federal, state, or local LORS that control building on the project site with the implementation of the proposed conditions of certification.

Staff reviewed **Socioeconomics Figure 1** (see the **Socioeconomics** section in PSA – Part A) which shows that the minority population is less than fifty percent within a six-mile radius of the proposed Rio Mesa SEGF. This population is not meaningfully greater than the minority population within the local area and Riverside County. Therefore, there are no environmental justice issues related to this project under land use.

## PROPOSED CONDITIONS OF CERTIFICATION

**LAND-1** The project owner shall restore disturbed agricultural land used during construction activities for the upgrading of two (2) drainage crossings; the drainage crossing near the corner of 30th Avenue and State Highway 78, and the drainage crossing on 34th Avenue closest to State Highway 78 shown on Land Use Figure 8 in the Energy Commission Staff Assessment.

The project owner shall submit to the Compliance Project Manager (CPM) for approval a restoration plan that with its full implementation will satisfy this requirement. The plan, at a minimum, shall show the area(s) to be restored, identify what is to be planted, and a schedule for the planting.

**Verification:** No more than 30 days following completion of the drainage improvements at both locations, the project owner shall submit the agricultural land restoration plan to the CPM for approval.

If the CPM notifies the project owner that any revisions of the agriculture land restoration plan are needed, within 30 days of receiving that notification the applicant shall submit to the CPM a plan with the specified revisions.

The project owner shall complete the agriculture land restoration within 90 days after approval of the plan by the CPM.

The project owner shall notify the CPM within seven days after completion of restoration that the restored area(s) is ready for inspection.

**LAND-2** Prior to the start of construction, the project owner shall file with the County of Riverside Planning Department a "Reversionary Map" prepared in accordance to the provisions of the State Subdivision Map Act and the applicable provisions of County of Riverside Ordinance No. 460.151 merging individual parcels within the boundary of the project site to create a single parcel. The project owner shall provide to the CPM a copy of the recorded "Reversionary Map" filed with the County of Riverside Assessor-County Clerk-Recorder.

**Verification**: Thirty (30) days prior to the start of construction, the project owner shall provide to the CPM a copy of the recorded "Reversionary Map" filed with the County of Riverside Assessor-County Clerk-Recorder.

## REFERENCES


BS 2011a – Bright Source/J. Woolard (tn 62584). Rio Mesa Application for Certification - Volumes 1, 2, and 3, dated October 14, 2011. Submitted to CEC Docket Unit on October 14, 2011.

BS 2012r – Bright Source (tn 65431) Applicant's Supplemental Response to Data Requests, Set 1B, 143 and 144, dated May 23, 2012. Submitted to CEC Dockets Unit on May 23, 2012.

BS 2012v – Bright Source/T. Stewart (tn 66292) Applicant's Environmental Enhancement Proposal dated July 23, 2012. Submitted to CEC Dockets Unit on July 23, 2012.

CCGC 2012 – California Code, Government Code, Sections 66410 – 66499.29 *(State Subdivision Map Act).*

CCOR 2012 – California Code of Regulations, Title 14, Chapter 3, Sections 15000 et seq., (State CEQA Guidelines).

CDOC 2010 – California Department of Conservation, Division of Land Resources Protection, Farmland Mapping and Monitoring Program. Riverside County Important Farmland 2010, Sheet 3 and Sheet 3. 2010.

CDOC 1997 - California Department of Conservation, 1997, California Agricultural Land Evaluation and Site Assessment Model Instruction Manual website: http://www.conservation.ca.gov/dlrp/LESA/Documents/lesamodl.pdf.

CEC 2008 – Title 20. California Code of Regulations, sections 1701-2031, Appendix B, "California Energy Commission, "Rules of Practice And Procedure Power Plant Site Certification and Designation of Transmission Corridor Zones" (CEC-140-2008-003), July 2008.

CJ 2012 – Citacion Judicial, Independent Energy Producers Association, a California Nonprofit Mutual Benefit Corporation; and Large-Scale Solar Association, A California Nonprofit Corporation vs. County of Riverside, Case No. INC 1200838. Filed Superior Count of California County of Riverside, February 3, 2012.

COFR 2012 – Code of Federal Regulations. Title 43 – Public Lands: Interior, Subtitle B, Chapter 11, Parts 2800 and 2880 – Rights of Way Under The Federal Land Policy Management Act.

CTTC 2012 – California Turtle & Tortoise Club, Northern and Eastern Colorado Desert Coordinated Management Plan (NECO) website: http://tortoise.org/conservation/neco.html).

ESH 2012e – Ellison Schneider & Harris, LLP (tn 65745) Applicant's Supplemental Notice for CEC Staff's Data Requests Set 2A, dated June 13, 2012. Submitted to CEC Dockets Unit on June 13, 2012.

RCBOS 2011 – Riverside County Board of Supervisors, Resolution No. 2011-273 Amending The Riverside County General Plan. November 3, 2011.

RCCO 2012 – Riverside County Counsel Office/Tiffany North, Deputy County Counsel, to Bradley Brownlow, BrightSource Energy, Inc. regarding filing of county conditional use permit application, dated May 16, 2012, email docketed May 16, 2012.

RCGP 2003 – Riverside County General Plan, Chapter 3 Land Use Element. 2003.

RCGPPVVA 2003 – Riverside County General Plan, Palo Verde Valley Area Land Use Plan. 2003.

RCLUO 2009 – Riverside County Ordinance No. 348 Land Use Ordinance of Riverside County Amended through Ordinance No. 348.4596. March 12, 2009.

RCLUO 2009a – Riverside County of Ordinance No. 348 Land Use Ordinance of Riverside County Amended Through Ordinance No. 348.4596, Section 18.28. Conditional Use Permits.

RCODIFO 2010 – Riverside County Ordinance No. 659 An Ordinance of the County of Riverside Amending Ordinance 659 and Chapter 4.60 of the Riverside County Code Establishing Development Impact Fees.

RCTD 2012 – Riverside County Transportation Department, "Encroachment Permit" website: http://www.tlma.co.riverside.ca.us/trans/cus_pam_encroach_permit.html.

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USBLM 1980 – United States Bureau of Land Management. The California Desert Conservation Area Plan 1980 as amended. 1980.

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URS 2012a – URS/A. Leiba (tn 64060) Applicant's Data Response to Data Request Set 1A, dated March 8, 2012. Submitted to CEC Dockets Unit on March 8, 2012.

**LAND USE - FIGURE 1**

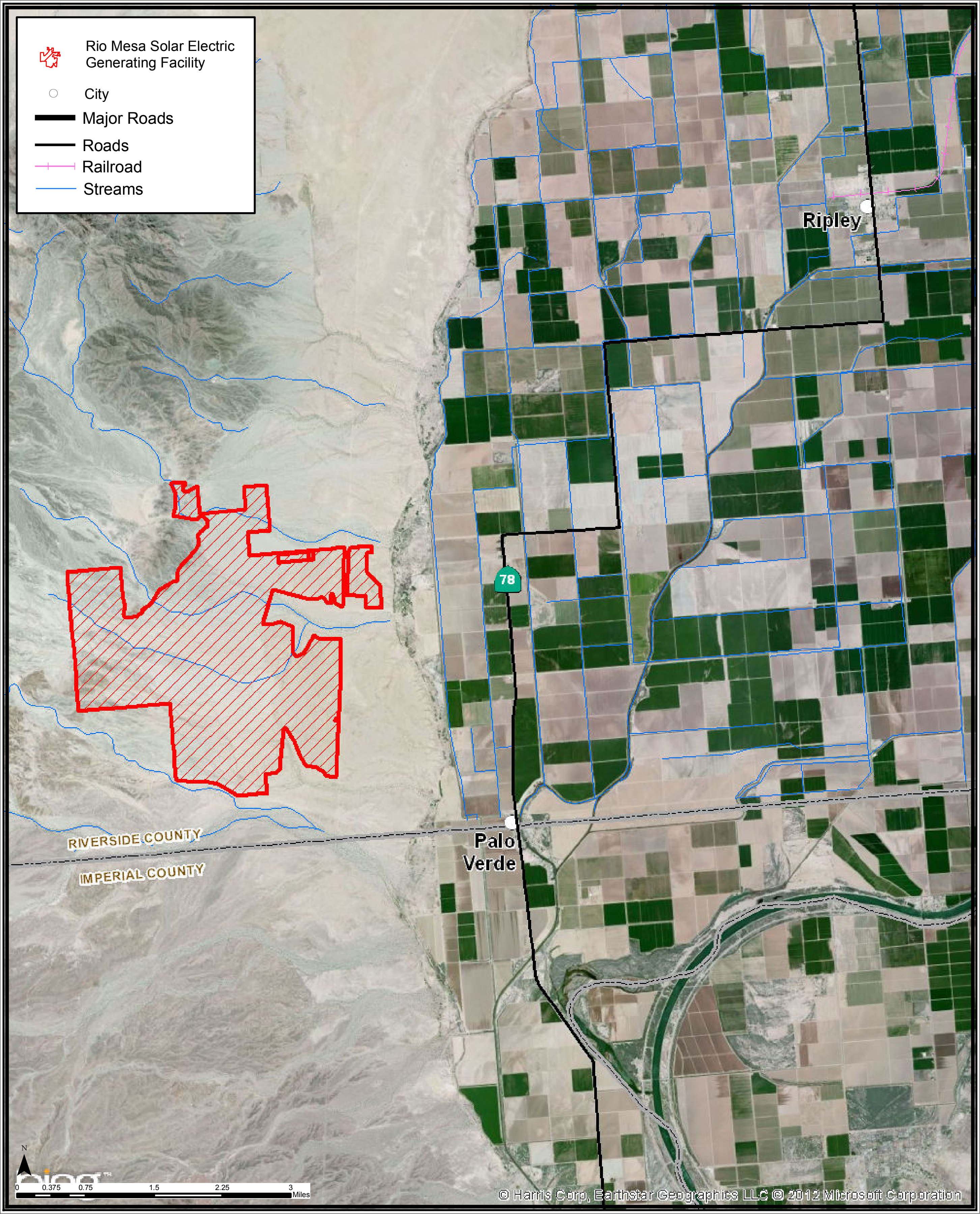
Rio Mesa Solar Electric Generating Facility - Regional and Vicinity Map


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AFC, Applicant's Supplemental Response to Data Request Set 1A, 6/7/2012, URS

**LAND USE - FIGURE 2**

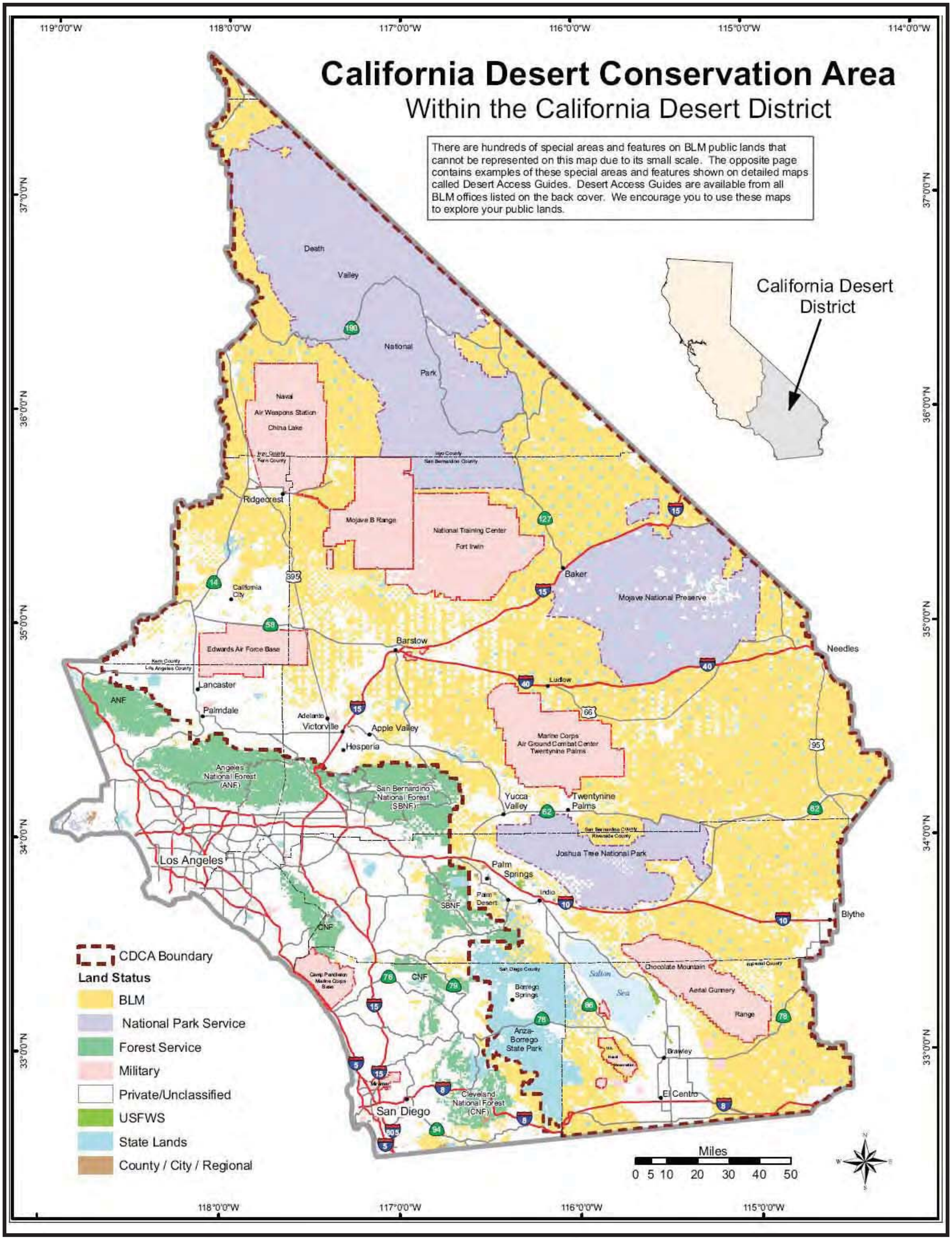
Rio Mesa Solar Electric Generating Facility - Aerial Photograph of Project Site and Vicinity




**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**
**SOURCE: Tele Atlas Data, and Bing Aerial Image.**

**LAND USE- FIGURE 3**

Rio Mesa Solar Electric Generating Facility - California Desert Conservation Area

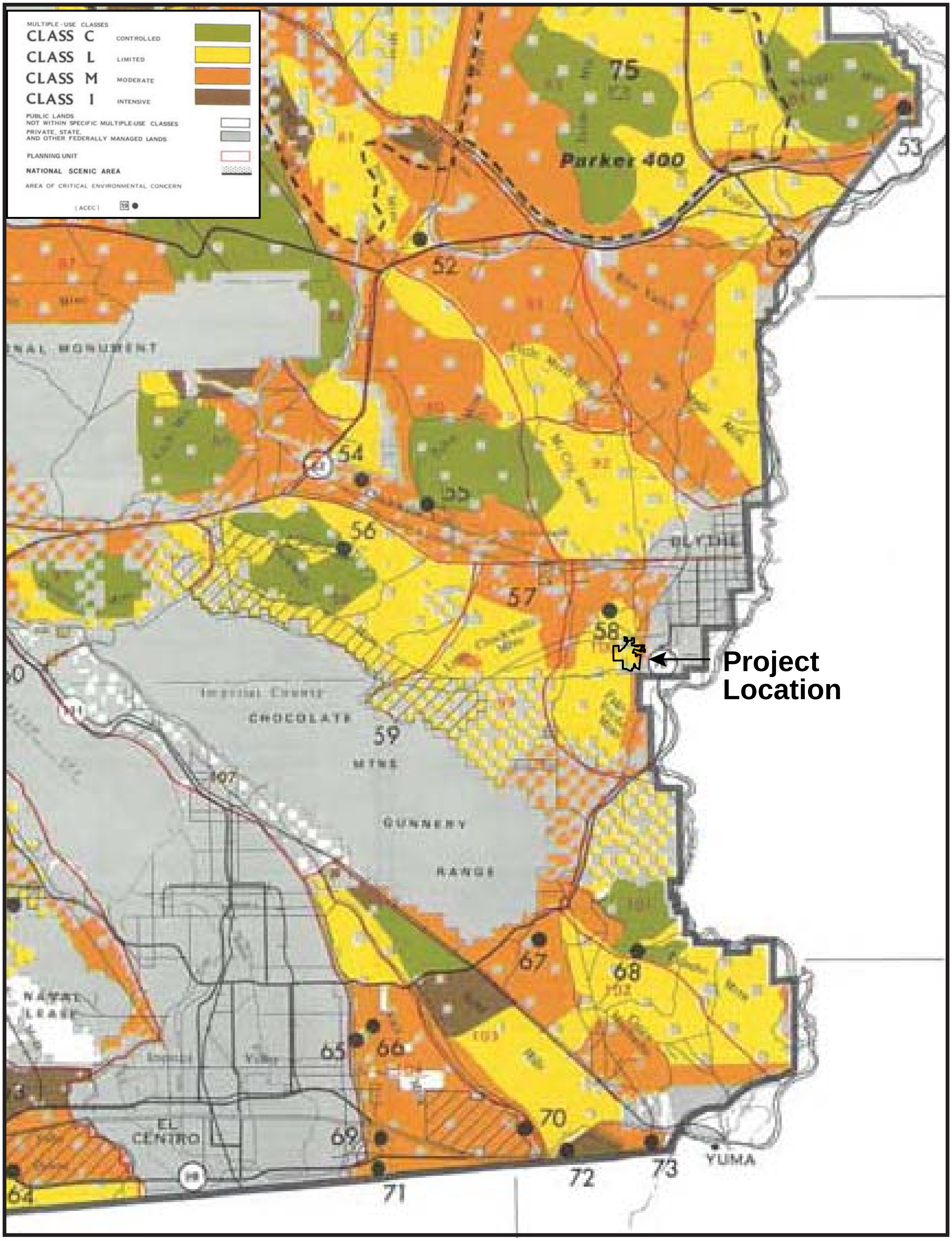



**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: BLM - California Desert Conservation Area

# LAND USE- FIGURE 4

Rio Mesa Solar Electric Generating Facility - California Desert Conservation Area Plan

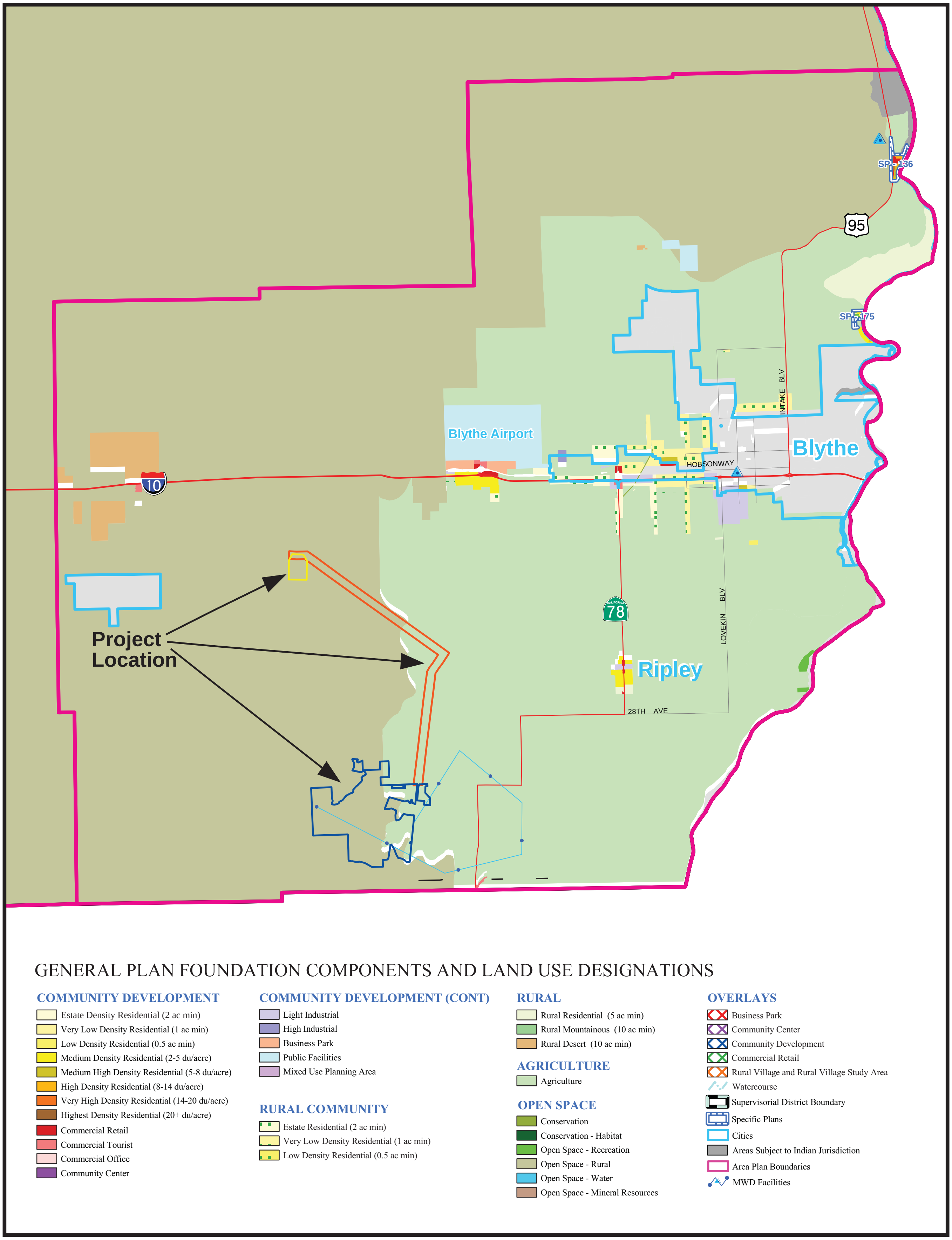



**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: BLM - California Desert Conservation Area Plan

**LAND USE - FIGURE 5**

Rio Mesa Solar Electric Generating Facility - Palo Verde Valley Area Land Use Plan

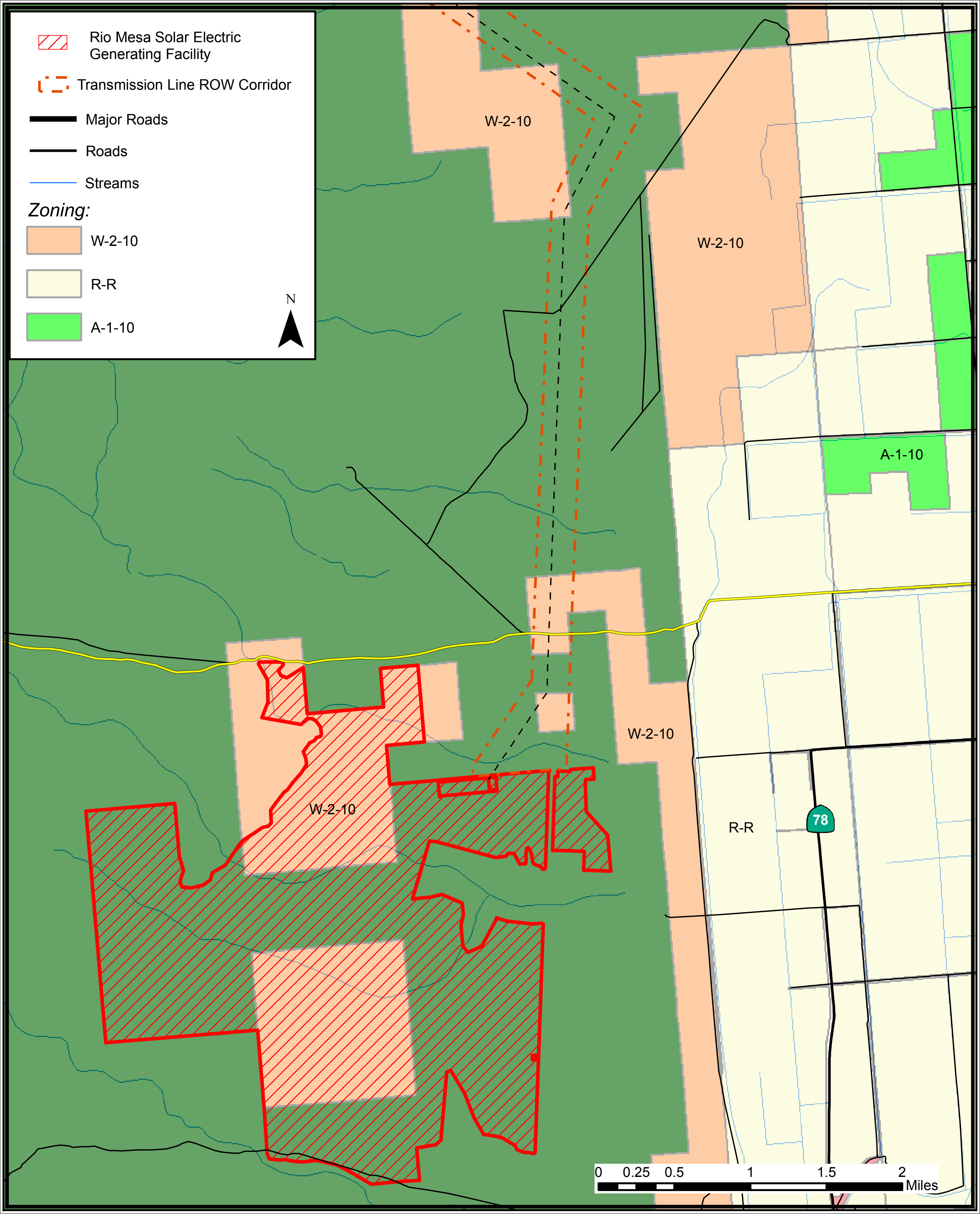



**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: Adapted from Palo Verde Area Land Use Plan - Riverside County, 10/7/2003

**LAND USE - FIGURE 6**

Rio Mesa Solar Electric Generating Facility - Site Zoning




**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

**SOURCE: Tele Atlas Data, and Bing Aerial Image, URS, Riverside County**

**LAND USE - FIGURE 7**

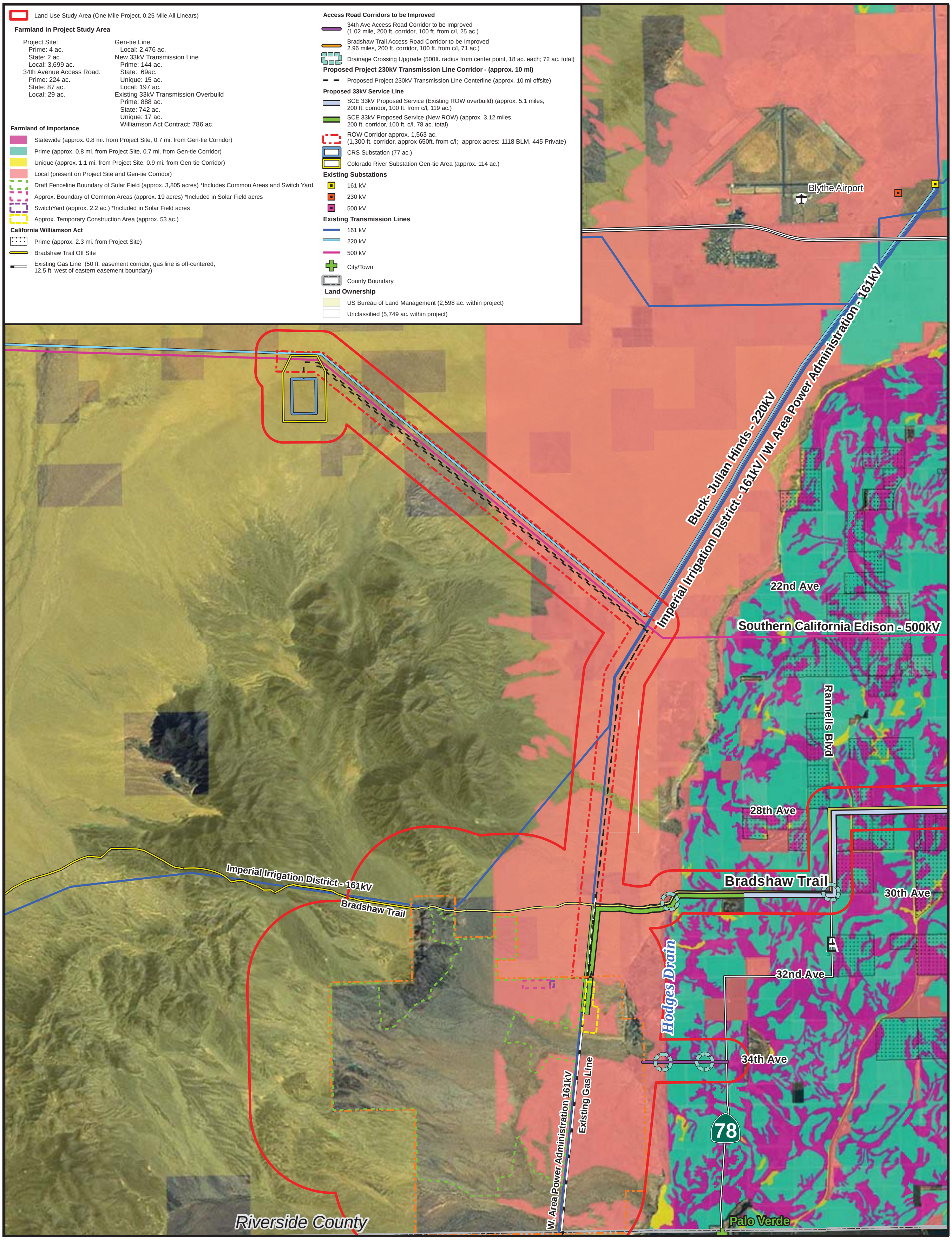
Rio Mesa Solar Electric Generating Facility - View of a Portion of the Project Site

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CEC Staff Photo

# LAND USE - FIGURE 8

Rio Mesa Solar Electric Generating Facility - Farmland

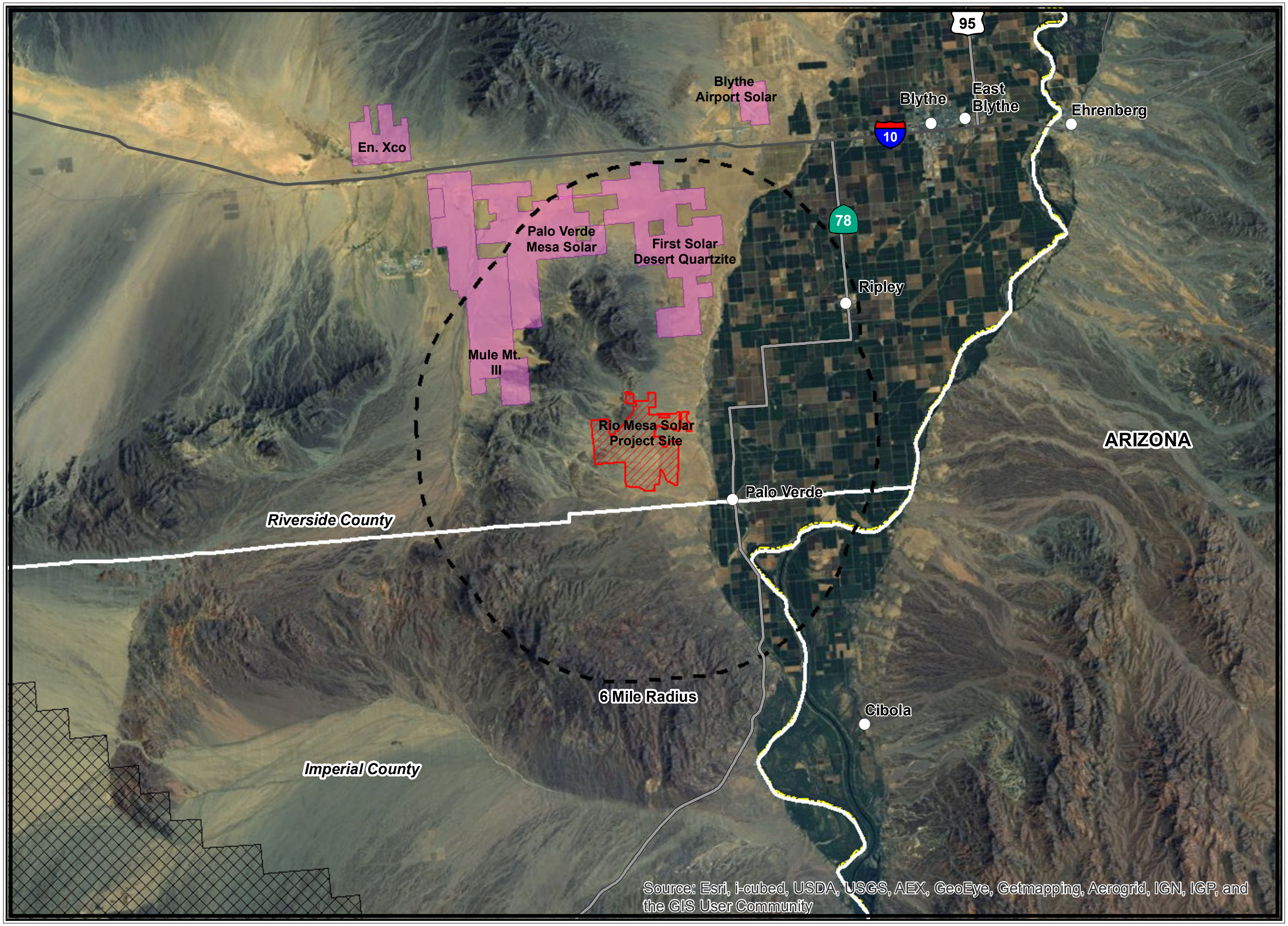



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AFC, Applicant's Supplemental Response to Data Request Set 1A, 6/7/2012, URS

**LAND USE - FIGURE 9**

Rio Mesa Solar Electric Generating Facility - Cumulative

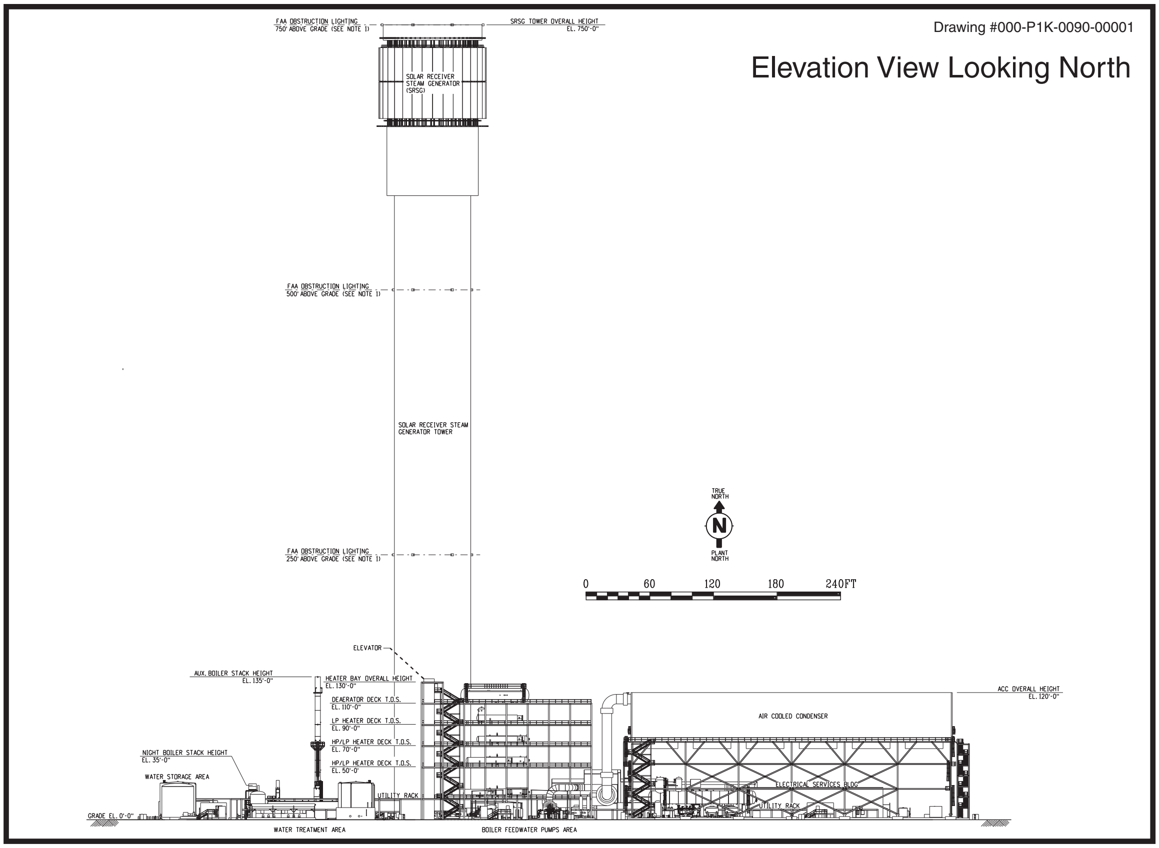


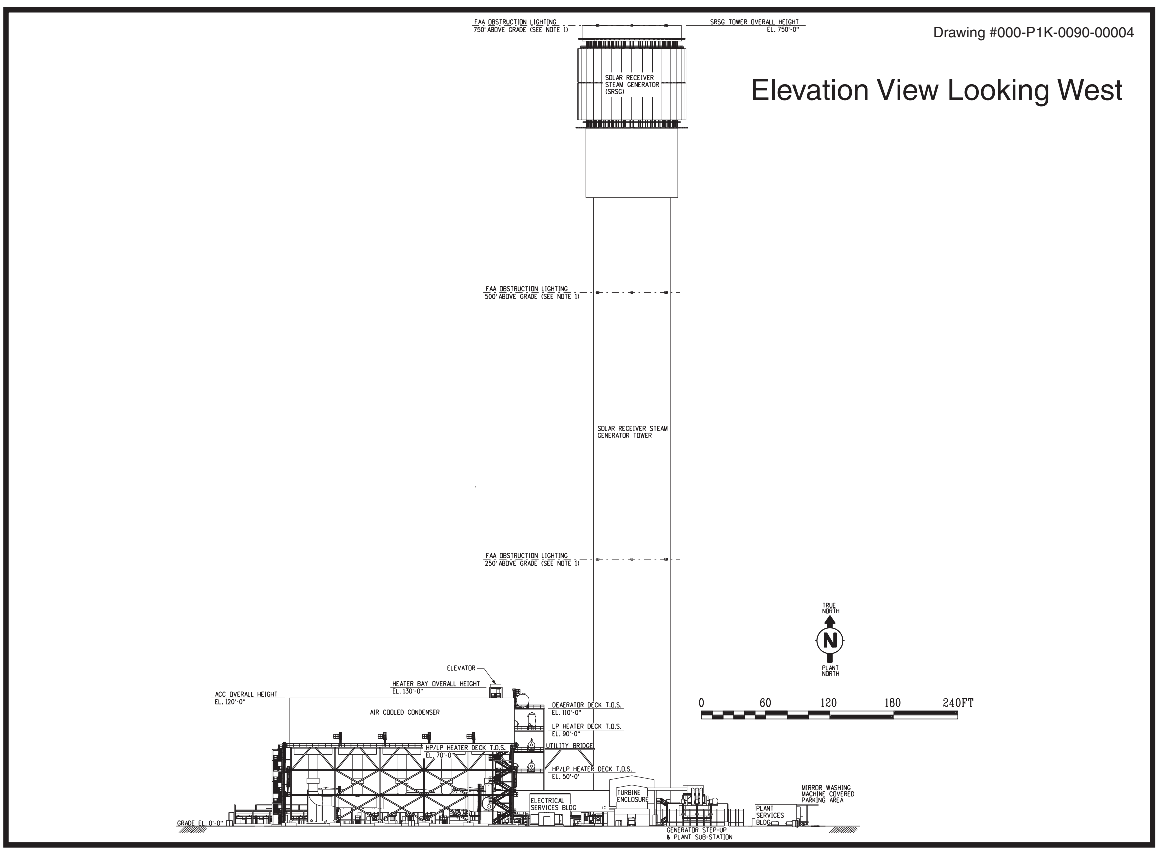

**CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: BLM, ESRI, Tele Atlas Data. Bing Aerial Image

# LAND USE - FIGURE 10

Rio Mesa Solar Electric Generating Facility - Project Power Block Elevation




**CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: AFC, Applicant's Supplemental Response to Data Request Set 1A, 6/7/2012, URS

# ALTERNATIVES

Susan Lee and Emily Capello

## INTRODUCTION

This analysis evaluates a reasonable range of potentially feasible alternatives to the proposed Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF or proposed project). Energy Commission staff (staff) reviewed the alternatives analysis provided by the project applicant in the application for certification (AFC) for the Rio Mesa SEGF project, and expanded upon that analysis with several additional alternatives that are evaluated in this staff assessment.

The sections that follow compare the potential environmental impacts of the proposed Rio Mesa SEGF project with those of the project alternatives. The analysis of the proposed Rio Mesa SEGF project concludes that after implementation of mitigation, the project would result in significant and unmitigable impacts to biological resources, cultural resources, and visual resources. The proposed Rio Mesa SEGF project would potentially result in significant and unmitigable impacts to paleontological resources; additional analysis will be presented in the final staff assessment (FSA). CEQA mandates the avoidance of significant environmental effects where feasible and the CEQA Guidelines require lead agencies to identify “an environmentally superior alternative[.]” Where the No Project Alternative is found to be environmentally superior, “the EIR shall identify an environmentally superior alternative among the other alternatives.” (CEQA Guidelines, § 15126.6, subd. (e)(2).) The CEQA Guidelines set forth no methodology for reaching this determination; and there is no indication that the determination must give particular weight to any “significant unavoidable impacts” of a proposed project.

Based on the alternatives analysis, the environmentally superior alternative is the no project alternative. Among the alternatives other than the no project alternative, the Solar Photovoltaic Alternative would be preferred for biological resources and visual resources. For paleontological resources, the Sonoran West Off-Site Alternative would be preferred. At this time, the Sonoran West Off-Site Alternative appears to be preferred to the proposed site for cultural resources; however, additional analysis will be completed for publication in the FSA that may provide additional information regarding the cultural resources comparison between the two sites. Given the information available at this time, based on establishing a priority for impacts to biological and visual resources, the environmentally superior alternative appears to be the Solar Photovoltaic Alternative.

Staff reviewed many potentially feasible off-site alternatives and alternative renewable technologies to define the scope and content of this analysis, including those that were also reviewed in the AFC for the proposed project. As a result, staff has defined six project alternatives for full analysis and comparison to the proposed Rio Mesa SEGF project:

- No project alternative

- Sonoran West Off-site Alternative (same size and technology as the proposed project)
- Solar Power Tower with Energy Storage Alternative (at the proposed Rio Mesa SEGF site)
- Reduced Acreage Solar Power Tower Alternative with or without Energy Storage (at the proposed Rio Mesa SEGF site)
- Solar Photovoltaic Alternative (at the proposed Rio Mesa SEGF site)
- Parabolic Trough Alternative (at the proposed Rio Mesa SEGF site)

Preparation of this alternatives analysis included reviews of many other renewable energy technologies that are at various stages of development, research, and implementation in California. Discussions of other renewable energy technologies that are not considered potentially feasible as alternatives to the proposed project are presented in **Alternatives Appendix-1** to this staff assessment, **OTHER RENEWABLE ENERGY TECHNOLOGIES**.

## CEQA REQUIREMENTS

As lead agency for the Rio Mesa SEGF, the California Energy Commission (Energy Commission) is required to consider and discuss alternatives to the proposed project. The guiding principles for the selection of alternatives for analysis in an environmental impact report (EIR) are provided by the California Environmental Quality Act Guidelines (State CEQA Guidelines) (Cal. Code Regs., tit. 14, § 15000 et seq.). Section 15126.6 of the State CEQA Guidelines indicates that the alternatives analysis must:

- Describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project;
- Consider alternatives that would avoid or substantially lessen any significant environmental impacts of the proposed project, including alternatives that would be more costly or would otherwise impede the project's objectives; and
- Evaluate the comparative merits of the alternatives.

These regulations also apply to the document used as a substitute for an EIR in a certified program (Cal. Code Regs., tit. 14, §§ 15251 and 15252).

The lead agency is responsible for selecting a range of project alternatives for examination and must publicly disclose its reasoning for selecting those alternatives (Cal. Code Regs., tit. 14, § 15126.6[a]). CEQA does not require an EIR to "consider every conceivable alternative to a project. Rather, CEQA requires consideration of a reasonable range of potentially feasible alternatives….". The range of reasonable alternatives must be selected and discussed in a manner that fosters meaningful public participation and informed decision making (Cal. Code Regs., tit. 14, § 15126.6[f]). That is, the range of alternatives presented in this analysis is limited to ones that will inform a reasoned choice by Energy Commission decision makers. Under the "rule of reason," an EIR “need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative” (Cal. Code Regs., tit. 14, § 15126.6[f][3]).

The lead agency is also required to (1) evaluate a “no-project alternative,” (2) identify alternatives that were initially considered but then rejected from further evaluation, and (3) identify the “environmentally superior alternative” among the other alternatives (Cal. Code Regs., tit. 14, § 15126.6).

Alternatives may be eliminated from detailed consideration by the lead agency if they fail to meet most of the basic project objectives, are infeasible, or could not avoid any significant environmental effects (Cal. Code Regs., tit. 14, § 15126.6[c]).

## ALTERNATIVES SCREENING

The Energy Commission must fulfill its role in implementing California’s Renewables Portfolio Standard (RPS) program, which was established in 2002 under Senate Bill (SB) 1078, accelerated in 2006 under SB 107, and expanded in 2011 under SB X 1-2. Other related legislation has altered specific parts of the RPS program. The RPS program requires a retail seller of electricity to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020. The California Public Utilities Commission (CPUC) and the Energy Commission are jointly responsible for implementing the program.

The importance of achieving these renewable energy goals was emphasized with the enactment of Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006, which sets aggressive greenhouse gas reduction goals for the state.

The Renewable Energy Resources Program (SB 107) states that the Energy Commission’s program objective is “to increase, in the near term, the quantity of California’s electricity generated by in-state renewable electrical generation facilities, while protecting system reliability, fostering resource diversity, and obtaining the greatest environmental benefits for California residents” (Pub. Resources Code, § 25740.5[c]).

## PROJECT OBJECTIVES

The process for selecting alternatives to evaluate begins with the establishment of project objectives. Section 15124 of the State CEQA Guidelines defines the requirement for a statement of objectives (Cal. Code Regs., tit. 14, § 15124[b]):

> *A clearly written statement of objectives will help the lead agency develop a reasonable range of alternatives to evaluate in the EIR and will aid the decision makers in preparing findings or a statement of overriding considerations, if necessary. The statement of objectives should include the underlying purpose of the project.*

In accordance with applicable legislative mandates and the CEQA Guidelines, the project objectives for the Rio Mesa SEGF, as identified in this staff assessment, are as follows:

- Construct and operate an approximately 500 megawatt (MW) solar generating facility capable of helping to meet California's Renewable Portfolio Standard requirements.
- Locate the solar generating facility in an area of high insolation.
- Locate the project near existing electric transmission equipment with a California Independent System Operator point of interconnection and natural gas infrastructure.
- Secure site control within a reasonable timeframe.

Although these project objectives are generally consistent with the project objectives set forth by the project applicant, they have been altered to facilitate staff's analysis of a reasonable range of potentially feasible alternatives, including alternatives that may not be preferred by the project applicant. Some of the project applicant's original project objectives were found to be unduly limiting, such as the objective to use BrightSource Energy's proprietary solar power tower technology and the objective to conform to the site-assigned Power Purchase Agreements, including the requirement for a commercial on-line date of 2015. The project applicant's original project objectives are listed in the "Executive Summary" of the AFC for the Rio Mesa SEGF (BS 2011a). Staff understands these objectives are important to the applicant, but hewing to narrowly drawn objectives would unduly restrict staff's analysis such that no other alternative save the applicant's proposal would meet the objectives. Staff does not believe that this is in keeping with the requirements to present a reasonable range of alternatives that would lessen or avoid some of the project's significant impacts. Staff believes it is ultimately the Commission's task to determine to what extent the applicant's narrowly drawn objectives should be taken into consideration in determining the feasibility of the alternatives analyzed by staff.

## ALTERNATIVES CONSIDERED IN THE APPLICATION FOR CERTIFICATION

### Review of Off-site Alternatives

Section 6.0, "Alternatives," of the AFC evaluated three on-site alternatives, nine off-site alternatives, and the no project alternative (BS 2011a and BS 2012v).

Subsection 6.4 of the AFC discusses alternative sites that were part of the screening analysis for off-site alternatives to the proposed project site. The following alternative sites were considered (see **Alternatives Figure 1**):

- Off-site Alternative A – MWD Property East of the Project Site
- Off-site Alternative B - MWD Property Southeast of the Project Site

- Off-site Alternative C – Site South of I-10, North of the Chuckwalla Desert Wildlife Management Area
- Off-site Alternative D – First Solar Site
- Off-site Alternative E – Chuckwalla Site
- Off-site Alternative F – McCoy Site
- Off-site Alternative G – Sonoran West Site
- Off-site Alternative H – Blythe Mesa Alternative
- Off-site Alternative I – Gabrych, Genesis Solar Site

Of these nine off-site alternatives, the project applicant carried forward the Off-site Alternative A and Off-site Alternative G sites for further analysis (BS 2012v). The remaining seven were not retained by the project applicant for further analysis based on a limited review of the sites' characteristics compared to the applicant's screening criteria. Subsection 6.4.3, "Comparison of Off-site Alternatives to Screening Criteria," of the AFC briefly discusses the reasons for eliminating the seven alternatives. Some of the stated reasons are biological sensitivity (e.g., in known ranges of desert tortoise), possible shortfalls of contiguous private land acreage, location relative to the protected areas like Chuckwalla Desert Wildlife Management Areas (DWMAs) or other special designations such as Areas of Critical Environmental Concern (ACECs) or wilderness designations, conflicts with preferred agricultural land uses, and site availability. Off-site Alternative D, E, F, and H are described as "stacked in line behind other developers," which means that other developers have the right to develop the land based on their earlier submittal of applications to the Bureau of Land Management, limiting the potential for site acquisition. Offsite Alternative I was identified as being too small to allow for the project as proposed, would be located on prime farmland, and would be immediately adjacent to the Colorado River, an important bird migratory pathway. Off-site Alternative C was identified as large enough for the project, but comprised parcel shapes that would hinder solar generation. Based partially on information provided in the AFC, staff concurs with the project applicant's rejection of Off-site alternatives B, C, D, E, F, H, and I.

**Off-site Alternative G**. Staff reviewed the screening level information provided by the project applicant on the Sonoran West site (applicant's Off-site alternative G) and determined that more information was needed to adequately evaluate the site and compare its impacts to those of the proposed project. In data requests submitted to the applicant in May and June 2012, staff requested additional information on the Sonoran West site. Responses to those data requests were received in July 2012. Staff's analysis of the Sonoran West Off-site Alternative incorporates information from those data responses as discussed below under, "Alternatives Evaluated in Detail."

**Off-site Alternative A.** Subsection 6.4.4.2 of the AFC addresses Off-site Alternative A (MWD Property east of proposed site) as an alternative carried forward and compares the potential environmental impacts of that alternative to the Rio Mesa SEGF project

(BS 2011a and BS 2012v). After staff reviewed the information in the AFC and used other maps and resource data to characterize the site, this site was eliminated from detailed considerations, see “Alternative Eliminated from Detailed Considerations”.

## Review of Alternative Project Configurations

Staff considered both larger and smaller power tower projects on the proposed project site. These included projects ranging from the 250 MW Reduced Acreage Power Tower Alternative to the 750 MW originally proposed project.

**750 MW Alternative.** The applicant’s original application to the Energy Commission presented a larger plant with a net generating electrical capacity of 750 MW on a combination of Metropolitan Water District of Southern California (MWD) owned land and BLM-administered public land, or only on MWD-owned land. As noted in the application, impacts of both the 750 MW alternatives would be greater relative to the 500 MW project. In the revised application proposing a 500 MW project, the applicant stated that a 750 MW alternative would not conform to the requirements of the 20-year Power Purchase Agreement assigned to RMS 1 and RMS 2 for a commercial on-line date of September 2015 (BS, 2012v). Staff concurs with the project applicant’s rejection of on-site 750 MW alternatives.

**250 MW Alternative (Reduced Acreage Solar Power Tower Alternative)**. The applicant had originally proposed an alternative with reduced capacity relative to the proposed project. In the revised application, this 500 MW alternative became the proposed project as described in the **Project Description**. No further reduced alternative was proposed in the Supplemental Response to DR Set 1A (BS, 2012v) when the project was modified to be 500 MW.

In data requests submitted to the applicant in June 2012, staff requested additional information on the feasibility of an alternative that would avoid or minimize impacts to waters of the U.S. on the project site because desert washes that flow to the Colorado River are under the jurisdiction of the U.S. Army Corps of Engineers and protected as valuable resources. The applicant’s response to the data request (July 2012) noted that no alternative could avoid all waters of the U.S. and also satisfy all of the applicant’s project objectives. Staff’s analysis of the 250 MW Reduced Acreage Solar Power Tower Alternative with or without Energy Storage incorporates information from the data responses, and is presented under “Alternatives Evaluated in Detail.”

## Review of Alternative Renewable Technologies

Other renewable solar technologies discussed in the AFC include central power tower with integral thermal storage, parabolic trough, and solar photovoltaic technologies. These three alternative technologies are analyzed as potentially feasible alternatives in this staff assessment. Refer to the section “Alternatives Evaluated in Detail” for a full analysis of these alternative technologies.

## PUBLIC AND AGENCY PARTICIPATION

Preparation of the Rio Mesa SEGF alternatives analysis included staff's participation in the Informational Hearing (February 2012) held in Blythe and several status conferences that were held before the Energy Commission in Sacramento. Comments from the public and intervenors on the alternatives analysis were considered by staff in determining the scope and content of this analysis. Following is the topic pertaining to the alternatives analysis that was presented by commenters and is addressed by staff:

- *Request to include alternatives to the facility design, including alternative technologies to avoid or minimize impacts to various resources* – A discussion of an alternative design and alternative technologies is included in **Alternatives Evaluated in Detail**, and in **Alternatives Appendix-1** "Other Renewable Energy Technologies."

### Clean Water Act, Section 404

The United States Army Corps of Engineers (USACE) has jurisdiction to protect water quality and wetland resources under Section 404 of the Clean Water Act. Under that authority, USACE reviews proposed projects to determine whether they may impact such resources, and/or be subject to the requirements for a Section 404 permit. The applicant provided the USACE and the Energy Commission with information regarding the potential onsite jurisdictional waters of the U.S. in January and February 2012. Because the project would impact jurisdictional waters of the U.S., the applicant must obtain a permit under the Clean Water Act Section 404(b)(1). The USACE may only permit discharges of dredged or fill material into waters of the U.S. after documentation that this discharge represents the least environmentally damaging practicable alternative (LEDPA), so long as the alternative does not have other significant adverse environmental consequences. The USACE coordinates with the U.S. Environmental Protection Agency on the selection of the 404(b)(1) Alternatives Analysis and the selection of the LEDPA.

The USACE will be the lead agency for the 404 permit and the LEDPA under the Clean Water Act. The BLM is the lead agency for the National Environmental Policy Act (NEPA) process and is coordinating with the USACE, but this process is ongoing and staff has therefore not analyzed a final version of the LEDPA. Staff expects that the LEDPA would determine the final footprint of the project and would fall within the range of alternatives fully analyzed in the Preliminary Staff Assessment (PSA) although the boundaries may be somewhat different from the alternatives analyzed. If additional information regarding the LEDPA becomes available after publication of the PSA, it will be included in the FSA.

## ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

Section 15126.6(c) of the State CEQA Guidelines defines the requirement to identify any alternatives that were considered by the lead agency but were rejected as infeasible. CEQA requires that the reasons underlying the lead agency's determination not to analyze these alternatives in detail be explained.

Five alternatives were considered as potential alternatives, but eliminated from detailed consideration: energy efficiency, distributed generation, Off-site Alternative A, the Palen Solar Project Alternative, and the Palo Verde Mesa site.

## Energy Efficiency

In 2003, the principal energy agencies in the state jointly created and adopted the *Energy Action Plan* (EAP), which identifies goals and actions to eliminate energy outages and excessive price spikes in electricity and natural gas (Energy Commission and CPUC 2003). The EAP states the importance of having reasonably priced and environmentally sensitive energy resources to support economic growth and attract new investments that will provide jobs and prosperity for California consumers and taxpayers. The EAP envisions a "loading order" of energy resources to guide agency decisions: (1) the agencies will optimize all strategies for increasing conservation and energy efficiency to minimize increases in electricity and natural gas demand, (2) recognizing that new generation is necessary and desirable, the agencies intend to meet the need first by renewable energy resources and distributed generation, and (3) because the preferred resources require both sufficient investment and adequate time to "get to scale," the agencies will support additional clean, fossil-fueled, central station generation (Energy Commission and CPUC 2003). Section 454.5(b) of the California Public Utilities Code addresses requirements for an electrical corporation's proposed procurement plan, including the requirement to "first meet its unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible."

In 2008, an update to the EAP was published that examines the state's ongoing actions in the context of global climate change following passage of AB 32. The updated EAP iterates how the EAP represents a collaborative process that is subject to change and updating over time. The EAP does not supersede or replace the extensive efforts of the Energy Commission's *Integrated Energy Policy Report* (IEPR), which remains the overall guiding document on energy policy. The IEPR addresses a wide range of issues pertaining to the state's electricity, natural gas, and transportation fuel sectors. The EAP is intended to capture recent changes in the policy landscape and describe activities to accomplish those policies (Energy Commission and CPUC 2008).

In its discussion on energy efficiency, the 2008 EAP update refers to strategies identified in the 2006 *California Climate Action Team Report*, explaining that "nearly one-quarter of the emission reductions identified from existing or known strategies in 2020 would come from some form of energy efficiency investment, either through improved building codes or appliance standards, utility energy efficiency programs, or smart growth strategies" (Energy Commission and CPUC 2008). The 2008 EAP update and the 2011 IEPR discuss the significance of AB 2021, which was enacted in 2006 to further the goal of achieving all cost-effective energy efficiency. AB 2021 requires the Energy Commission, in consultation with CPUC, to develop statewide energy efficiency potential estimates and targets for California's investor-owned and publicly owned utilities. Progress toward meeting the targets is reported in the current biennial IEPR (Energy Commission 2012b). In December 2011, Energy Commission staff published the final report, *Achieving Cost-Effective Energy Efficiency for California 2011–2020*, which summarizes utility progress and recommends improvements for publicly owned utility efficiency efforts (Energy Commission 2012b).

The 2008 EAP update also discusses CPUC's strategic planning process to develop comprehensive, long-term strategies for making energy efficiency a way of life for Californians. CPUC adopted California's first *Long-Term Efficiency Strategic Plan* in 2008, which was developed through a collaborative process with CPUC's regulated utilities—PG&E, SCE, SDG&E, and Southern California Gas Company—and many other key stakeholders. The long-term plan provides a statewide roadmap to maximize achievement of cost-effective energy efficiency in California's electricity and natural gas sectors from 2009 through 2020 and beyond. CPUC's 2011 update to the *Energy Efficiency Strategic Plan* (CPUC 2011b) is a comprehensive plan with goals and strategies covering all major economic sectors in the state.

As described in the 2011 IEPR, California's energy efficiency policies, programs, and energy standards for buildings and appliances in the last three decades have contributed to keeping the state's per capita electricity consumption relatively constant while energy use in the rest of the country has increased by approximately 40 percent (Energy Commission 2012b). In addition to achieving all cost-effective energy efficiency, California's energy efficiency policies include reducing energy use in existing buildings and achieving *zero net energy* building standards. Reducing building energy use to zero net energy is accomplished by combining greater energy efficiency and on-site clean energy production.

In its discussion on reducing energy use in existing buildings, the 2011 IEPR states that more than half of the state's 13 million residential units and more than 40 percent of commercial buildings were built before building and appliance efficiency standards were implemented (Energy Commission 2012b). AB 758 directed the Energy Commission to develop, adopt, and implement a comprehensive statewide program to reduce energy consumption in existing buildings and report on that effort in the IEPR. The Energy Commission shares responsibility with CPUC, local governments, and utilities to coordinate residential and commercial building retrofit programs. Completion of needs assessments and development of action plans is continuing. Other joint efforts are planned and intended to achieve improved compliance with building and appliance standards and ensure that energy efficiency measures and equipment are properly installed and delivering savings.

The Energy Commission, CPUC, and the California Air Resources Board have adopted a goal of achieving zero net energy building standards by 2020 for residential buildings and 2030 for commercial buildings (Energy Commission 2012b). In September 2011, the CPUC released its *2010–2012 Zero Net Energy Action Plan* for the commercial building sector. The Energy Commission regularly updates its building efficiency standards to reflect new technologies and strategies consistent with the goal of achieving 20 to 30 percent energy savings in each triennial update. Appliance standards are being updated to include electronics and other devices plugged into electrical outlets.

As detailed above, energy efficiency measures are critical components of California's energy policy, and as a result of these policies, California leads the nation in implementation of efficiency measures. While energy efficiency strategies are critical to reducing energy consumption in the state, no particular regulatory program or confluence of conservation strategies can be specifically identified and implemented as an alternative to the proposed project. Additionally, energy efficiencies alone would not satisfy the project objectives.

## Distributed Generation

### Overview

Governor Jerry Brown's Clean Energy Jobs Plan identifies a goal of installing 20,000 MW of new renewable capacity by 2020, including 12,000 MW of localized electricity generation (i.e., distributed generation [DG])[1] (Energy Commission 2011a). These targeted renewable capacity goals support California's RPS program goals.

There is no single accepted definition of renewable DG. The *2011 Integrated Energy Policy Report* published by the Energy Commission provides this definition: "For the purposes of the 12,000 MW of renewable distributed generation by 2020 goal, distributed generation is defined as: (1) fuels and technologies accepted as renewable for purposes of the Renewables Portfolio Standard; (2) sized up to 20 MW; and (3) located within the low-voltage distribution grid or supplying power directly to a consumer" (Energy Commission 2012). As of 2011, a total of approximately 3,000 MW of renewable DG capacity has been installed; another 6,200 MW is pending or authorized under existing state programs that support DG.

Distributed solar facilities vary in size from kilowatts to tens of megawatts and do not require transmission to get to the areas where the electricity is used. Renewable DG technologies like small PV can be located in industrial areas on previously disturbed land or on existing residential, industrial, or commercial buildings. Standards, codes, and fees vary widely for DG projects, and land use requirements for identical systems can vary significantly from jurisdiction to jurisdiction. Efforts at the national, state, and local levels are underway to identify and provide solutions to barriers to permitting renewable DG facilities (Energy Commission 2011a).

The California Public Utilities Commission (CPUC) oversees two incentive programs for customer-side of the meter DG (also called *on-site generation* or *self generation*) for customers in the territories of Pacific Gas & Electric Company (PG&E), San Diego Gas & Electric (SDG&E), and Southern California Edison (SCE) (CPUC 2010). The customer-side DG programs include several existing, new, and emerging distributed energy sources, including solar electric. The Energy Commission oversees related incentive programs.

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[1] In addition to the 12,000 MW of DG, the total 20,000 MW from the Governor's Clean Energy Jobs Plan includes 8,000 MW of utility-scale renewable capacity from wind, solar, and geothermal projects.

The programs supporting on-site solar projects include CPUC's California Solar Initiative, the Energy Commission's New Solar Homes Partnership, and a variety of solar programs offered through publicly owned utilities. The overall goal of these programs is to encourage Californians to install 3,000 MW of solar energy systems on homes and businesses by 2016 (CPUC 2011). Generation from these facilities may or may not be able to produce excess electricity exported to the distribution or transmission system, but all are connected to the electric grid (Energy Commission 2011a).

CPUC has implemented policies and programs related to procurement of utility-side DG (also called *wholesale* or *system-side generation*) (CPUC 2010). Under its investor-owned utility solar PV programs, the CPUC authorized PG&E, SDG&E, and SCE to own and operate PV facilities and to execute solar PV power purchase agreements with independent power producers through a competitive solicitation process. Based on decisions issued by the CPUC in 2009 and 2010, these programs will yield up to 1,100 MW of new solar PV capacity in the next few years. The energy produced under the solar PV programs will contribute to meeting the state's RPS goals.

Other programs in the state are designed to help offset the costs of installing rooftop PV systems on affordable and low-income housing. For example, the Los Angeles Department of Water and Power (LADWP) recently relaunched its solar incentive program. As part of the program, LADWP staff is investigating options for making solar affordable for lower income households (Energy Commission 2012).

If existing state programs to support DG, including solar PV, are fully successful, the state could add approximately 6,000 MW of additional capacity in the next several years. Additional programs or incentives may be needed to attain the 2020 goal specified in the Governor's Clean Energy Jobs Plan (Energy Commission 2011a).

## Decision to Eliminate Detailed Consideration of DG

Comments received during the proceedings on previous siting cases for large solar projects (e.g., Ivanpah Solar Electric Generating System [ISEGS]) have included requests that the review of project alternatives include a rooftop or distributed generation photovoltaic (DGPV) analysis.

As discussed above, CEQA does not require consideration of "every conceivable alternative to a project…" (Cal Code Regs., tit. 14, § 15126.6[a]). CEQA also does not require consideration of "an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative" (Cal Code Regs., tit. 14, § 15126.6[f][3]). Other reasons for staff's decision to eliminate the technology from detailed analysis are provided below:

- *No Oversight or Permitting Authority for a DGPV Alternative* – DG projects are generally initiated and installed or constructed under the jurisdiction of local governments by public utilities, private developers or residents and business owners, and others. As the project sites would likely be distributed among several jurisdictions, the coordination and feasibility of getting approvals in a timely fashion would be challenging.

- *Voluntary Participation in On-site Generation Programs* – Participation in the state's on-site generation incentive programs (e.g., rooftop solar incentives) is based on decisions made by individual residents and property and business owners. Participation in the incentive programs is elective; no laws or regulations mandate installation of on-site renewable energy systems; and utilities do not approve or deny DG systems on private property. Although the importance of the state's DG incentive programs cannot be overstated, it is not possible to treat a conglomeration of DGPV (or other types of DG) projects as a potentially feasible alternative to a utility-scale renewable energy project such as the proposed project.
- *Failure to Meet Critical Project Objectives* – Critical project objectives for Rio Mesa SEGF include those addressing development of a renewable energy facility that will contribute to meeting the state's RPS program goals. Based on electricity supply and demand forecast reports prepared by Energy Commission staff, as well as expert witness testimony in prior proceedings (e.g., the ISEGS siting case), it is apparent that renewable DG projects alone would not supply enough electricity to meet the state's mandated RPS program goals. Energy generation to meet the RPS program goals needs to come from a mix of renewable sources, and not merely one to the exclusion of others. Various agency publications identify the need to increase renewable generating capacity from DG and utility-scale sources; both are essential to successfully meeting RPS program goals. Therefore, rejection of the proposed Rio Mesa SEGF project on the grounds that some renewable DG projects will be built would be inconsistent with the state's RPS program objectives. Such a decision would also be inconsistent with the Rio Mesa SEGF's project goals of helping to meet such objectives.

## Off-site Alternative A

Subsection 6.4.4.2 of the AFC addresses Off-site Alternative A (MWD Property east of proposed site) as an alternative carried forward and compares the potential environmental impacts of that alternative to the Rio Mesa SEGF project (BS 2011a and BS 2012v). After staff reviewed the information in the AFC and used other maps and resource data to characterize the site, this site was eliminated from detailed considerations.

The project applicant identifies similar impacts on biological and cultural resources at the Alternative A site compared to the proposed project. The AFC concludes that construction of the project at Alternative A would result in greater impacts from geologic hazards due to the potential for liquefaction, greater impacts to land use due to conversion of important farmlands and Williamson Act lands, fewer impacts to paleontological resources as it is located in the Colorado River floodplain, and greater impacts to visual resources as it would be in closer proximity to sensitive visual receptors and at a lower elevation making the alternative more visible.

Based on a review of regional maps and discussions with biology staff, staff observes that the Alternative A would reduce impacts to vegetation and habitat as it would be located primarily on agriculture lands. Subsection 6.3.3.1 of the AFC, “Preferred Alternative,” describes the proposed project site as being outside designated critical habitat for desert tortoise or other high-value biological resource areas; the Biological Resources section of this staff assessment concludes that the project would have significant but mitigable impacts to desert tortoise. Compared with the proposed project, Alternative A would have reduced impacts to sensitive habitat for desert tortoise because it would be located on agricultural land that is not suitable habitat for desert tortoise. Refer to the Biological Resources section of this staff assessment for a discussion and analysis of sensitive plant and animal species at the Rio Mesa SEGF project site, including desert tortoise.

Off-site Alternative A would be 1.75 miles closer to the Colorado River and to the Cibola National Wildlife Refuge than the proposed project site, increasing impacts to bird species. The Biological Resources section of this staff assessment concludes that the most important operational impacts of the proposed project would be the impacts to birds and perhaps bats due to injury from collision with mirrors (heliostats) or flying through the zones of concentrated solar energy above the heliostat fields. This impact would be significant and feasible mitigation measures to reduce these impacts below a level of significance have not yet been identified. Because Alternative A would be closer to the Colorado River migration corridor and Cibola National Wildlife Refuge, it would increase impacts to bird species and possibly bat species.

The AFC identifies a greater impact to geologic hazards at the Alternative A site compared to the proposed project, due to the potential for liquefaction. Alternative A is identified as having loose, granular alluvial soil and shallow groundwater which leads to a high potential for liquefaction. This impact could be reduced to less than significant through project design.

The entire Alternative A site is identified as primarily agriculture land, including Prime Farmland, Farmland of Statewide Importance, and Unique Farmland as defined by the California Department of Conservation. Some of the site is under a Williamson Act contract. Additionally, as with the proposed Rio Mesa site, the zoning designation of the alternative includes a height restriction. Because of the conversion of agriculture land and because of the height restriction that would require rezoning of the alternative, impacts to land use would be greater at the alternative site.

Alternative A would be located within 0.5 miles from the community of Palo Verde. Due to the close proximity to the sensitive receptors and the lower elevation compared with the proposed project site, this alternative would result in greater visual impacts than the proposed project.

Staff is not retaining the Alternative A site for detailed analysis based primarily on the increased proximity to the Colorado River and the Cibola National Wildlife Refuge and the corresponding increase in impacts to birds and possibly bats. Although the screening level review of the site’s characteristics indicates that impacts to desert wash woodlands and sensitive vegetation would be avoided or reduced at the Alternative A site compared to the proposed project, this would be offset by the increase in impacts to sensitive bird species, a significant and unavoidable impact.

## Palen Solar Project Alternative

Staff evaluated the I-10 corridor to identify other potential alternative sites that would meet most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project. There are several applications for solar projects on public and private lands in the I-10 corridor. These projects are proposed by developers other than BrightSource. The lands covered by these other applications are considered to be unavailable for development by the Rio Mesa project applicant because the current applicants have priority rights to pursue development. Only sites under the control of BrightSource or unencumbered by other applications are considered to be viable as site alternatives.

During preparation of the Rio Mesa staff assessment, the development rights to the previously-approved Palen Solar site were purchased by BrightSource. Staff at the U.S. Fish & Wildlife Service suggested that because the Rio Mesa applicant had purchased the Palen Solar project and therefore had first priority rights to develop the Palen site, this site should be considered as an alternative to the Rio Mesa site.

A solar project at the Palen site was originally proposed by Solar Millennium LLC and Chevron Energy Solutions as a 500 MW solar thermal facility using solar parabolic trough technology. The Palen Solar I, LLC Project was certified by the Energy Commission in December 2010. In June 2012, Palen Solar I, LLC filed a petition to transfer ownership of the Final Decision for the Palen Solar Power Project (09-AFC-7) from Palen Solar I, LLC to Nalep Solar Project I, LLC (now called Palen SEGS I, LLC), a wholly owned, indirect subsidiary of BrightSource Energy, Inc (Galati 2012). In July 2012 the Energy Commission approved the transfer of ownership (Energy Commission 2012c).

The Palen solar project has been the subject of a proceeding at the Energy Commission, and is approved in its solar trough design. It would require an updated NEPA/CEQA analysis to consider the conversion to the power tower technology. It is not considered feasible as an alternative to the Rio Mesa SEGF because it is an already approved project that has been considered as part of California's renewable portfolio since its approval.

### Palo Verde Mesa Solar Project Site

In August 2012, Basin and Range Watch recommended the consideration of the Palo Verde Mesa Solar (PVMS) Project site as an alternative to the Rio Mesa site. The PVMS Project is located on disturbed private agricultural land on the Palo Verde Mesa west of Blythe, California. Riverside County has released a Notice of Preparation (NOP) for an EIR for a solar project at this site and the applicant is looking for a developer for its project (BRW  2012a).

The PVMS Project is located in approximately the same location as the southernmost portion of the applicant's Off-site Alternative H, as shown in **Alternatives Figure 1**. The PVMS Project site is located immediately north and northwest of the Blythe Airport and partially within the Blythe Airport Compatibility Zone. As noted in the NOP (dated August 8, 2012), the project being proposed is a 486 MW solar PV project on approximately 3,400 acres. The project proposes to interconnect at the Colorado River Substation and would require a 15-mile 230 kV transmission line.

As noted by the Basin and Range Watch, the PVMS Project applicant states that it does not have a solar company as a technology partner for the project at this time. The PVMS Project applicant clarifies that the project is being developed for solar PV. The BrightSource power tower technology would not be a viable technology at this location because of the proximity to the Blythe Airport. A solar power tower project would be incompatible with the airport compatibility zone for two primary reasons: height restriction and the glare from the towers affecting airport operations.

The applicant for the Blythe Solar Power Project (BSPP), a solar trough project approved by the Energy Commission in September 2010) prepared an Application for Major Land Use Action Review for the Riverside County Airport Land Use Commission (SM 2010a). The BSPP application included a figure that illustrated the 14 CFR 77 Allowable Heights for the Blythe Airport (Attachment 1, Figure 1). As indicated on this figure, the PVMS Project would be limited to a structure elevation of both 160 feet and 380 feet for much of the PVMS Project site (SM 2010a). The Rio Mesa solar power towers would be approximately 760 feet tall and would not be compatible with the height restrictions.

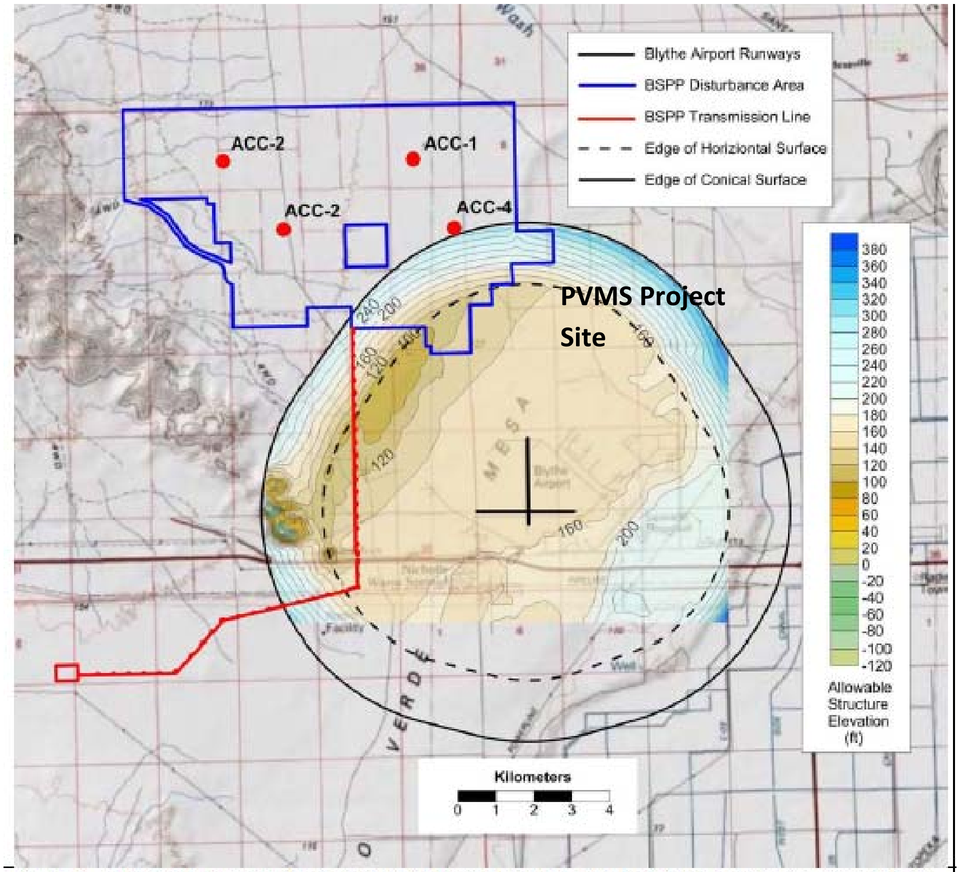



Figure 1. Blythe Solar Power Plant 14 CFR 77 Allowable Height Analysis for Transmission Line and Air Cooled Condensers (ACCs)

As noted by the Airport Land Use Commission in the BSPP proceeding, pursuant to Policy 4.3.7 of the Countywide Policies of the 2004 Riverside County Airport Land Use Compatibility Plan: "New land uses that may case visual, electronic, or increased bird strike hazards to aircraft in flight shall not be permitted within any airport's influence areas. Specific characteristics to be avoided include: (a) Glare or distracting lights which could be mistaken for airport lights; …" The policy would be implemented through the application of "standard" conditions which include prohibiting "(b) any use which would cause sunlight to be reflected towards an aircraft engaged in an initial straight climb following takeoff or towards an aircraft engaged in a straight final approach towards a landing at an airport. (ALUC 2010)" Because this alternative site would be located within the Blythe Airport Influence Area, the site would not be a feasible alternative for the Rio Mesa SEGF project.

## ALTERNATIVES EVALUATED IN DETAIL

CEQA requires consideration of "a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation. An EIR is not required to consider alternatives which are infeasible" (Cal. Code Regs., tit. 14, § 15126.6[a]). Feasibility is defined as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors" (Cal. Code Regs., tit. 14, § 15364).

Project alternatives were selected based on their potential to satisfy most of the basic project objectives discussed under, "Alternatives Screening," and their potential to reduce or avoid the significant impacts identified for the proposed project.

This analysis evaluates six alternatives to the proposed project:

- No project alternative
- Sonoran West Off-Site Alternative (same technology as the proposed project)
- Solar Power Tower with Energy Storage Alternative (at the proposed Rio Mesa SEGF site)
- Reduced Acreage Solar Power Tower Alternative with or without Energy Storage (at the proposed Rio Mesa SEGF site)
- Solar Photovoltaic Alternative (at the proposed Rio Mesa SEGF site)
- Parabolic Trough Alternative (at the proposed Rio Mesa SEGF site)

Summary discussions are provided below comparing the environmental effects of the proposed Rio Mesa SEGF project to each of the project alternatives and the no project alternative. Environmental impacts that could potentially occur under a project alternative but that would not occur under the proposed project are also discussed. A summary table comparing the potential impacts of the proposed project to the potential impacts of the project alternatives and the no project alternative is provided in **Alternatives Appendix-2**. **Alternatives Appendix-3** contains a list of staff contributors to the comparative analysis of alternatives.

The Energy Commission has the exclusive authority to license thermal power plants in the state with a generating capacity of 50 MW or greater. Therefore, state and local land use plans, policies, and regulations that would be applicable to a project alternative discussed below would be covered under the Energy Commission's in lieu permitting authority.

## NO PROJECT ALTERNATIVE

The State CEQA Guidelines require that, among other alternatives, a no project alternative shall be evaluated in relation to the proposed project. The no project alternative analysis must "discuss the existing conditions at the time…environmental analysis is commenced, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services" (Cal. Code Regs., tit. 14, § 15126.6[e][2]). As required by CEQA, a no project alternative is included to allow a comparison of the impacts of approving the proposed Rio Mesa SEGF project with the impacts of not approving the proposed project.

The proposed Rio Mesa SEGF site is currently undeveloped vacant land owned by MWD. The project site has been disturbed by military training operations during World War II and investigative activities resulting from the proposed SunDesert Nuclear Power Plant by San Diego Gas and Electric (SDG&E) in the 1970s. Existing transmission lines traverse the project site. A Western Area Power Administration transmission line borders the site to the east and the Bradshaw Trail borders the site to the north. The closest town is Palo Verde, located on the Riverside and Imperial County lines along State Route 78, about two miles east of the southeast corner of the proposed project. According to the 2010 U.S. Census, Palo Verde had a population of 171 in 2010 (U.S. Census 2010). The site comprises 30 parcels ranging from approximately 1 to 650 acres in size, and averaging approximately 230 acres.

The project site is currently zoned Open Space – Rural (OS-RUR) and Agricultural (AG) by the Riverside County Zoning Ordinance. (Refer to the **LAND USE** section of this staff assessment for a discussion of general plan designations and zoning districts for the Rio Mesa SEGF project site.) The MWD has an option of ground leasing the property for solar energy facility development through a competitive request for proposal process. Additionally some of the site has been previously used for agriculture, but there are no plans for agriculture on the site in the future. It is unknown whether MWD would issue a new competitive request for proposal process for a new solar project. Based on available information, the no project alternative consists of retaining the Rio Mesa SEGF site in its current condition. No development action would be taken and no renewable energy project would be constructed and operated at the Rio Mesa SEGF site. No other use "would be reasonably expected to occur in the foreseeable future if the project were not approved" (Cal. Code Regs., tit. 14, § 15126[e][2]), and it is assumed that existing conditions would persist at the site absent the proposed project although the current land use designation and zoning allows for rural residential and agricultural development.

Continuation of existing conditions under the no project alternative has the potential to affect certain resource areas to varying degrees. The subsections that follow summarize how minor changes in land use from relatively low intensity uses such as some recreational use at the existing Rio Mesa SEGF site could affect environmental resources at and near the site.

## Biological Resources

Current human uses at the proposed project site include off-highway vehicle (OHV) use, transmission line maintenance, roadway maintenance, and stormwater runoff. Under the no project alternative, continuation of these uses would cause a slow, continued degradation of the site that would affect plant and wildlife assemblages by reducing the abundance and health of the habitat system. Impacts to all special-status species, plants, desert woodlands, waters of the U.S., and waters of the state under the no project alternative would be **much less than those of the proposed project**.

No collision or singeing/burning impacts would occur to avian species under the no project alternative, but ongoing habitat degradation and aquifer decline would impact avian species to a minor degree. These impacts would also be **much less than the proposed Rio Mesa SEGF.**

## Cultural Resources

Reasonably foreseeable human activities under the no project alternative would include intermittent use of the site for unauthorized recreational uses, OHV use, transmission line maintenance, roadway maintenance, and stormwater runoff. Natural erosion and burial of archaeological deposits would continue as would the degradation of built-environment resources. While the natural and human-induced changes would vary from baseline conditions, staff does not interpret the changes to meet the threshold for consideration as effects in the context of planning for the proposed project. The changes represent the anticipated evolution of the baseline for the project area as well as for many parcels in the vicinity. These impacts would be **much less than the proposed Rio Mesa SEGF.** Additional analyses will be completed for publication in the FSA for the Rio Mesa SEGF cultural resources including a comparison of the alternatives.

## Geology and Paleontology

The no project alternative would leave the site in its present condition, with some continued degradation as defined previously. The **Geological and Paleontological Resources** section of this PSA describes the site's present condition. In summary, a previously unrecognized, widely distributed paleosol (fossil soil) has been discovered. To date, nearly 800 vertebrate fossils have been collected from the surface of the paleosol. The paleosol is exposed at the ground surface over large areas of the project site. It is found on both sides of the road that parallels the southern border of the project, both sides of the road that parallels the Western Area Power Administration power line along the eastern side of the project, and along both sides of the proposed transmission line. It also underlies the entire "common area" where the combined administration, control, maintenance, water treatment plant and the common switchyard are located. It is undetermined where the paleosol is buried on the remainder of the project site.

The proposed project is located on MWD-owned land, and with the no project alternative, the site would presumably continue to be primarily open and subject to unauthorized recreation, which is presumed to occur occasionally. Although the site would continue to degrade from occasional vehicle use, impacts to geological and paleontological resources under present conditions would be **considerably less than the proposed Rio Mesa SEGF**.

## Visual Resources

The no project alternative would leave the site in a condition similar to its current state, with some surface degradation. The area is located on MWD-owned land, but the site would continue to be primarily open and subject to unauthorized recreation, which is presumed to occur occasionally.

The no project alternative would eliminate the glare impacts to residents in Ripley, Palo Verde, and Blythe that would result from the heliostats and power towers included in the proposed project. Project glare would also impact motorists on I-10 and recreational visitors on BLM lands including portions of the Bradshaw Trail and Palo Verde Mountains Wilderness Area. Impacts from visual contrast and intrusion of project heliostats, solar towers, generation facilities and the gen-tie line would not occur. Impacts to visual resources under present conditions would be **much less than those of the proposed Rio Mesa SEGF project**.

## Soil and Surface Water

The proposed project site is on undeveloped land. The no project alternative would leave the site in its present condition and would be subject to continued OHV and other recreational activities. Although the site would continue to degrade from occasional vehicle use, impacts to water quality under present conditions would be **less than if the proposed project** is built and operated for 25 years. Proposed project impacts on water quality would be less than significant if conditions of certification are implemented as recommended in the **Water Quality** section.

# SONORAN WEST OFF-SITE ALTERNATIVE

## Overview

This alternative is considered because BrightSource has a pending application with the BLM to develop the Sonoran West site with the power tower solar technology. This alternative would consist of constructing and operating a 500-MW solar power tower project at the Sonoran West site. The project elements and major facility components of this alternative would be similar to those of the proposed project.

The Sonoran West site would be located entirely on public lands managed by the BLM, immediately adjacent to and south of the site of the Colorado River Substation. The BLM lands are designated as Multiple-use Class M, Moderate. Access to groundwater is considered feasible by the applicant (BS 2011a and BS 2012v). The Sonoran West site lies within the Chuckwalla Valley near the western limits of the Palo Verde Mesa on the northern flank of the Mule Mountains.

The Sonoran West Off-Site Alternative is located approximately 3.5 miles northwest of the proposed Rio Mesa SEGS site and 13 miles west of Blythe. According to 2010 U.S. Census data, a total of 20,817 people are living in Blythe. The community includes 5,473 housing units. The site is bordered by the BLM utility corridor and the I-10 to the north and the Ironwood State Prison and Chuckwalla Valley State Prison are located less than two miles from the western boundary of the site. The Mule Mountains border the site to the south and east.

Southern California Edison's Devers-Palo Verde No. 1 and 2 500 kV transmission lines cross the northern portion of the site boundary; however, the majority of the site is undisturbed. The recently completed Colorado River Substation is adjacent to the northeast corner of the Sonoran West site.

The Sonoran West site is 6,623 acres. A 500-MW solar power tower would require about 3,800 acres. The northwestern portion of the site could be avoided to reduce impacts to woodland washes that cross the proposed site. **Alternatives Figure 2** shows the study area for the Sonoran West Off-site Alternative that has been evaluated by staff. **Alternatives Figure 3** shows photographs of the Sonoran West Off-site Alternative.

The linear corridors for the transmission line for the Sonoran West Off-site Alternative would be shorter than those for the proposed project. The project applicant identified a possible alignment for a generation intertie line (gen-tie) to the proposed Colorado River Substation which is located adjacent to the Sonoran West Off-site Alternative. The natural gas pipeline to connect to the Southern California Gas Company pipeline for the Sonoran West Off-site Alternative would be less than one mile long, similar in length to the natural gas pipeline to connect the proposed Rio Mesa SEGF project to the TransCanada Gas Transmission Company North Baja pipeline.

## Potential to Attain Project Objectives

CEQA requires an alternatives analysis to "describe a range of reasonable alternatives to the project…which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project..." (Cal. Code Regs., tit. 14, § 15126.6[a]).

**Construct and operate a 500 MW solar generating facility.** Development of an approximately 500-MW solar power tower project at the Sonoran West site would meet this objective.

**Locate the solar generating facility in an area of high insolation and near existing electric transmission equipment and natural gas infrastructure.** This alternative would satisfy these project objectives.

**Secure site control.** The meaning of "a reasonable amount of time" in the context of the timeline for the proposed Rio Mesa SEGF project is uncertain. It is possible that the end of a reasonable time period defines the point at which schedule delays could cause the proposed project to become potentially infeasible, but that point is not currently known. Given that the applicant is currently undergoing environmental surveys at the Sonoran West site, staff assumes that obtaining site control and use within a reasonable time period would be possible but that the timeframe would be delayed compared with the proposed site.

The Sonoran West Off-Site Alternative would likely satisfy the four project objectives entirely, with one of the project objectives delayed compared with the proposed site. The applicant has stated in the AFC Section 6.4.3.7, that it considers the Sonoran West site to be feasible from an economic and technical standpoint; AFC Section 6.4.4.3 states that the Sonoran West Off-Site Alternative could feasibly achieve a commercial on-line date of 2015, which would allow it to comply with the existing PPA requirements. As such, staff believes that this alternative is feasible in a slightly longer timeframe than the proposed site.

## Environmental Analysis

**Alternatives Table 1** presents a summary comparison of impacts of the proposed Rio Mesa SEGF project to the same or similar potential impacts of the Sonoran West Off-Site Alternative. Notes at the bottom of the table provide a key to the abbreviations used in the table. Comparative discussions for each environmental topic area follow the table. As stated above, **Alternatives Appendix-2** contains a complete summary table comparing the potential impacts of the proposed project to the potential impacts of all the project alternatives and the no project alternative.

**Alternatives Table 1**
**Summary Comparison of the Proposed Project's Impacts**
**to the Sonoran West Off-site Alternative**

| | **Proposed Project** | **Sonoran West Off-site Alternative** | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Air Quality** | | | |
| Construction-related emissions | SM | SM | Slightly less |
| Project operations emissions | SM | SM | Similar |
| Greenhouse Gases | LS | LS | Similar |
| **Biological Resources** | | | |
| Impacts to vegetation and special status plants – sand dune habitat and transport | SM | SM | Greater |
| Impacts to vegetation and special status plants – all other species | SM | SM | Similar |
| Impacts to waters of the US | SM | LS | Much less |
| Impacts to waters of the state including microphyll woodland habitat | PSU | PSU | Similar |
| Impacts on desert tortoise | SM | SM | Slightly greater |
| Impacts on special-status terrestrial wildlife species (other than desert tortoise) – Mojave fringe-toed lizard | SM | SM | Greater |
| Impacts on special-status terrestrial wildlife species (other than desert tortoise) – all other species | SM | SM | Similar |
| Impacts on avian species, including raptors | SU | SU | Similar or slightly less |
| **Cultural Resources** | | | |
| Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites or ethnographic resources, or impact built environments on or beyond the site | UNK at this time | UNK at this time | UNK at this time |
| **Geology and Paleontology** | | | |
| Potential impacts from strong seismic shaking | SM | SM | Similar |

**Alternatives Table 1**
**Summary Comparison of the Proposed Project's Impacts to the Sonoran West Off-site Alternative**

| | Proposed Project | Sonoran West Off-site Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| Potential impacts from soil failure caused by hydro-collapse and/or dynamic compaction | SM | SM | Similar |
| Potential impacts on paleontological resources | SU | SM | Much less |
| **Hazardous Materials** | | | |
| Risk of fire or explosion during commissioning or operations | SM | SM | Similar |
| Risk of hazardous material spill off-site during hazardous materials transportation | SM | SM | Similar |
| Risk of hazardous material spill off-site resulting from hazardous materials storage and use on-site | SM | SM | Similar |
| Risk of drawdown of emergency response services causing impact off-site | SM | SM | Similar |
| **Land Use** | | | |
| Compatibility with land use plan, policy, or regulation | LS | LS | Similar |
| **Noise and Vibration** | | | |
| Potential for noise to impact noise-sensitive receptors | SM | SM | Slightly less |
| **Public Health** | | | |
| Potential for project operations to cause air toxics-related impacts that could affect public health | LS | LS | Similar |
| **Socioeconomic Resources** | | | |
| Adversely impact acceptable levels of service for police protection (law enforcement), schools, parks, and recreation | SM | SM | Similar |
| Displace substantial numbers of people and/or existing housing | LS | LS | Similar |
| Induce substantial population growth in the area | SM | SM | Similar |
| **Traffic and Transportation** | | | |
| Damage to Roads and Bridges | SM | SM | Less |
| Glint Impacts to Motorists and Pilots – heliostats | SM | SM | Slightly greater |
| Level of Service on Roads and Highways – Construction | SM | SM | Slightly less |
| Level of Service on Roads and Highways – Operation | LS | LS | Similar |
| Glare Impacts to Motorists and Pilots – solar receiver steam generator | LS | LS | Slightly greater |

**Alternatives Table 1**
**Summary Comparison of the Proposed Project's Impacts to the Sonoran West Off-site Alternative**

| | Proposed Project | Sonoran West Off-site Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Transmission Line Safety and Nuisance** | | | |
| Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure | SM | SM | Slightly less |
| **Visual Resources** | | | |
| Visual change/contrast of project facilities, excluding glare effect | SU | SU | Slightly greater |
| Potential to create a new source of glare from solar receivers | SU | SU | Slightly greater |
| **Waste Management** | | | |
| Material/waste generated during the construction and operation would be managed in an environmentally safe manner, i.e. recycling or disposal | SM | SM | Similar |
| Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities | SM | SM | Similar |
| Potential for impacts on human health and the environment related to past or present soil or water contamination | SM | SM | Slightly greater |
| **Soil and Surface Water** | | | |
| Soil erosion by wind and water during project construction or operations | SM | SM | Similar |
| Potential contamination of groundwater resources from infiltration | SM | SM | Similar |
| Environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly | SM | SM | Similar |
| **Water Supply** | | | |
| Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level | LS | LS | Similar |

Notes: — = no impact
UNK = significance of impact is unknown
B = beneficial impact
LS = less-than-significant impact, no mitigation required
SM or PSM = significant or potentially significant impact that can be mitigated to less than significant
SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

## Air Quality

### *Environmental Setting*

The Sonoran West site would be similar to the proposed project site assuming the entire project would be composed of the same emitting sources with a similar layout (for example the boilers, emergency generators and fire pumps). The project at this site would still be under the jurisdiction of the Mojave Desert Air Quality Management District (MDAQMD) and therefore subject to the same laws, ordinances, regulations, and standards. The alternative site is in the same air basin as the applicant's proposed site, the Mojave Desert Air Basin (MDAB). Both sites are in areas designated as non-attainment for the state ozone and particles with a size of less than 10 microns in diameter (PM10) standards. This region is designated as attainment or unclassified for all federal criteria pollutant ambient air quality standards and the state carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), and particulate matter with a particle size less than 2.5 microns (PM2.5) standards.

Additional information regarding the MDAB and the MDAQMD can be found in the **Air Quality** section of the PSA.

### *Environmental Impacts Pertaining to the Air Basin*

Exhaust emissions from heavy-duty diesel construction equipment and fugitive particulate matter (dust) emissions would be essentially the same at the applicant's proposed site and the Sonoran West site. Exhaust emissions would also be caused by workers commuting to and from the work sites, from trucks hauling equipment and supplies to the sites, and crew trucks (e.g., derrick trucks, bucket trucks, pickups). Since the Sonoran West Off-Site Alternative is closer to the I-10 highway, the travel distance of workers and trucks hauling equipment and supplies would be about 9 miles less than the distance to the applicant's proposed site. Exhaust emissions from the worker and delivery vehicles would be slightly less than those with the applicant's proposed site. There would also be a slight decrease in construction emissions associated with gen-tie line construction activities because the Sonoran West alternative site is adjacent to the new Colorado River Substation.

Appropriate mitigation at the Sonoran West site would likely involve similar, locally oriented recommendations such as the conditions of certification presented in the **Air Quality** section of this PSA. Staff has been in communication with the MDAQMD and believes that MDAQMD will find that the project as proposed complies with MDAQMD rules and regulations, and as such, it is likely that the Sonoran West Off-Site Alternative would comply with MDAQMD rules and regulations as well.

As with the Rio Mesa SEGF site, construction and operation of the project at the Sonoran West site would emit some GHG emissions. However, the project, if built at the Sonoran West site, would also contribute to meeting the goals of the RPS in California and would result in a net cumulative reduction of GHG emissions from new and existing fossil-fired electricity resources. Electricity is produced by operation of inter-connected generation resources. Operation of one power plant, like Rio Mesa SEGF (whether located at the proposed site or at the Sonoran West site) affects all other power plants in the interconnected system. The operation of the Rio Mesa SEGF at the Sonoran West site would affect the overall electricity system operation and GHG emissions in several ways. The Sonoran West site:

- would provide low-GHG, renewable generation;
- would facilitate to some degree the replacement of high GHG emitting (e.g., out-of-state coal) electricity generation that must be phased out to meet the State's 2006 Emission Performance Standard; and
- could facilitate to some extent the replacement of generation provided by aging fossil-fired power plants that use once-through cooling.

These system impacts would result in a net reduction in GHG emissions across the electricity system providing energy and capacity to California. Thus, as with the Rio Mesa SEGF, the Sonoran West Off-Site Alternative would result in a cumulative overall reduction in GHG emissions from power plants, does not worsen current conditions, and would not result in impacts that are cumulatively significant.

The construction emissions at the Sonoran West alternative site would be **slightly less than Rio Mesa SEGF** due to its location about 9 miles closer to the I-10 freeway. The operational emissions at the Sonoran West alternative site would be **similar to those of the Rio Mesa SEGF.**

## Biological Resources

The Sonoran West site and the proposed Rio Mesa site have similar vegetation, similar species reported, and are only 3.5 miles apart. The size of the projects and the methods for constructing and operating the projects are also substantially similar. The Sonoran West Off-Site Alternative would require approximately the same amount of land to produce the same electrical output proposed at the Rio Mesa SEGF.

**Vegetation and special status plants**. Vegetation at the Sonoran West site is similar to that at the proposed project site, including creosote bush scrub and dry desert wash communities. According to the California Natural Diversity Database (CNDDB; CDFG 2012), many of the special-status species reported at the Rio Mesa study area are also recorded at the Sonoran West site, including desert tortoise (*Gopherus agassizii*), Harwood's milk-vetch (*Astragalus insularis var. harwoodii*), and Harwood's eriastrum (*Eriastrum harwoodii*). Given the substantially similar vegetation and wildlife and the proximity to the proposed project site, impacts to creosote bush vegetation and habitat, and special-status plants would be **similar to the Rio Mesa SEGF.**

**Waters of the U.S. and waters of the state.** Drainage patterns and channels on the Sonoran West site are generally comparable to those on the proposed project site, and appear to meet criteria as waters of the state, subject to regulation under the California Fish and Game Code Section 1602. The Sonoran West site is within the closed basin draining to Ford Dry Lake and therefore stream channels on the site may not meet criteria as jurisdictional waters of the U.S. Impacts to federally jurisdictional waters would be **much less than those at Rio Mesa**. Impacts of the Sonoran West alternative to state-jurisdictional waters and the biological resources associated with the channels, including microphyll woodland habitat, would be **similar to the Rio Mesa SEGF.**

**Desert Tortoise.** Impacts to the desert tortoise would be **similar to or slightly greater than at the Rio Mesa SEGF**. Field surveys completed by BrightSource for desert tortoises on the Sonoran West site have not been made available for staff's review, but the site consists of suitable desert tortoise habitat and tortoises are reported from the vicinity in the CNDDB (CDFG 2012). In addition, most of the Sonoran West site has designated critical habitat along its western boundary (USFWS 1994).

**Other special status wildlife species.** Impacts to other special-status wildlife species would be **similar to the Rio Mesa SEGF**, with the exception of Mojave fringe-toed lizard, discussed below. Potential impacts to terrestrial biological species and habitats at the Sonoran West site could be reduced to less than significant with implementation of conditions of certification similar to those recommended for the proposed project.

**Sand Transport and Mojave Fringe-Toed Lizard**. There is an aeolian (windblown) sand transport corridor that crosses the northern portion of the Sonoran West project site, and there is suitable habitat for Mojave fringe-toed lizard (a BLM-designated sensitive species) on the site (Attachment DR 180-4 of URS 2012j). The proposed Rio Mesa SEGF site does not support sand transport and does not provide suitable Mojave fringe-toed lizard habitat. The northern portion of the proposed Rio Mesa SEGF gen-tie line would cross the same aeolian sand transport corridor including occupied Mojave fringe-toed lizard habitat, but gen-tie line impacts to the species, its habitat, and sand transport function would be much less severe. Therefore, impacts of the Sonoran West Alternative to Mojave fringe-toed lizard, aeolian sand habitat, and sand transport would be **greater than Rio Mesa SEGF**. Based on the location of the Sonoran West site and limited extent of downwind aeolian sand habitat, staff believes that these impacts of the Sonoran West Off-Site Alternative could be mitigated below a level of significance by avoiding or minimizing impacts to aeolian sand habitat and sand transport areas or, if avoidance is infeasible, by providing off-site compensation for direct and indirect impacts to aeolian sand habitat and sand transport, both on the alternative project site and off-site.

**Avian/Bat Impacts.** The most important operational impacts of the proposed project and Sonoran West Off-Site Alternative would be the impacts to birds and perhaps bats due to injury from collision with mirrors (heliostats) or flying through the zones of concentrated solar energy above the heliostat fields. Staff concludes that birds could be killed when they collide with heliostats and when their flight feathers are burned or singed as they fly through zones of concentrated solar energy surrounding the central solar receiver towers. Due to the reflected images, birds will not perceive the heliostats as solid barriers to flight. Instead, the heliostats will reflect open sky or other images, including the birds themselves. In addition, reflected light from heliostats may cause a glint and glare hazard, which may damage vision of birds flying over the site. Many native bird species, including golden eagle, other raptors and other special-status species would be at risk of collision, burning, or damage to feathers or eyes. The proposed Rio Mesa SEGF site is located along the Colorado River bird migration corridor, within a few miles of wildlife refuges and other important habitat areas. In addition, it is about one mile west of extensive irrigated agricultural lands that likely attract numerous species of birds and bats, including special-status species (e.g., burrowing owls). The Sonoran West site is a few miles more distant from the Colorado River migration corridor and wildlife refuges, and from the extensive irrigated agricultural lands. Therefore, staff believes that the collision and concentrated solar energy impacts of the Sonoran West Alternative to birds and bats would be **significant, although slightly less than at the Rio Mesa SEGF**. Feasible mitigation measures to reduce these impacts below a level of significance have not yet been developed; therefore, staff believes that this impact would be significant and unavoidable.

**Conclusion for Biological Resources.** Overall, impacts to biological resources at the Sonoran West Off-Site Alternative would be similar to those at the proposed project site.

## Cultural Resources

Additional analyses will be completed for publication in the final staff assessment (FSA) for the Rio Mesa SEGF including presenting information regarding impacts to archaeological, historical, and Native American resources at the Sonoran West Off-Site Alternative and a comparison with the proposed project.

## Geology and Paleontology

The Sonoran West Off-Site Alternative is located approximately 3.5 miles northwest of the proposed Rio Mesa SEGF within the Chuckwalla Valley and northwest of the Mule Mountains. The alternative site is characterized by gently sloping alluvium and alluvial fans that emanate from the Mule Mountains. Gullies and washes, generally draining toward the north, dissect much of the project site. The southern-most edge of the project site lies within the flanks of the Mule Mountains forming moderate relief terrain. While the site is, in general, gently sloping, steeper slopes are adjacent to the Mule Mountains on the southernmost edge of the site, as well as adjacent to the larger washes.

Available information suggests that most of the near-surface material consists of Late Quaternary and Holocene-age alluvium and alluvial fan deposits, eolian deposits of wind-blown sand, and playa lake deposits. Desert pavement with variable degrees of development is also present as a surface characteristic on many of the alluvial fan deposits. The alluvial deposits consist primarily of medium dense to dense granular material (sand and gravel). Looser and finer-grained materials may be present within the washes, eolian deposits, and playa lake deposits.

The potential for fault rupture and seismic shaking is substantively similar for the proposed project site and the Sonoran West Off-Site Alternative since they are located in close proximity to each other (approximately 3.5 miles apart). The Sonoran West Off-Site Alternative site is not crossed by any Alquist-Priolo Earthquake Fault Zones (EFZ) or active fault zones. Faults mapped near the site are considered ancient geologic structures and are not seismic hazard concerns. Seismic shaking levels are generally low to moderate, because the site is at least 60 miles east of the active seismic sources associated with the tectonic plate boundary and the San Andreas Fault System.

The potential for seismic settlement, subsidence, and ground fissures at the Sonoran West Site Alternative site is expected to be low. Liquefaction is not expected to be a hazard at the Sonoran West Site Alternative site due to the depth to groundwater.

There are no known viable geological or mineralogical resources at the proposed Sonoran West Off-Site Alternative site.

No paleontological resources have been identified at the Sonoran West site which is underlain by a different soil type than the paleosol (fossil soil) discovered at the proposed project site (BLM, 2012b). Should paleontological resources be encountered at the Sonoran West Off-Site Alternative at areas where the applicant is proposing to limit subsurface construction to standard conventional excavation techniques, potential impacts to paleontological resources due to construction activities could be mitigated through worker training and monitoring by qualified paleontologists. The applicant's proposed heliostat foundation construction methodology (predrilling and vibratory pedestal insertion) would destroy any fossils encountered at the Sonoran West site. Due to the underlying soil type at the Sonoran West site and since significant paleontological resources were discovered at the proposed Rio Mesa SEGF, staff believes that the potential for significant impacts to paleontological resources at the Sonoran West Off-Site Alternative would be **much less than the proposed project**.

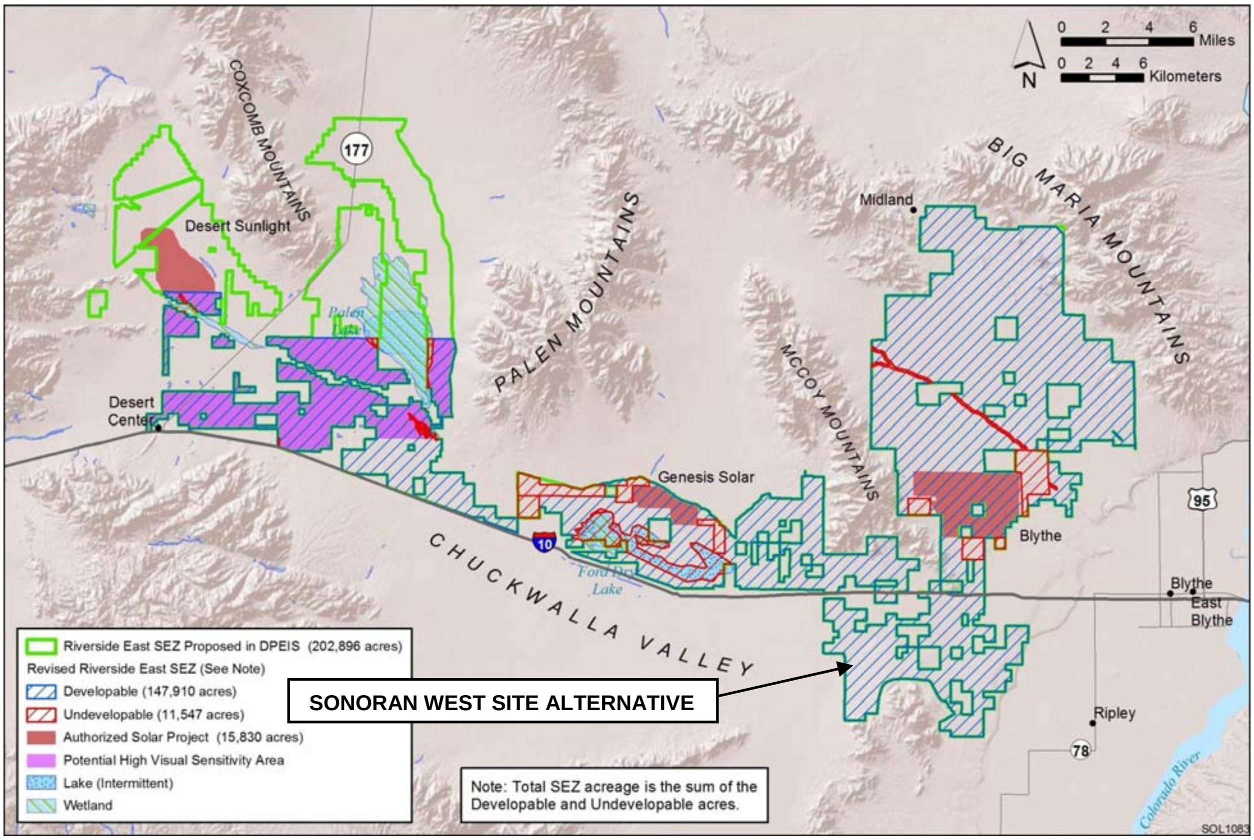
The potential for significant adverse impacts to project facilities from geologic hazards during the design life at either the proposed project site or the Sonoran West site would be low. Similarly, the potential for significant adverse impacts to potential geologic and mineralogic resources from the construction, operation, and closure at either site would be low. Depending on the discovery and delineation of paleontological resources and design of heliostat foundations, either project could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards (LORS), and in a manner that both protects environmental quality and assures public safety, to the extent practical. However, at this time, impacts to paleontological resources at the proposed project site are considered potentially significant and staff requires additional information to determine whether the impacts are mitigable.

## Hazardous Materials

The Sonoran West Off-Site Alternative would present the same hazardous materials risk profile as that for the proposed project. This alternative project would be essentially the same as the proposed project, but in a different location. The Sonoran West Off-Site Alternative and the proposed Rio Mesa site are both over 9,000 feet from the nearest sensitive receptor. As compliance with LORS and recommended conditions of certification would require the same actions, and all would occur on the plant site, this alternative project would also have no significant impacts on the public off-site, **similar to the proposed project**.

## Land Use

The Sonoran West Off-Site Alternative is within a portion of the "Riverside East Solar Energy Zone as designated in the BLM's Solar Programmatic Environmental Impact Statement (PEIS) (see solar energy zone map below). The PEIS defines a solar energy zone (SEZ) as an area with few impediments to utility-scale production of solar energy where BLM would prioritize solar energy and associated transmission infrastructure development. The BLM has determined that the Riverside East SEZ has generally low resource conflict and high potential for solar energy development including access to transmission lines. However, the Solar PEIS has not been adopted by the BLM through a Record of Decision at this time, so the SEZ is only proposed.




Source: U.S. Department of the Interior Bureau of Land Management, Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States, Vol. 2, Arizona and California Proposed Solar Energy Zones, Chapters 8 and 9, FIGURE 9.4.1.1-2 Developable and Non-development Areas for the Proposed Riverside East SEZ as Revised, July 2012., p.9.4-3.

The Sonoran West Alternative site is land designated as "BLM Land Available for Application – Solar Development Program" (Ibid, p. 9.4-2). However, in this case, an application has been submitted to the BLM by BrightSource. The BLM would analyze a project according to the applicable provisions of the National Environmental Policy Act (NEPA) and the California Desert Area Conservation Plan.

Similar to the proposed Rio Mesa site, the construction of a solar power tower project at the Sonoran West Off-site Alternative site would not physically divide a community and would not conflict with applicable land use plans or regulations as it is located entirely on BLM land within a proposed SEZ. The alternative site would not impact any agriculture or forest resources. There are no active grazing allotments on the Sonoran West site (BLM 2012b). Construction impacts of the Sonoran West Alternative and the proposed project site **would be similar**. Operation of the power tower project at this alternative site would have less than significant impacts to land use, **similar to the proposed project.**

## Noise and Vibration

This Sonoran West Off-Site Alternative is located approximately 3.5 miles northwest of the Rio Mesa SEGF site and has similar topography as the Rio Mesa SEGF site. The surrounding area is populated with slightly fewer noise-sensitive receptors than the proposed Rio Mesa SEGF site. The Sonoran West Off-Site Alternative and the proposed Rio Mesa site are both over 9,000 feet from the nearest sensitive receptor Noise from construction-related traffic would impact fewer noise-sensitive receptors along the access route to the Sonoran West site than along the access route to the Rio Mesa SEGF site. Noise impact may be **slightly less at the Sonoran West site**. However, staff can only make a definite conclusion about the degree of the impact after closely evaluating this alternative based on measured existing ambient noise levels in the area and a noise modeling showing the expected project noise levels at the nearest noise-sensitive receptors, and that information is not available.

## Public Health

Under the Sonoran West Off-Site Alternative, the project's elements and major facility components would be similar to those of the proposed project; therefore, toxic air emission levels would be similar. According to the results of staff's health risk assessment, both construction and operating emissions from the Rio Mesa SEGF would not contribute significantly or cumulatively to morbidity or mortality in any age or ethnic group residing in the project area.

This alternative site is about the same distance from the city of Blythe as the proposed Rio Mesa SEGF. Existing land uses at this alternative site include only undeveloped land. The Ironwood State Prison and Chuckwalla Valley State Prison are located about 2 miles to the west, a distance that is similar to the distance from the Rio Mesa site to the nearest sensitive receptor. As discussed in the "Public Health" section, potential air toxics-related impacts from operation of the Rio Mesa SEGF should be below significant levels within the 6-mile radius of typical concern to staff. The Sonoran West Off-Site Alternative would use the same technology in a similar environment as the Rio Mesa project and Staff expects potential impacts within the 6-mile radius of the Sonoran West Off-Site Alternative to be less than significant. Staff concludes that this impact would be **similar to Rio Mesa SEGF**.

## Socioeconomic Resources

The Sonoran West site is in the service area of the Riverside County Sheriff's Department. As is the case with the Rio Mesa SEGF site, there is no paved access to the Sonoran West site from Riverside County. If the Riverside County Sheriff were to provide service to the alternative site, they would have to use Wiley's West Road (paved) and the BLM utility corridor Power Line Road (dirt) to access the site. If the Sonoran West Off-Site Alternative were developed, it is likely that the Power Line Road would be improved (graveled or paved) to the project access point. Similarly, if the Rio Mesa SEGF site is developed the dirt access road would likely be improved. The nearest Riverside County Sheriff's office to the Sonoran West Off-Site Alternative is the Colorado River Station in Blythe. The station is approximately 13 miles (a 15-minute drive) from the study area. The California Highway Patrol substation in Blythe is about the same distance to both this alternative and the Rio Mesa SEGF project site so the distance the responders would have to travel would be similar for both sites. Therefore, this alternative site impact to law enforcement would be **similar to the Rio Mesa SEGF project**.

Southern California Edison's Devers-Palo Verde and Colorado River-Devers 500 kV transmission lines cross the northern portion of the study area boundary; however, the majority of the site is undisturbed. There are no structures on the Sonoran West Off-Site Alternative. Similarly, no structures, including residences, are located at the proposed Rio Mesa SEGF site. This alternative site would not displace people and/or existing housing and is **similar to the Rio Mesa SEGF project**.

Like the Rio Mesa SEGF, the Sonoran West Off-Site Alternative would not induce a substantial population growth in the area and would not displace substantial numbers of people and/or existing housing. Because the alternative would not induce a substantial population growth, staff believes that the development of this alternative site would not have an impact on parks and recreation or necessitate the construction of new parks. The socioeconomic benefits from construction employment and wages, purchase of materials and supplies, increased taxes and fees, and reduction in vacant housing would be **similar to the proposed Rio Mesa SEGF project**.

The Sonoran West Off-Site Alternative and the Rio Mesa SEGF site are both located within the Palo Verde Unified School District (PVUSD). School impact fees would also apply to this alternative site and would be payable to the PVUSD. As noted earlier for Rio Mesa SEGF, PVUSD has sufficient capacity to absorb the small increase in the school children of operation workers who may relocate to the local area during project operation. This would also be the case if the Sonoran West Site Alternative were developed. The impact on local schools would be **similar to the proposed Rio Mesa SEGF project**.

## Traffic and Transportation

Access to the Sonoran West Off-Site Alternative would likely be from I-10 via Wiley's Well Road, a two-lane road, and Power Line Road. The northern boundary of the site is located approximately 1.5 miles south of I-10, and would reduce the distance and number of roads traveled by construction traffic as compared to the Rio Mesa SEGF, which is located approximately 9 miles south of I-10. Construction traffic would be able to avoid travel over the various county farm roads that lead to the Rio Mesa SEGF, which are susceptible to damage, especially from oversized vehicles. For these reasons, impacts from the Sonoran West Off-Site Alternative to roads and bridges from construction traffic would be **slightly less than those from the Rio Mesa SEGF**.

The number of construction and operation workers needed for the Sonoran West Off-Site Alternative and the Rio Mesa SEGF would be the same. However, access to the Sonoran West site would degrade the level of service of fewer intersections than the Rio Mesa SEGF. Therefore, the Sonoran West Off-Site Alternative's construction and operation impacts to level of service would be **slightly less than those generated by the Rio Mesa SEGF**.

### *Glint and Glare*

The Sonoran West Off-Site Alternative is closer to I-10 and the Blythe Airport, and therefore more motorists and pilots would be exposed at close ranges to the project's heliostats. Motorists and pilots would be more likely to experience heliostat glint. As a result, glint impacts from the Sonoran West Off-Site Alternative would be **slightly greater than those from the Rio Mesa SEGF**. Glint would not be disabling to pilots due to the distance between the heliostats and the airport.

I-10 and the Blythe Airport would be within 8 miles of the project site, so glare events from the solar tower's receiver steam generator would be significantly increased in duration and continuous in nature. Therefore, glare impacts from the Sonoran West Off-Site Alternative would be **slightly greater than those from the Rio Mesa SEGF**. Glare would not be disabling to pilots or motorists as noted in the Visual Resources section.

## Transmission Line Safety and Nuisance

Under the Sonoran West Off-Site Alternative, Rio Mesa SEGF's elements and major facility components would be similar to those of the presently proposed version; however, the length of the required interconnection transmission line would be about 10 miles shorter for the Sonoran West site since the site is immediately adjacent to the Colorado River Substation. Using this site alternative would thus lead to reduction in the area in which the discussed field and nonfield impacts of concern with transmission line operation would be encountered. Impacts at the Sonoran West Off-Site Alternative would be **slightly less than at the Rio Mesa site.**

## Visual Resources

The Sonoran West Off-Site Alternative is located approximately 3.5 miles to the northwest of the proposed project site, approximately 1.5 miles south of I-10, and less than 2 miles east of Ironwood State Prison at its nearest point. The site lies at the northwest foot of the Mule Mountains near the easternmost limits of the Chuckwalla Valley.

The primary visual impact of both the proposed Rio Mesa SEGF and this alternative would be the very bright glare of the solar receivers, which are anticipated to have significant and unmitigable adverse effects within a radius of approximately 8.5miles. Although these strong glare effects would be essentially similar in nature under the proposed project and the Sonoran West Off-Site Alternative, the overall impacts of the Sonoran Site Off-Site Alternative would differ from the proposed project in several ways.

The Sonoran West Off-Site Alternative would create a visual impact to a substantially larger portion of Highway I-10, and result in a **much greater impact than the proposed project**. As indicated in GIS viewshed studies conducted by staff, the amended Rio Mesa SEGF would affect portions of I-10 from a point slightly west of the Blythe Airport, eastward (see **Alternatives Figure 4)**. West of the airport, glare from the solar receivers of the proposed project would be masked to I-10 viewers by intervening portions of the Mule Mountains. Similarly, the Palen-McCoy Wilderness Area would not be affected by solar receiver glare of the proposed project for the same reason. Under the proposed project, glare from the solar receivers would be visible to motorists on I-10 for an overall distance of roughly 17 miles. Under the proposed project, no part of I-10 would fall within the 8.5 mile radius identified by staff to represent potentially significant nuisance and discomfort glare, and glare impacts to I-10 motorists would be less than significant.

In comparison, glare from the Sonoran West Off-Site Alternative would be visible from I-10 over a segment of roughly 34 miles. Of that, approximately 16 miles would fall within the 8.5 mile radius of potentially significant nuisance and discomfort glare impacts (see **Alternatives Figure 4)**. (It is important to note that at no point would either alternative cause disability glare, i.e., levels impairing motorists' ability to drive). Portions of the Palen-McCoy Wilderness Area, including McCoy Peak, would also fall within the 8.5-mile zone. To motorists on the I-10, SRSG glare effects of the Sonoran West Off-Site Alternative would be more extensive and more severe than the proposed project because of the greater proximity of the solar towers to the highway. Under the Sonoran West Off-Site Alternative, solar receivers would be visible to I-10 viewers at a distance of under 3 miles at the nearest point. At middle-ground distances such as this, both the brightness and visual magnitude (perceived size or scale; proportion of the visual field) of the solar receivers would be substantial. Residences in the town of Mesa Verde, south of the Blythe Airport, would be within the radius of significant nuisance/discomfort glare impact under the Sonoran West Alternative. Under the proposed project, they would be outside of that radius. The Blythe Airport would also fall within the radius of discomfort glare (however, this level of glare would not represent a level of hazardous disability glare to the airport). Wiley's Well Rest Area on I-10 would also lie within 5 miles of SRSGs under the Sonoran West Alternative and experience strong nuisance/discomfort glare.

The Sonoran West Off-Site Alternative would have SRSG glare impacts on the BLM Mule Mountains Long Term Visitor Area, including Wiley's Well Campground at a distance of approximately 5.5 miles; and the Coon Hollow Campground at a distance of approximately 8.8 miles (measured from center of alternative footprint). At these distances, impacts to the campgrounds would be similar to those under the proposed project. Perceived brightness of the solar receivers would be strong, and impacts potentially substantial. Under the Sonoran West Alternative, overall impacts to the LTVA, portions of the Bradshaw Trail west of the Mule Mountains, and the Little Chuckwalla Mountains WA would affect a larger area than under the proposed project. However, the Hodge, Roosevelt, and Opal Mine sites, also located on BLM lands and accessible by open OHV trails, would not be impacted by the Sonoran West Off-Site Alternative, as they would be by the proposed project. Similarly, the roughly 2.4-mile segment of the Bradshaw Trail on BLM land, located east of the Mule Mountains and affected by the proposed Rio Mesa SEGF, would not be affected by the Sonoran West Off-Site Alternative. The Palo Verde Mountains Wilderness Area, which would experience SRSG glare impacts under the proposed project lie outside of the radius of significant SRSG glare effects under the Sonoran West Off-Site Alternative.

The towns of Palo Verde and Ripley, which would experience significant SRSG glare impacts under the proposed project, would not experience those impacts under the Sonoran West Off-Site Alternative. The Cibola National Wildlife Refuge would lie outside the 8.5-mile radius of significant SRSG glare impacts under the Sonoran West Off-Site Alternative.

Non-glare impacts of the Sonoran West Off-Site Alternative would differ from the proposed project in various ways. For example, the form and line contrast of the heliostat fields and solar towers would be **greater under this alternative than under the proposed project**, as seen by motorists on I-10, because of the orientation of the site topography, which faces the highway. Such form, line, and texture contrasts as seen from the highway would be strong. Form and line contrasts of the solar towers, however, would not occur to residents in Ripley and Palo Verde under the Sonoran West Off-Site Alternative, as they would under the proposed project. However, this type of impact (contrast from project structures) would be dwarfed in both degree and extent by the strong glare effects of the solar receivers. In both cases, the overall impacts of the alternatives would ultimately be determined by the glare impacts.

Overall, impacts of the Sonoran West Off-Site Alternative would thus be similar in type and character as the proposed project. However, because the Sonoran West Off-Site Alternative would have strong adverse glare effects on a larger portion of the Mule Mountains Long Term Visitor Area and associated campgrounds; and because it would affect a substantially larger segment of Highway I-10, impacts of the Sonoran West Off-Site Alternative are considered to be **slightly greater than those of the proposed Rio Mesa SEGF project**. In both cases, however, solar receiver glare impacts would be significant and unavoidable.

## Waste Management

Staff does not have the results of a Phase I Environmental Site Assessment (ESA) for analysis of recognized environmental conditions (REC) that may be present on the alternative site. If this site were chosen, staff would require completion of a Phase I ESA. If any RECs were identified on the site, characterization and remediation requirements would remain the same as for the proposed project. This impact would be **similar to the Rio Mesa SEGF**.

Construction and operation of a renewable energy facility at the Sonoran West Off-Site Alternative would produce approximately the same amount of waste as the proposed Rio Mesa SEGF. There is available Class III landfill capacity in Riverside County landfills as with the proposed project, and staff considers project compliance with LORS and staff's conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the Sonoran West Off-

Site Alternative. Impacts related to waste management would be **similar to the proposed Rio Mesa SEGF project** (URS 2012).

## Soil and Surface Water

Construction of the Rio Mesa SEGF on the Sonoran West alternative site would disturb the same amount of land area because the size of the proposed solar generating facility would be the same as the proposed project. The southwest portion of the site is characterized by gently sloping alluvium and alluvial fans that emanate from the Mule Mountains.  Gullies and washes, generally draining toward the north, dissect much of the site. This alternative site is generally level with gradual slopes, except for some steeper slopes that are adjacent to the Mule Mountains on the southernmost edge of the site, as well as adjacent to the larger washes.

No geotechnical studies addressing potential for slope instability in this alternative site have been made available to staff.  This alternative is similar to the proposed project from a soils impacts perspective. Similar to the proposed project, **soils impacts will be less than significant under the Sonoran West Off-Site Alternative.**

Construction and operation of the 500-MW solar power tower project on the Sonoran West Off-Site Alternative would be required to adhere to proper material storage and handling, applicable good housekeeping procedures and employ stormwater design Best Management Practices (BMPs). It would also need to adhere to a Storm Water Pollution Prevention Plan (SWPPP), state water quality standards, and other applicable federal, state, and local LORS addressing stormwater runoff and surface water quality. Therefore, the water quality impacts would **be similar** under the Sonoran West Off-Site Alternative compared to the proposed project.

Due to the presence of ephemeral drainages through the site, which have the tendency to be highly erosive and to shift laterally during intense flooding events, flooding is a potential issue for the Sonoran West Off-Site Alternative. Development of the site would require protection of these drainages, for example, through setbacks of project features from drainages or engineering stabilization controls. The flooding is not likely to result in significant impacts, and the risk of flooding at the Sonoran West Off-Site Alternative would be similar to that at the Rio Mesa SEGF site and constitutes a **similar potential for adverse water resources impacts relative to the proposed project**.

## Water Supply

The Sonoran West Off-Site Alternative is located in the Chuckwalla Valley Groundwater Basin (CVGB), west of the Palo Verde Mesa Groundwater Basin (PVMGB) where the Rio Mesa SEGF would be located. The Mule Mountains partially separate the Sonoran West site from the Colorado River (BS, 2011a; URS, 2012f) which flows through the Palo Verde Valley Groundwater Basin east of the proposed site. Water for construction and operation of either the proposed project or the Sonoran West Off-Site Alternative would come from groundwater wells. Also, the volume of groundwater for project construction and operation at either the proposed project site or at the Sonoran West Off-Site Alternative would be similar.

No groundwater modeling of potential environmental impacts to the CVGB, PVMGB, or the PVVGB have been completed for the Sonoran West site.

Potential significant impacts to groundwater levels, the volume of flow in the Colorado River, and groundwater basin balances could occur if the proposed project were built and operated at either site. Quantification through groundwater modeling of these potential impacts has not been completed for either site by the applicant but staff performed modeling using the available information and made conservative assumptions for the groundwater supply impacts. Project pumping at both sites would be expected to have similar impacts to groundwater levels and basin balances. However, potential impacts to the volume of flow in the Colorado River would be expected to be less at the Sonoran West Off-Site Alternative site than at the proposed project site due the additional distance from the Colorado River. Without groundwater modeling of the proposed project pumping of the groundwater at each site, the potential impacts to the volume of flow in the Colorado River cannot be quantified.

## SOLAR POWER TOWER (SPT) WITH ENERGY STORAGE ALTERNATIVE

### Overview

This alternative would use BrightSource Energy's solar thermal technology with added molten-salt storage at the proposed project site. The purpose of adding storage capacity is to extend the generating time each day for an additional 2 to 6 hours and stabilize the output during extended solar transients (e.g. cloud cover). Adding storage to the technology would increase the overall gigawatt hours (GWh) produced by the project. A BrightSource 200 MW solar power tower project with energy storage is estimated to generate 733 GWh; a 200 MW solar power tower project without storage is estimated to generate 573 GWh (CPUC 2012a). SCE has requested California Public Utilities Commission approval for amended and restated power purchase agreements with BrightSource Energy to add energy storage (CPUC 2012a). Three of the 200 MW PPAs held by the applicant with SCE currently include storage as a project component (CPUC, 2015). The three solar thermal plants associated with these PPAs (Siberia 1, Siberia 2, Sonoran West) are expected to start generating electricity in 2016 and 2017 (CPUC 2012a).

Thermal energy storage (TES) allows solar energy to be captured during the day and retained in a liquid salt heat transfer fluid (HTF). Liquid salt has inherent TES properties. In its liquid state, salt has a viscosity similar to water. Salt remains in a liquid state at very high temperatures whereas water turns to steam (Energy Commission 2010a).

Because this technology uses liquid salt, a medium that can be heated to a very high temperature, the steam cycle is more efficient. Storage technology would stabilize the projects energy production and extend operating hours.  Because the heated liquid salt can be stored with very little heat loss, this system allows power to be generated during the day regardless of short-term weather fluctuations and for additional hours during the night. Storage allow the project to maintain a consistent output even during extended (2-3 hour) weather fluctuations or solar transients and even when these incidents extend beyond the 2-3 hour storage window the plant output would slowly decrease compared to the immediate decrease in output of a photovoltaic power plant. Extended operating hours and a more consistent output would give system operators more time and thus more options to compensate for the reduction in output caused by solar transients or even sundown. More options would likely result in lower system operating costs.

Similar to the proposed Rio Mesa SEGF project, heliostats would concentrate the sun's rays on the water-filled solar boiler at the top of the central receiver tower in each solar field. The resulting high-temperature, pressurized steam would be piped through a conventional steam turbine generator to produce electricity. To store the heat, some of the steam produced during the day would be used to superheat molten salts held in a tank (Press-Enterprise 2012a). The heat retained in the molten salts would be available to convert water to steam, which would be used to run the plant's steam turbine generators to produce electricity during solar transients (e.g., cloud cover), and later in the evening than the proposed project would be available.

The applicant has stated that an energy storage technology option would require that about 18 percent of the heliostats would generate heat only for the storage component (URS 2012b; URS 2012j). This is because thermal energy storage would divert some of the steam flow produced by the Solar Receiver Steam Generator in order to charge the hot molten salt tank during the day, rather than using all the steam to generate electricity to transmit into the grid. The charging is done by means of superheated steam from the Solar Receiver Steam Generator, which is directed through a steam/molten salts heat exchanger thereby transferring the energy from the steam into the molten salts, as shown in **Alternatives Figure 5**. The heat stored in the molten salts is used to generate steam to run the turbine at a later time.

In order to retain the 500 MW generation capacity, the proposed project would require additional heliostats on approximately 670 acres for a total of about 4,475 acres of heliostats (as compared with 3805 acres of heliostats in the proposed configuration). The proposed project footprint does not provide sufficient acreage to accommodate this increase as the remaining land owned by MWD has too great a slope or is located to the east of the existing WAPA transmission line. Use of the land east of the WAPA transmission line would require relocating the line to the east of the project boundary (BS, 2011a). As such, incorporating storage into a 500 MW project is not feasible. However, using the same footprint and dedicating 18 percent of the heliostats (30,600 heliostats) to charge the hot molten salt, the remaining 82 percent of the heliostats would produce about 410 MW of renewable energy (the PPAs attributed to the Rio Mesa site only require 400MW).

The Solar Receiver Steam Generator capacity would allow parallel operation of the unit at maximum continuous rate and charging the thermal storage. The storage charging occurs during about 6 hours in a day. Due to thermal losses in the process the charging time is more than double the storage capability.

The BrightSource Energy website describes a SolarPLUS™ technology that includes storage using molten salt (BS 2012ah). This technology is said to provide "utilities with greater operational flexibility to shape production to meet changing utility customer demand” and offer “utilities and grid operators additional operational and market value, by providing balancing and shaping capabilities…” (BS 2012ah).

Descriptions of two projects under development that include molten-salt storage are provided below for reference.

### Rice Solar Energy Project (RSEP)

RSEP is a 150-MW SPT project that was approved for construction and operation by the Energy Commission in December 2010. SolarReserve is developing RSEP on approximately 1,500 acres of private land in the Colorado Desert in eastern Riverside County. The RSEP will use liquid salt as the HTF (Energy Commission 2010a). A total of seventy million pounds (4.4 million gallons) of liquid salt will be stored in insulated hot (1,050°F) and cold (550°F) above-ground tanks to retain solar energy. The thermal storage component allows generation of electricity after dark and during periods of cloud cover, for an average of an extra 8.4 hours per day above operation without storage.

Fossil fuels consisting of either propane or compressed natural gas will be used prior to plant start-up in two small boilers for the initial melting, heating, and conditioning of the salt thermal storage medium (Energy Commission 2010b). The salt conditioning process will take place once during plant commissioning, resulting in a closed loop system of liquid salt storage and circulation that will remain heated and contained for the life of the project. RSEP requires no other fossil fuel supply for plant operations.

### Crescent Dunes Solar Energy Project (Crescent Dunes SEP)

Crescent Dunes SEP is a 110-MW SPT project with integral thermal storage. SolarReserve is developing Crescent Dunes SEP on approximately 1,600 acres of BLM-administered land near Tonopah, Nevada. Construction began in September 2011 and is expected to be completed by January 2014. Construction was recently completed on the approximately 540-foot SPT for the project. Crescent Dunes SEP is planned for 10 hours of energy storage (Press-Enterprise 2012a). Like the Rice project, Crescent Dunes SEP will not require a natural gas supply to maintain project operations. **Alternatives Figure 5** shows the completed solar power tower for the Crescent Dunes SEP.

## Potential to Attain Project Objectives

**Construct and operate a 500 MW solar generating facility.** Development of an approximately 410-MW solar power tower project with energy storage at the proposed project site would partially meet this project objective.

**Locate the solar generating facility in an area of high insolation and near existing electric transmission equipment and natural gas infrastructure.** This alternative would satisfy these project objectives.

**Secure site control.** The SPT with Energy Storage Alternative would be built on the proposed project site so would meet the objective addressing obtaining site control and use within a reasonable time frame.

The SPT with Energy Storage Alternative could satisfy the four project objectives either entirely or partially. The probable need to redesign the project site to accommodate the storage infrastructure could result in a project schedule delay.

Construction of the SPT with Energy Storage Alternative at the proposed project site would reduce the total proposed electrical capacity to about 410 MW. It would satisfy the first project objective to construct and operate a renewable electrical generation facility; however, the total proposed 500-MW capacity would not be achieved.

## Potential Feasibility Issues

Staff's data requests to the project applicant included requests for information on the potential feasibility of adding energy storage to the Rio Mesa SEGF project. In the corresponding data responses, the applicant states that adding energy storage capabilities would be infeasible because of contractual obligations, site limitations, and economics (URS 2012b). The site limitations discussed by the applicant include the need to redesign the heliostat field and project layout if energy storage was added to the project. The applicant states that the site footprint would have to be expanded.

A storage alternative would require using some of the heliostat capacity for generating steam for energy storage. The applicant noted that the project footprint would need to be revised to accommodate the molten-salt storage tanks, decreasing the amount of electricity produced for immediate sale. However, as noted above, a solar power tower project with energy storage would potentially deliver more energy to the grid per MW installed than without storage (CPUC 2012a). Therefore, although the SPT with Energy Storage Alternative would generate fewer MW than the proposed project at peak, it would be able to generate energy over a longer period of time. Therefore, staff expects the amount of total energy produced to be comparable.

The applicant also responded to data requests about the expected benefits of adding storage capabilities to the project. The applicant's responses state that "any potential benefits would be heavily outweighed by the redesign costs, permitting delays, and loss of at least two signed and approved PPAs. Changing the design at this point would result in a higher cost to the project in engineering, procurement, and construction... since the project would lose its related PPAs, it would likely become unfinanceable." (URS 2012b).

Staff's review of the PPAs for the Rio Mesa SEGF (provided by the applicant), indicates that the power generated by the proposed Rio Mesa SEGF project would be sold to SCE under two separate PPAs, and both are under review by the CPUC for approval. The CPUC draft decision stated that the [Rio Mesa] projects compare poorly on price and value relative to other solar thermal projects offered to SCE (CPUC 2012a).

The applicant states that it has targeted the last quarter of 2015 for commercial operation of the proposed project. For the Hidden Hills Solar Electric Generating System (Hidden Hills SEGS) Staff Assessment, the Energy Commission staff contacted the CPUC to inquire about the overall process involving CPUC's approval of PPAs for renewable energy projects. CPUC staff stated that filing of amended advice letters requesting amendments to PPAs is not an uncommon occurrence during the development process for renewable energy projects (Energy Commission 2012az). Once a PPA is approved, submittal of an amended advice letter to CPUC requesting an amended PPA is required unless the change to the project was accounted for in the original PPA for the project (e.g., a PPA that allows a project location or technology change). CPUC's review of requests for amended PPAs considers resultant changes to the pricing structure of the PPA, project viability, and value compared to cost. For example, in considering a hypothetical amendment to a PPA to add energy storage to a solar thermal project, CPUC would assess the net economic benefit of the added storage. Given the complexity of permitting and construction for these large solar power projects, staff believes it is likely that BrightSource Energy's strategic planning processes acknowledge the potential for project changes to affect project scheduling and financing and the potential need to amend a PPA.

Staff acknowledges that altering the proposed Rio Mesa SEGF to include TES could delay the project schedule and increase project costs. However, staff does not know at what point a project schedule delay or a cost increase would affect project viability.

## Environmental Analysis

**Alternatives Table 2** presents a summary comparison of impacts of the proposed Rio Mesa SEGF to the same or similar potential impacts of the SPT with Energy Storage Alternative. Comparative discussions for each environmental topic area follow the table.

**Alternatives Table 2**
**Summary Comparison of the Proposed Project's Impacts to the Solar Power Tower with Energy Storage Alternative**

| | **Proposed Project** | **SPT with Energy Storage Alternative** | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to proposed project** |
| **Air Quality** | | | |
| Construction-related emissions | SM | SM | Similar |
| Project operations emissions | SM | SM | Less |
| Greenhouse Gases | LS | LS | Less |
| **Biological Resources** | | | |
| Impacts to vegetation and associated wildlife habitat | SM | SM | Similar |
| Impacts on waters of the U.S. | SM | SM | Similar |
| Impacts to waters of the state including desert microphyll vegetation and associated wildlife | PSU | PSU | Similar |

**Alternatives Table 2**
**Summary Comparison of the Proposed Project's Impacts**
**to the Solar Power Tower with Energy Storage Alternative**

| | Proposed Project | SPT with Energy Storage Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to proposed project** |
| habitat | | | |
| Impacts on desert tortoise | SM | SM | Similar |
| Impacts on special-status terrestrial wildlife species (other than desert tortoise) | SM | SM | Similar |
| Impacts on avian species, including raptors | SU | SU | Similar |
| **Cultural Resources** | | | |
| Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites or ethnographic resources, or impact built environments on or beyond the site | UNK at this time | UNK at this time | UNK at this time |
| **Geology and Paleontology** | | | |
| Potential impacts from strong seismic shaking | LS | LS | Similar |
| Potential impacts from soil failure caused by hydro-collapse and/or dynamic compaction | LS | LS | Similar |
| Potential impacts on paleontological resources | SU | SU | Similar |
| **Hazardous Materials** | | | |
| Risk of fire or explosion during commissioning or operations | SM | SM | Similar |
| Risk of hazardous material spill off-site during hazardous materials transportation | SM | SM | Similar |
| Risk of hazardous material spill off-site resulting from hazardous materials storage and use on-site | SM | SM | Similar |
| Risk of drawdown of emergency response services causing impact off-site | SM | SM | Similar |
| **Land Use** | | | |
| Compatibility with land use plan, policy, or regulation | LS | LS | Similar |
| **Noise and Vibration** | | | |
| Potential for noise to impact noise-sensitive receptors | SM | SM | Greater |
| **Public Health** | | | |
| Potential for project operations to cause air toxics-related impacts that could affect public health | LS | LS | Similar |
| **Socioeconomic Resources** | | | |
| Adversely impact acceptable levels of service for police protection (law enforcement), schools, parks, and recreation | SM | SM | Similar |
| Displace substantial numbers of people and/or existing housing | LS | LS | Similar |
| Induce substantial population growth in the area | SM | SM | Similar |

**Alternatives Table 2**
**Summary Comparison of the Proposed Project's Impacts to the Solar Power Tower with Energy Storage Alternative**

| | Proposed Project | SPT with Energy Storage Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to proposed project** |
| **Traffic and Transportation** | | | |
| Damage to Roads and Bridges | SM | SM | Similar or slightly greater |
| Glint Impacts to Motorists and Pilots – heliostats | SM | SM | Similar |
| Level of Service on Roads and Highways – Construction | SM | SM | Similar or slightly greater |
| Level of Service on Roads and Highways – Operation | LS | LS | Similar or slightly greater |
| Glare Impacts to Motorists and Pilots – solar receiver steam generator | LS | LS | Similar |
| **Transmission Line Safety and Nuisance** | | | |
| Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure | SM | SM | Similar |
| **Visual Resources** | | | |
| Visual change/contrast of project facilities, excluding glare effect | SU | SU | Similar |
| Potential to create a new source of glare from solar receivers | SU | SU | Similar |
| **Waste Management** | | | |
| Material/waste generated during the construction and operation would be managed in an environmentally safe manner, i.e. recycling or disposal | SM | SM | Similar |
| Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities | SM | SM | Similar |
| Potential for impacts on human health and the environment related to past or present soil or water contamination | SM | SM | Similar |
| **Soil and Surface Water** | | | |
| Soil erosion by wind and water during project construction or operations | SM | SM | Similar |
| Potential contamination of groundwater resources from infiltration | SM | SM | Similar |
| Environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly | SM | SM | Similar |
| **Water Supply** | | | |
| Substantially deplete groundwater supplies or interfere substantially with groundwater recharge | LS | LS | Greater |

**Alternatives Table 2**
**Summary Comparison of the Proposed Project's Impacts**
**to the Solar Power Tower with Energy Storage Alternative**

| | Proposed Project | SPT with Energy Storage Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to proposed project** |
| such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level | | | |

Notes: — = no impact
UNK = significance of impact is unknown
B = beneficial impact
LS = less-than-significant impact, no mitigation required
SM or PSM = significant or potentially significant impact that can be mitigated to less than significant
SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

## Air Quality

Staff reviewed the air quality Commission Decision of the RSEP as a basis to compare the potential air quality effects of this alternative to those of the proposed project. Staff assumes that a project constructed and operated to include molten-salt energy storage would be generally comparable to the proposed Rio Mesa SEGF regardless of the specific technology that would be used to facilitate the energy storage.

Under the SPT with Energy Storage Alternative at the Rio Mesa site, power plant commissioning would require small boilers for the initial melting, heating, and conditioning of the salt thermal storage medium. The RSEP technology requires no other natural gas use for plant operations. The SPT with Energy Storage Alternative would not require overnight boilers or auxiliary boilers. This would reduce project operations emissions during regular plant operations. Net air quality emissions impacts would be less than Rio Mesa SEGF for this alternative technology. No auxiliary boilers would be required for project operations of this alternative because the molten salt would provide this service, and much less fuel would be used during the commissioning phase to liquefy the salt compared to the fuel use that would be required to operate the auxiliary boilers for the proposed project over its life. The salt melting process during commissioning of the project may result in higher emissions than the initial commissioning phase of the proposed project. During operations the emissions would **be less than that of Rio Mesa SEGF**.

Incorporating molten-salt storage would require about 18% of the heliostats to heat the molten salt for energy storage reducing the project capacity to about 410 MW. This alternative would remain within the footprint of the proposed project. Construction-related emissions and impacts would be **similar to the Rio Mesa SEGF** for this alternative. Refer to the discussion below under, "Engineering Assessment of the Alternatives," for an analysis of power plant efficiency and reliability.

The SPT with Energy Storage Alternative would result in a **slightly greater cumulative reduction in GHG emissions from power plants compared to the proposed Rio**

**Mesa SEGF** because the molten-salt storage would increase the plant's capacity value. Staff expects the amount of energy produced by the SPT with Energy Storage Alternative to be comparable with the proposed project.

## Biological Resources

This on-site alternative would require approximately the same amount of land to produce about 410 MW of renewable energy and would allow for energy storage on-site, to be used after the power plant goes off line at sunset. Because the SPT with Energy Storage Alternative would be located within the same footprint as the proposed project, impacts to biological resources and state and U.S. waters would be **substantially similar.**

The applicant has stated that incorporating storage would require redesign of the heliostat field; however, the redesign would remain within the footprint of the project and the cone of energy flux would be expected to remain the same. Impacts on avian species, including the state listed golden eagle and other raptors and special-status bat species, would be **similar to the Rio Mesa SEGF**, given that the zones of reflected solar flux would be similar. The applicant has identified no means of mitigating or minimizing these impacts at the proposed Rio Mesa SEGF site; therefore, impacts on avian species are significant. While additional information is anticipated from the applicant regarding measures to mitigate and minimize impacts related to reflected solar flux, avoidance of exposure to solar flux is not possible (i.e., no feasible on-site mitigation is possible). Off-site mitigation measures have not yet been identified. It is unknown if impacts could be mitigated to below a level of significance. The results of ongoing coordination with the California Department of Fish and Game and the U.S. Fish and Wildlife Service will be presented in the FSA, with related determinations of significance.

## Cultural Resources

Construction and operation of the SPT with Energy Storage Alternative at the proposed project site would result in a similar extent of physical ground disturbance on the project site compared with the proposed Rio Mesa SEGF project. Additional analyses will be completed for publication in the FSA for the Rio Mesa SEGF including presenting information regarding impacts to archaeological, historical, and Native American resources of the SPT with Energy Storage Alternative and a comparison with the proposed project.

## Geology and Paleontology

For comparison purposes, the solar tower with molten salt alternative is assumed to be similar to the Solar Reserve technology used at the approved RSEP site. While BrightSource has a proprietary energy storage technology, SolarReserve's storage technology used at RSEP was approved by the Energy Commission in December 2010 and staff is familiar with it. The SolarReserve technology is assumed to be similar to what BrightSource would use.

Plant construction and commissioning would require two small boilers for the initial melting, heating, and conditioning of the salt thermal storage medium. The salt conditioning process would take place only once during initial plant commissioning, resulting in a closed system of liquid salt storage and circulation loops that would remain heated and contained for the life of the project. The SPT with Energy Storage Alternative would require construction of additional equipment not included in the proposed Rio Mesa SEGF.

Incorporating molten salt storage would require a portion of the heliostats to be used to heat the molten salt but the alternative would remain within the proposed Rio Mesa footprint. The construction techniques and methodologies used for the alternative technology would be similar to the proposed Rio Mesa SEGF. The construction and operation impact of the additional equipment would have a **similar significant impact** to geological and paleontological resources compared with the proposed project.

## Hazardous Materials

The SPT with Energy Storage Alternative would present a **similar hazardous materials risk profile** as that for the proposed project. This alternative project would be essentially the same as the proposed project, except for two aspects. The SPT with Energy Storage Alternative would utilize natural gas or liquefied propane gas (LPG) continuously on site for approximately three months during the commissioning process of mixing and melting the salts to be used as the HTF. There would be a small and less than significant increased risk of a fire during that period.

Operationally, this alternative facility would have the additional process of utilizing and managing a large volume of hot molten salt, adding to process complexity. The salt is not a gas, is non-flammable, and is not highly toxic. If a spill were to occur, it would quickly solidify and not leave the site. Any added risk from the salt's presence on site is not significant to the off-site public.

Compliance with LORS and any recommended conditions of certification would require similar actions as for the proposed project, and all mitigation would occur on the plant site. The SPT with Energy Storage Alternative would also have no significant impacts on the off-site public, **similar to the proposed project**.

## Land Use

A thermal energy storage system introduces sizing options for the thermal storage tank(s) and requires some heliostats to be used to heat the storage system. The STP with Energy Storage Alternative would remain within the proposed project footprint. Because the alternative would not change the location or footprint of the proposed project, land use impacts would be **similar as for the Rio Mesa SEGF**.

## Noise and Vibration

Enhancement of the SPT technology with several hours of storage would increase the noise impact mainly due to the project's potential for the extension of operation before and after sunset. This impact may or may not be significant; staff would have to evaluate the project using a revised noise modeling in order to make a determination. For this analysis, staff assumes that the impact would be **slightly greater than Rio Mesa SEGF** but as with the proposed project, is expected to comply with all applicable noise and vibration laws, ordinances, regulations and standards, and would produce no significant adverse noise impacts on people within the affected area, directly, indirectly, or cumulatively.

## Public Health

Enhancement of the solar power tower technology with several hours of thermal energy storage at the proposed Rio Mesa site would extend this alternative's operations beyond the hours of available sunlight. Regardless of the specific technology that would be used to facilitate the energy storage, staff assumes that this alternative project would include molten-salt energy storage like RSEP. No overnight boilers and auxiliary boilers would be required because the molten salt would provide this service, and much less fuel would be used during the commissioning phase to liquefy the salt compared to the lifetime fuel use of the boilers in proposed Rio Mesa SEGF project. Therefore, lifetime toxic air emissions from boilers would be substantially reduced. Staff concludes during operation, the toxic air emissions and health impacts would be **less than those identified for the proposed Rio Mesa SEGF project**.

Incorporating molten-salt storage would use about 18% of the heliostats to heat the molten salt for energy storage but the alternative would remain within the Rio Mesa SEGF footprint and generate about 410 MW of electrical capacity. Therefore, construction-related toxic air emissions and impacts would be **similar to the Rio Mesa SEGF** for this alternative. This would not cause any significant change in operational emissions.

## Socioeconomic Resources

The beneficial impact through construction employment and increased taxes and fees would be **similar as to Rio Mesa SEGF**. Potential impacts to law enforcement services, schools, and parks and recreation would be **similar to the proposed Rio Mesa SEGF**, which staff concludes is less than significant.

## Traffic and Transportation

This alternative would involve different infrastructure (i.e. the molten salt tanks and heat exchanger) than the proposed project but the same number of heliostats, and as a result could possibly require more construction workers or a longer construction period. Therefore, there would be more potential for construction vehicle damage to roads and bridges. Increased construction vehicles could result in increased level of service impacts, and a longer construction period would extend any level of service impacts over a longer period of time. Therefore, this alternative would generate **similar or slightly greater** construction impacts to roads and bridges and level of service than the Rio Mesa SEGF.

In all other categories, the SPT with Energy Storage Alternative would generate **similar impacts to those from the Rio Mesa SEGF**, as this alternative would be located on the proposed Rio Mesa SEGF site, using similar technology.

## Transmission Line Safety and Nuisance

Under the SPT with Energy Storage Alternative, staff concludes that use of this alternative technology would require the use of transmission lines of the same voltage and carrying-capacity as is proposed for Rio Mesa SEGF. This means that the magnitude of these transmission line-related impacts would be similarly less than significant. This impact would be **similar to Rio Mesa SEGF**.

## Visual Resources

Under the SPT with Energy Storage Alternative, the addition of structures for energy storage, while substantial in size, would be lower in height than the air-cooled condenser and auxiliary boiler stack, which are 120 and 135 feet tall, respectively. As discussed above under, “Rice Solar Energy Project (RSEP),” the summary of structural dimensions lists the domed top heights of the above-ground salt tanks as 64.5 feet and 63.5 feet (SolarReserve 2009). Like the proposed Rio Mesa SEGF project, implementation of conditions of certification would reduce potential impacts on visual resources for views at the ground plane. Potential impacts of structural lighting could be partially mitigated with implementation of standard conditions of certification to control lighting and screen views.

The principal impact of concern from both the proposed Rio Mesa SEGF and the SPT with Energy Storage Alternative would result from the glare of the solar receivers. The radius of potentially significant impact due to solar receiver glare is expected to extend to great distances from the project boundary, approximately 8.5 miles. Visual effects of project structures themselves, including the heliostat field, storage tanks, and tall towers would extend to a much smaller distance. Thus, though the heliostat field under the SPT with Energy Storage Alternative would be revised to accommodate the energy storage infrastructure, the overall difference in visual impact of this alternative compared to the proposed project would be relatively minor. In both cases, the area and degree of visual impact due to the form and texture contrast of the heliostat fields would be dwarfed by the area strongly affected by solar receiver glare. Although the area with visually dominant views of the heliostat field could change under the SPT with Energy Storage Alternative because the heliostat field would potentially be reconfigured to accommodate energy storage, that change in visual character and quality would be overshadowed by the intense glare effects of the solar receivers, which would be the same under both the Rio Mesa SEGF and an energy storage alternative. The overall area and degree of significant impact under this alternative is thus considered to be **similar to the proposed project**. That is, both projects would have unavoidably significant adverse glare impacts from the solar receivers within a radius of 8.5 miles from the solar towers.

## Waste Management

The location of the SPT with Energy Storage Alternative would be the same as the proposed project and would be no closer to any unidentified recognized environmental conditions. As with the proposed project, staff would require investigation and remediation of soil and groundwater contamination if it was encountered during construction and operation of this alternative. Site characterization and remediation requirements would remain the same as for the proposed project. This impact would be **similar to the Rio Mesa SEGF**.

The SPT with Energy Storage Alternative would remain within the Rio Mesa SEGF footprint but construction of additional storage facilities and equipment installation would be required. Staff anticipates this would also increase the volume of the waste stream by some amount. Although the waste volume would increase somewhat, there is adequate available Class III landfill capacity in Riverside County landfills. Similar to the proposed project, staff considers project compliance with LORS and staff's condition of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the SPT with Energy Storage Alternative. This impact would be **similar to Rio Mesa SEGF**.

## Soil and Surface Water

The SPT with Energy Storage Alternative would be reduced to about 410 MW to remain within the proposed project footprint. This means that the potential for soil erosion would be **similar to the proposed project**, and a similar amount of water would be contaminated both by soil erosion and by the increased potential for rain water to come in contact with the operating units.

Because the SPT with Energy Storage Alternative would operate for a longer duration each day, larger volumes of water would be required by the project for process operations. The number of personnel needed to run the plant would be similar to that of the proposed project as it would be a 410 MW project but with minimal added operational needs of the storage facility, thereby producing similar volumes of sanitary waste. The potential impacts in terms of water quality and soil erosion would be **similar to Rio Mesa SEGF** using molten salt versus direct conversion of water to steam.

## Water Supply

The SPT with Energy Storage Alternative would be reduced to about 410 MW to remain within the proposed project footprint. Therefore, a molten salt technology would require a similar amount of heliostats and a similar amount of water for mirror washing.

Because the SPT with Energy Storage Alternative would operate for a longer duration each day, a larger volume of water would be required by the project for process operations. The potential impacts **would be slightly greater** using molten salt versus direct conversion of water to steam. The same conditions of certification proposed by staff for the proposed Rio Mesa SEGF project would be recommended for this alternative. With implementation of conditions of certification, impacts on water supply and groundwater resources would be reduced to less than significant.

# REDUCED ACREAGE SOLAR POWER TOWER ALTERNATIVE WITH OR WITHOUT ENERGY STORAGE

## Overview

This alternative would consist of constructing and operating a single 250-MW solar power tower at the proposed Rio Mesa SEGF site. The project elements and major facility components of this alternative would be similar to those of the proposed project's Unit 1. However, Unit 1 heliostats rows 38 through 59 located in the northeast corner of the unit adjacent to the Construction Area (see AFC Figure 2-5 REV, Site Plan) would be moved to where the Unit 2 power tower is proposed. This revision would result in a square arrangement of heliostats and would eliminate any heliostats north of Wash G (see AFC Figure 5.2-5a REV). A 250-MW project would require 1,850 acres of land for the heliostat field and associated infrastructure and 100 acres for the construction logistics area.

The Reduced Acreage SPT Alternative with or without Energy Storage would have two options:

- Reduced Acreage SPT Alternative without Energy Storage would require a total of 1,950 acres and is shown in **Alternatives Figure 6** outlined in red.
- Reduced Acreage SPT Alternative with Energy Storage would require an additional 335 acres of heliostats to allow peak generation to remain at 250 MW. This additional acreage allows for both the molten salt storage area and 18 percent more heliostats. With energy storage, the alternative would require almost 2,300 acres of land. **Alternatives Figure 6** includes a potential layout for the additional area required by the addition of storage. Energy Storage would increase the flexibility of the alternative as explained under the SPT with Energy Storage Alternative.

The reduced acreage site would be located entirely on MWD-owned lands and would use the same infrastructure as the proposed project Unit 1. The common area and temporary construction logistics area would be relocated south of Wash G more proximate to Unit 1 and to reduce the need to cross Wash G. The common area would include an operations and maintenance building, evaporation ponds, groundwater wells, and water treatment plant. Because Unit 1 as proposed includes a 220 kV Generator Step-up Substation, the common switchyard identified for the proposed project would not be required. An underground/overhead transition tower would be required and would be located in the same location as the proposed project common switchyard to transition the 220 kV gen-tie line from Unit 1 to overhead. The linear corridor for the gen-tie line would be the same as for the proposed project but would extend south to the Unit 1 common area. The natural gas pipeline would remain the same as with the proposed project for Unit 1.

The Reduced Acreage SPT Alternative would require 84.5 acre-feet per year (afy) of water and 4.3 afy for the common area use. The construction schedule would remain the same as for Unit 1, beginning in the Fourth Quarter 2013 with commercial operation expected in the fourth quarter 2015. The Reduced Acreage SPT Alternative would be expected to require up to 70 full time employees during operations. Access to the site would be via 34th Avenue off of State Route 78.

## Potential to Attain Project Objectives

**Construct and operate a 500 MW solar generating facility.** Development of an approximately 250-MW solar power tower project with or without energy storage would partially meet this project objective.

**Locate the solar generating facility in an area of high insolation and near existing electric transmission equipment and natural gas infrastructure.** This alternative would satisfy these project objectives.

**Secure site control.** The alternative would be built on the proposed project site so would meet this objective.

The Reduced Acreage SPT Alternative with or without Energy Storage would satisfy the four project objectives either entirely or partially. The probable need to redesign the project site could result in project schedule delay compared with the proposed project. As such, staff believes that this alternative is feasible in a slightly longer timeframe than that of the proposed site.

Construction of the Reduced Acreage SPT Alternative with or without Energy Storage at the proposed project site would reduce the total proposed electrical capacity to 250 MW. It would partially satisfy the first project objective to construct and operate a renewable electrical generation facility; however, the total proposed 500-MW capacity would not be achieved.

## Environmental Analysis

**Alternatives Table 3** presents a summary comparison of impacts of the proposed Rio Mesa SEGF project to the same or similar potential impacts of the Reduced Acreage SPT Alternative with or without Energy Storage. Comparative discussions for each environmental topic area follow the table.

**Alternatives Table 3**
**Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage SPT with or without Energy Storage Alternative**

| | **Proposed Project** | **Reduced Acreage SPT with or without Energy Storage Alternative** | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Air Quality** | | | |
| Construction-related emissions | SM | SM | Less |
| Project operations emissions | SM | SM | Less |
| Greenhouse Gases | LS | LS | Slightly greater than |

**Alternatives Table 3**
**Summary Comparison of the Proposed Project's Impacts**
**to the Reduced Acreage SPT with or without Energy Storage Alternative**

| | **Proposed Project** | **Reduced Acreage SPT with or without Energy Storage Alternative** | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Biological Resources** | | | |
| Impacts to vegetation and special status plants | SM | SM | Much Less |
| Impacts to waters of the US | SM | SM | Much Less |
| Impacts to waters of the state including microphyll woodland habitat | PSU | Expected SM | Much Less |
| Impacts on desert tortoise | SM | SM | Much Less |
| Impacts on special-status terrestrial wildlife species (other than desert tortoise) | SM | SM | Much Less |
| Impacts on avian species, including raptors | SU | SU | Less |
| **Cultural Resources** | | | |
| Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites or ethnographic resources, or impact built environments on or beyond the site | UNK at this time | UNK at this time | UNK at this time |
| **Geology and Paleontology** | | | |
| Potential impacts from strong seismic shaking | SM | SM | Less |
| Potential impacts from soil failure caused by hydro-collapse and/or dynamic compaction | SM | SM | Less |
| Potential impacts on paleontological resources | SU | SU | Less |
| **Hazardous Materials** | | | |
| Risk of fire or explosion during commissioning or operations | SM | SM | Similar |
| Risk of hazardous material spill off-site during hazardous materials transportation | SM | SM | Similar |
| Risk of hazardous material spill off-site resulting from hazardous materials storage and use on-site | SM | SM | Similar |
| Risk of drawdown of emergency response services causing impact off-site | SM | SM | Similar |
| **Land Use** | | | |
| Compatibility with land use plan, policy, or regulation | LS | LS | Similar |
| **Noise and Vibration** | | | |
| Potential for noise to impact noise-sensitive receptors | SM | SM | Slightly less |

**Alternatives Table 3**
**Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage SPT with or without Energy Storage Alternative**

| | Proposed Project | Reduced Acreage SPT with or without Energy Storage Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Public Health** | | | |
| Potential for project operations to cause air toxics-related impacts that could affect public health | LS | LS | Less |
| **Socioeconomic Resources** | | | |
| Adversely impact acceptable levels of service for police protection (law enforcement), schools, parks, and recreation | SM | SM | Slightly less |
| Displace substantial numbers of people and/or existing housing | LS | LS | Similar |
| Induce substantial population growth in the area | SM | SM | Similar |
| **Traffic and Transportation** | | | |
| Damage to Roads and Bridges | SM | SM | Less |
| Glint Impacts to Motorists and Pilots – heliostats | SM | SM | Similar |
| Level of Service on Roads and Highways – Construction | SM | SM | Less |
| Level of Service on Roads and Highways – Operation | LS | LS | Less |
| Glare Impacts to Motorists and Pilots – solar receiver steam generator | LS | LS | Similar |
| **Transmission Line Safety and Nuisance** | | | |
| Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure | SM | SM | Similar |
| **Visual Resources** | | | |
| Visual change/contrast of project facilities, excluding glare effect | SU | SU | Similar |
| Potential to create a new source of glare from solar receivers | SU | SU | Similar |
| **Waste Management** | | | |
| Material/waste generated during the construction and operation would be managed in an environmentally safe manner, i.e. recycling or disposal | SM | SM | Similar |
| Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities | SM | SM | Less |
| Potential for impacts on human health and the environment related to past or present soil or water contamination | SM | SM | Similar |

**Alternatives Table 3**
**Summary Comparison of the Proposed Project's Impacts to the Reduced Acreage SPT with or without Energy Storage Alternative**

| | Proposed Project | Reduced Acreage SPT with or without Energy Storage Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Soil and Surface Water** | | | |
| Soil erosion by wind and water during project construction or operations | SM | SM | Less |
| Potential contamination of groundwater resources from infiltration | SM | SM | Less |
| Environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly | SM | SM | Less |
| **Water Supply** | | | |
| Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level | LS | LS | Less |

Notes: — = no impact
UNK = significance of impact is unknown
B = beneficial impact
LS = less-than-significant impact, no mitigation required
SM or PSM = significant or potentially significant impact that can be mitigated to less than significant
SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

## Air Quality

Exhaust emissions from heavy-duty diesel construction equipment and fugitive particulate matter (dust) emissions would be essentially half of the emissions from the proposed project due to the reduced number of heliostats and power towers. Exhaust emissions would also be caused by workers commuting to and from the work sites, from trucks hauling equipment and supplies to the sites, and crew trucks (e.g., derrick trucks, bucket trucks, pickups). With this alternative, the number of workers commuting would be reduced and the duration of the construction during which the workers would be commuting would be reduced by approximately half. Exhaust emissions from the worker and delivery vehicles would be half those with the applicant's proposed project. There would not be a decrease in construction emissions associated with gen-tie line construction activities which would remain the same length as with the proposed project.

Appropriate mitigation at the Reduced Acreage SPT Alternative with or without Energy Storage would likely involve similar, locally oriented recommendations such as the conditions of certification presented in the Air Quality section of this PSA. It is likely that the alternative would comply with MDAQMD rules and regulations.

As with the proposed project, a 250 MW project would emit some GHG emissions. However, the contribution of the 250 MW project would continue to meet the RPS goals in California and would result in a net cumulative reduction of energy generation and GHG emissions from new and existing fossil-fired electricity resources. These system impacts would result in a net reduction in GHG emissions across the electricity system providing energy and capacity to California. Thus, as with the proposed project, the Reduced Acreage SPT with or without Energy Storage would result in a cumulative overall reduction in GHG emissions from power plants. Because the Reduced Acreage SPT with or without Energy Storage would generate less renewable energy than the proposed project, it would contribute **less to the overall reduction in GHG emissions from power plants**. The Reduced Acreage SPT with Energy Storage, while producing more energy than without storage, would still produce about a third less energy than the proposed project.

If the Reduced Acreage SPT Alternative included energy storage, it would not require project operations emitting sources during regular plant operations because overnight boilers and auxiliary boilers would not be needed. Less fuel would be used during the commissioning phase to liquefy the salt compared to the fuel use that would be required to operate the auxiliary boilers for the proposed project over its life. However, there would be some emissions that would come from the salt melting process during commissioning of the project that may equate to or be higher than the initial commissioning phase of one unit of the proposed project. During operations the emissions would **be less than that of Rio Mesa SEGF**.

The construction emissions of the Reduced Acreage SPT Alternative would be **less than the Rio Mesa SEGF even with energy storage**. The operational emissions at the Reduced Acreage SPT Alternative would be **less than the Rio Mesa SEGF.** The contribution of the Reduced Acreage SPT Alternative without energy storage to the overall reduction in GHG emissions from power plants would be **50 percent less than Rio Mesa SEGF.** The contribution of the alternative with energy storage would be **about 35 percent less than Rio Mesa SEGF.**

## Biological Resources

This Reduced Acreage SPT Alternative with or without Energy Storage would reduce overall impacts to most biological resources by about one third (with storage) to one half (without storage) compared with the impacts of the proposed Rio Mesa SEGF project. Impacts to waters of the state including desert microphyll vegetation and associated wildlife habitat would be reduced by more than 50 percent by avoiding much of washes G and H and all of wash E and staff believes that these impacts could be feasibly reduced to less than significant with mitigation (i.e., habitat compensation). Operational impacts to bird and bat species, including golden eagle, other raptors, and other special-status species would also be reduced by about one third to one half, but would remain significant and unavoidable. Overall, the Reduced Acreage SPT Alternative with or without Energy Storage would **greatly reduce impacts of the Rio Mesa SEGF**.

## Cultural Resources

Construction and operation of the Reduced Acreage SPT Alternative with or without Energy Storage at the proposed project site would result in a smaller extent of physical ground disturbance on the project site compared with the proposed Rio Mesa SEGF project. Additional analyses will be completed for publication in the FSA for the Rio Mesa SEGF including presenting information regarding impacts to archaeological, historical, and Native American resources of the Reduced Acreage SPT Alternative and a comparison with the proposed project.

## Geology and Paleontology

Construction and operation of the Reduced Acreage SPT Alternative with or without Energy Storage could have significantly fewer impacts compared to the proposed Rio Mesa SEGF project. The alternative would require between 32 to 50 percent fewer deep or otherwise specialized foundations for the collector towers and the numerous heliostat foundations than for the proposed project. The elimination of between 32 and 50 percent of the deep foundations and avoidance of some of the paleosol would decrease the potential for encountering fossil bearing strata. Due to elimination of one of the tall tower structures, the project as a whole would have a decrease in seismic susceptibility. However, because most of the Reduced Acreage SPT Alternative with or without Energy Storage would continue to be located on potentially sensitive soil formations, the impact to paleontological resources would remain potentially significant and unmitigable. Potential impacts on geological and paleontological resources under this alternative would be **less than Rio Mesa SEGF**.

## Hazardous Materials

The Reduced Acreage SPT Alternative with or without Energy Storage would present a similar hazardous materials risk profile as that for the proposed project. This alternative project would be for all practical purposes the same as one unit of the proposed project. If energy storage were included in the alternative, it would require use of natural gas or liquefied propane gas continuously on site for up to three months during the commissioning process of mixing and melting the salts to be used as the HTF. There would be a small but less than significant increased risk of a fire during that period.

The Reduced Acreage SPT with Energy Storage would have the additional process of utilizing and managing a large volume of hot molten salt, adding to process complexity. The salt is not a gas, is non-flammable, and is not highly toxic. If a spill were to occur, it would quickly solidify and not leave the site. Any added risk from the salt’s presence on site is not significant to the off-site public.

Compliance with LORS and any recommended conditions of certification would require similar actions as for the proposed project, and all mitigation would occur on the plant site. This alternative would also have no significant impacts on the off-site public, **similar to the proposed project**.

## Land Use

A Reduced Acreage SPT Alternative with or without Energy Storage would reduce the size of the proposed project to only one heliostat field and one solar power tower. The Reduced Acreage SPT Alternative with Energy Storage would include additional heliostats for energy storage but would remain within the proposed project footprint. Because the alternative would not change the location or footprint of the proposed project, land use impacts would be **similar to the Rio Mesa SEGF**.

## Noise and Vibration

The Reduced Acreage SPT Alternative with or without Energy Storage would require use of fewer pieces of equipment during construction and operations. The distance between the alternative footprint and the long-term and short-term noise measurement locations would remain the same for all measurement locations except for LT2 (see AFC Figure No 5.7-1 (REV) for the measurement locations). Measurement location LT2 would be about 0.35 mile further from the heliostat array than with the proposed project and the same distance from the solar power tower and related infrastructure. The noise impact **may be slightly lower than the Rio Mesa SEGF** due to the farther distance to sensitive receptors and the reduced amount of construction and operation equipment.

The Reduced Acreage SPT with Energy Storage would increase the noise impact mainly due to the project's potential for the extension of operation before and after sunset. For this analysis, staff assumes that the impact would be **slightly greater than Rio Mesa SEGF** but as with the proposed project, is expected to comply with all applicable noise and vibration laws, ordinances, regulations and standards, and would produce no significant adverse noise impacts on people within the affected area, directly, indirectly, or cumulatively.

## Public Health

Under the Reduced Acreage SPT Alternative with or without Energy Storage, the project's elements and major facility components would be limited to one unit. Construction-related toxic air emissions and impacts would be approximately **half of the Rio Mesa SEGF** for this alternative. One start-up/auxiliary boiler would be required at the unit and approximately half of the fuel would be used over the lifetime of the proposed Rio Mesa SEGF project. Therefore, lifetime toxic air emissions from boilers would be substantially reduced. Staff concludes during operation, the toxic air emissions and health impacts that would be **less than those identified under the proposed Rio Mesa SEGF project**.

## Socioeconomic Resources

The beneficial impact through construction employment and increased taxes and fees would be **less than with the Rio Mesa SEGF**. Potential impacts to law enforcement services, schools, and parks and recreation would be **slightly reduced or similar to the proposed Rio Mesa SEGF**, which staff concludes is less than significant.

## Traffic and Transportation

This alternative would involve different infrastructure, one power tower, and fewer heliostats, and as a result would require fewer construction workers or a shorter construction period. The alternative would also require fewer operation workers. Therefore, there would be less potential for construction vehicle damage to roads and bridges. A decreased number of construction vehicles could result in decreased level of service impacts, and a shorter construction period would reduce any level of service impacts to a shorter period of time. This alternative would generate **slightly less construction and operation impacts than the Rio Mesa SEGF**.

In all other categories, the Reduced Acreage SPT Alternative with or without Energy Storage would generate **similar impacts to those from the Rio Mesa SEGF**, as this alternative would be located on the proposed Rio Mesa SEGF site, using similar technology.

## Transmission Line Safety and Nuisance

Under the Reduced Acreage SPT Alternative with or without Energy Storage, staff concludes that use of this alternative technology would require the use of transmission lines of the same voltage and carrying-capacity as is proposed for Rio Mesa SEGF. This means that the magnitude of these transmission line-related impacts would be similarly less than significant. This impact would be **similar to Rio Mesa SEGF.**

## Visual Resources

For purposes of assessing visual impacts, the primary difference between the Reduced Acreage SPT Alternative with or without Energy Storage and the proposed Rio Mesa SEGF is overall footprint size and the elimination of one power tower. The alternative would result in a measurable decrease in acreage of one-third to one-half of the acreage.

The principal impact of concern from both the proposed Rio Mesa SEGF and the Reduced Acreage SPT Alternative with or without Energy Storage would result from the glare of the solar receivers. Although the alternative would only have one solar power tower, the radius of potentially significant impact due to solar receiver glare is expected to extend to great distances from the project boundary, up to approximately 8.5 miles. Visual effects of project structures themselves, including the heliostat field and tall towers would extend to a much smaller distance. Thus, though the heliostat field under the alternative would affect a smaller area than under the proposed Rio Mesa SEGF project, the overall difference in visual impact of this alternative compared to the proposed project would not be proportional. In both cases, the area and degree of visual impact due to the form and texture contrast of the heliostat fields would be dwarfed by the area strongly affected by solar receiver glare. The area with visually dominant views of the heliostat field could include a slightly fewer number of sensitive observers in the residential areas east of the site, but the change would be overshadowed by the intense glare effects of the solar receiver, which would be **similar under both the Rio Mesa SEGF and Reduced Acreage SPT Alternative with or without Energy Storage**. The overall area and degree of significant impact under this alternative is thus considered to be similar to the proposed project. That is, both projects would have unavoidably significant adverse glare impacts from the solar receivers within a radius of up to 8.5 miles from the solar tower(s).

## Waste Management

The location of the Reduced Acreage SPT Alternative with or without Energy Storage would be the same as the proposed project and no closer to any unidentified RECs. Similar to the proposed project, staff would require investigation and remediation of soil and groundwater contamination for the one unit if it was encountered during construction and operation of this alternative. Site characterization and remediation requirements would remain the same. This impact would be **similar to the Rio Mesa SEGF**.

Construction of the Reduced Acreage SPT Alternative with or without Energy Storage would reduce the number of facilities and equipment installation. Staff anticipates this would decrease the volume of the waste stream by about one-third to one-half. Although the waste volume would decrease somewhat, there is adequate available Class III landfill capacity in Riverside County landfills. Similar to the proposed project, staff considers project compliance with LORS and staff's condition of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the Reduced Acreage SPT Alternative. This impact would be **similar to Rio Mesa SEGF**.

## Soil and Surface Water

Construction of the Reduced Acreage SPT Alternative with or without Energy Storage would disturb about one third to one half less land than the Rio Mesa SEGF project because the size of the alternative proposed solar generating facility would be 1,950 to 2,300 acres. The western portion of the site has steeper slopes that are adjacent to the Mule Mountains and adjacent to some larger washes. This portion of the project would be eliminated by the alternative. Because of the reduced size, this alternative would result in **less impacts as a result of soil erosion than the proposed project** from a soils impacts perspective. Similar to the proposed project, soils impacts will be less than significant under the Reduced Acreage SPT Alternative with or without Energy Storage.

If construction and operation of the alternative adhere to proper material storage and handling as well as any other applicable good housekeeping procedures and employ stormwater design BMPs and adhere to a SWPPP, State water quality standards, and other applicable federal, state, and local LORS addressing stormwater runoff and surface water quality, the water quality impacts would be **less than with the proposed project**.

## Water Supply

The volume of groundwater required to build a Reduced Acreage SPT Alternative with or without Energy Storage at the proposed site would be one third to one half of the amount required for the proposed project. Due to the reduced construction and operation needs, staff estimates that the impacts to the groundwater basin volume and groundwater levels would be **less than the proposed project**.

If the alternative included energy storage, the project would be able to operate for a longer duration each day, and a larger volume of water would be required by the project for process operations. The potential impacts would be slightly greater using energy storage versus direct conversion of water to steam but **would still be less than the Rio Mesa SEGF**.

## SOLAR PHOTOVOLTAIC (PV) ALTERNATIVE

### Overview

This alternative would involve construction of a utility-scale PV project at the proposed project site. Solar PV technology involves the direct conversion of photons (i.e., sunlight) into electricity. PV modules (also called solar panels) absorb solar radiation and convert it into direct current electricity (BS 2011a). This direct current power is then converted into alternating current electricity for delivery to the electrical grid system. This conversion occurs when direct current (DC) flows through a device called an *inverter*, which converts the electrical characteristics to alternating current (AC) that can be tied to the power distribution system for power delivery. The electrical current produced is directly dependent on how much light strikes the module. Multiple PV panels are wired together to form an array, an arrangement that aggregates the total system output. PV technology does not involve thermal energy or the production of steam to power turbines. PV systems are relatively simple to operate and maintain and require little water for project operations compared to solar thermal energy systems.

A traditional fixed-tilt PV system is composed of flat-plate collectors (i.e., PV solar panels or modules) installed in arrays at a fixed tilt facing south. Maximum yearly solar radiation can be achieved using a tilt angle approximately equal to a site's latitude. More complex installations use flat-plate collectors that track the sun from east to west for maximum efficiency. PV trackers use either single-axis (east-west) tracking or dual-axis (east-west and north-south) tracking in order to maximize the panels' absorption of sunlight during the day and throughout the year. Tracking PV modules produce more electricity annually compared to fixed-tilt modules. **Alternatives Figure 7** includes photographs showing fixed-tilt and tracking PV modules.

Staff requested that the project applicant provide additional information to compare the proposed Rio Mesa SEGF project to an alternative using PV technology. In the corresponding data responses, the applicant questioned whether a PV project could be developed at the Rio Mesa site that would generate a net 500 MW and be capable of selling competitively priced renewable energy, consistent with the procurement obligations of California's publicly owned and privately owned utilities. The applicant states that a solar PV project would have 18 percent less capacity than the proposed Rio Mesa SEGF (URS 2012b). At least seven large utility-scale PV projects are approved and under construction in California; **Alternatives Table 4** summarizes data for these projects. Based on data in the final environmental documents for these PV projects, average land use efficiency is approximately 7.4 acres per MW, whereas average land use efficiency for BrightSource Energy's proposed Rio Mesa SEGF and Hidden Hills SEGS projects is roughly 7.0 acres per MW. Land use efficiency is slightly lower for the PV projects but it varies with PV technology. Two large solar PV projects are proposed near the proposed project, the proposed McCoy Solar Energy Project, 750 MW, and the Blythe Solar Power Project, 1,000 MW.

A 500-MW solar PV alternative may not be feasible on the proposed 3,850 acre Rio Mesa project footprint. The PV alternative could use some or all of the 1,575 acres east of the WAPA 161 kV transmission that remain within the MWD property line to complete the 500 MW. Some of this acreage would be more suitable for solar PV as the slope is less than along the western part of the proposed project.

Examples of operating PV projects provided by the applicant include a 21-MW project on 200 acres in Blythe and a 58-MW project on 350 acres in Boulder City, Nevada (Copper Mountain Solar 1). **Alternatives Figure 7** includes a photograph of the Copper Mountain Solar 1 project. Expansion of the Copper Mountain PV complex is underway; when construction of Copper Mountain Solar 2 is completed, it will include an additional 150 MW of generating capacity for a total of 208 MW (Sempra U.S. Gas & Power 2012).

The Draft Solar Programmatic Environmental Impact Statement (Draft Solar PEIS) prepared by BLM in 2010 summarizes "utility-scale PV facilities" that were scheduled for completion in several countries in 2008 and beyond. Many of these facilities had capacities (expressed as megawatt peak [MWp]) in the range of 10–25 MWp (BLM 2010). The Draft Solar PEIS listed average land use efficiency for PV facilities as 9.0 acres per MW (BLM 2010). The largest of the PV facilities listed in Table F.3.2-2 of the Draft Solar PEIS is the 550-MW Topaz Solar Farm Project (see below), and the total plant acreage is shown as 6,200 acres. The EIR considered the 6,200 acres a "Study Area"; the actual proposed project site was considered approximately 4,000 acres (San Luis Obispo County 2011). When San Luis Obispo County approved the Topaz Solar Farm Project in March 2011, the selected alternative reduced the facility's fence line to encompass approximately 3,500 acres (see **Alternatives Table 4**). The project was reconfigured to reduce impacts on biological resources and avoid Williamson Act lands, and the 550-MW generating capacity was maintained.

The April 2012 DRECP Stakeholder Committee Meeting included a review of an update to the renewable energy calculator that was developed by Energy Commission staff to use as a tool for framing an understanding of renewable energy supply and demand for the 2040 planning horizon. Partly in response to comments on an earlier version of the 2040 planning scenario, the average acreage requirement for all central station solar projects, including solar thermal and PV project types, was reduced from 9.1 acres per MW to 7.0 acres per MW. Although it was acknowledged at the meeting that scenarios will vary depending partly on the portfolio[2], the modified efficiency ratio is considered to be plausible and reasonable. Adjustments to the portfolio will be made every 5 years

[2] The portfolio includes central station solar thermal, central station PV, wind, biomass/fuels, geothermal, utility-side distributed generation, and small rooftop solar.

during the planning horizon. Of the four PV projects summarized by staff in **Alternatives Table 4**, the two 550-MW projects show land use efficiencies that are slightly below 7.0 acres per MW. (The proposed Hidden Hills SEGS and Rio Mesa SEGF projects are also close to that land use efficiency ratio).

Operational water use for the PV projects shown in **Alternatives Table 4** varies from less than 0.3 acre-feet per year (afy) for the Desert Sunlight Solar Farm Project to approximately 12 afy for the AV Solar Ranch One Project. The proposed Rio Mesa SEGF project would require approximately 169 afy for project operations and 4.3 afy of potable water.

**Alternatives Table 4**
**Summary Descriptions of Seven Approved Utility-Scale Solar Photovoltaic Projects in California**

| Project Name and Location | Major Project Equipment | Megawatts per Acre | Schedule |
|---|---|---|---|
| AV Solar Ranch One Project, Antelope Valley area of northern Los Angeles County | • PV panels (First Solar thin-film PV modules)<br>• Single-axis trackers (to position PV panels with the sun's movement) on a portion of the facility; some fixed-tilt supports<br>• Inverters to convert electricity from DC to AC<br>• Pad mounted transformers and circuit breakers | 230 MW on 1,955 acres (project site and transmission line route); about 8.5 acres per MW: 592 gigawatt hours per year (GWh/yr) | Project approved December 2010 and will be fully operational at the end of 2013 |
| Desert Sunlight Solar Farm Project, Chuckwalla Valley of the Sonoran Desert in eastern Riverside County | • First Solar fixed-tilt thin-film PV modules organized into arrays, combining switchgear, overhead lines, and access corridors<br>• Operations and maintenance facility<br>• PV arrays consisting of PV modules, a power conversion station, and a transformer<br>• On-site substation | 550 MW on 3,800 acres (area of permanent ground disturbance); about 6.9 acres per MW; 1, GWh/yr | Project approved August 2011 and will be fully operational by the first quarter of 2015 |
| Topaz Solar Farm Project, Carrizo Plain in San Luis Obispo County | • First Solar fixed-tilt thin-film PV modules organized into arrays, combining switchgear, overhead lines, and access corridors<br>• Operations and maintenance facility<br>• PV arrays consisting of PV modules, a power conversion station, and a transformer<br>• On-site substation | 550 MW on 3,500 acres; about 6.4 acres per MW: 1,066 GWh/yr | Project approved summer 2011; construction began in late 2011 and will be finished in 2015 |

**Alternatives Table 4**
**Summary Descriptions of Seven Approved Utility-Scale**
**Solar Photovoltaic Projects in California**

| Project Name and Location | Major Project Equipment | Megawatts per Acre | Schedule |
|---|---|---|---|
| California Valley Solar Ranch Project, Carrizo Plain in San Luis Obispo County | • Crystalline silicon PV panels on the SunPower T0 Tracker® system<br>• Invertors<br>• Electrical substation<br>• Operations and maintenance facilities | 250 MW on 1,900 acres; about 7.6 acres per MW 550 GWh/yr (assumes a 210 MW project) | Project approved April 2011 and will be fully operational by 2013 |
| Mt Signal Solar Farm I and Calexico I and II, Imperial County | • Three 200 MW solar PV farms (technology undecided) | 600 MW on 4,228 acres; about 7.1 acres per MW (GWh/yr depend on technology) | Project approved by County in April 2012 |
| Centinela Solar, Imperial County and BLM land | • 275 Solar PV Arrays (technology undecided)<br>• 4.25 mile Gen-tie line | 275 MW on 2,067 acres; about 7.5 acres per MW (GWh/yr depend on technology) | Project approved December 2011, expected to be fully operational by 2014 |
| Imperial Solar Energy Center West | • 150 MW Solar PV (technology undecided)<br>• 230 kV Gen-tie line<br>• Water Treatment Facility | 150 MW on 1057 acres; about 7 acres per MW (GWh/yr depend on technology) | Approved in November 2011, Construction expected to begin in 2012 |

Sources:
AV Solar Ranch One Project: <http://planning.lacounty.gov/case/view/project_no._r2009-02239_tract_map_no._tr071035_av_solar_ranch_one_project>
Desert Sunlight Solar Farm Project: <http://www.blm.gov/ca/st/en/fo/palmsprings/Solar_Projects/Desert_Sunlight.html>
Topaz Solar Farm Project: <http://www.slocounty.ca.gov/planning/environmental/EnvironmentalNotices/optisolar.htm>
California Valley Solar Ranch Project: <http://www.slocounty.ca.gov/planning/environmental/EnvironmentalNotices/sunpower.htm>
Mt. Signal Solar Farm I (et. al):
< ftp://ftp.co.imperial.ca.us/icpds/eir/mount-signal-solar/final/08project-description.pdf>
Centinela solar:
< http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/elcentro/nepa/centinela.Par.18221.File.dat/ca670_ea1128_02description.pdf>
Imperial Solar Energy Center West:
< http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/elcentro/nepa/isec_west.Par.5832.File.dat/F2ISECw_ProposedAction.pdf>
Gigawatt hours provided in the CPUC RPS Project Status Table,: <http://www.cpuc.ca.gov/PUC/energy/Renewables/index.htm>

## Potential to Attain Project Objectives

**Construct and operate a 500 MW solar generating facility.** Recent approvals and ongoing construction of utility-scale PV projects in California and Nevada indicates the suitability of using PV technology for development of a large, renewable energy power plant with a capacity of several hundred MW that could potentially meet this objective.

**Locate the solar generating facility in an area of high insolation and near existing electric transmission equipment and natural gas infrastructure.** This alternative would satisfy these project objectives.

**Secure site control.** The Solar PV Alternative would be built on the proposed project site and would meet the objective addressing obtaining site control and use within a reasonable time frame.

The Solar PV Alternative would satisfy three of the four project objectives either entirely or partially. It is not known whether the proposed 3,805-acre project site could be used for construction of a PV project that would achieve the 500-MW capacity of the proposed project. The possible need to reconfigure the 3,805-acre project site and use additional acreage, if needed, could result in a project schedule delay.

## Potential Feasibility Issues

The applicant's data responses regarding the feasibility of a solar PV alternative state that use of solar PV technology would not comply with provisions of the PPAs for the proposed project. The applicant states that "The generic PV plant would be incapable of generating the maximum permitted MWh allowed under the PPA's that relate to the Rio Mesa SEGF site. It may also be infeasible, since it could not be accomplished in a reasonable time frame, given the lead time to negotiate for the use of another proprietary technology and the follow-on development process." The two PPAs currently attached to the Rio Mesa site are for 200 MW each rather than for 250 MW (CPUC 2012a). A PPA may also include some flexibility for a reduction in contract capacity. While a generic PV plant would generate fewer MWh at this site than a 500 MW solar power tower, it could possibly still comply with the provisions of the PPAs.

If the project technology at the Rio Mesa SEGF site were changed to a PV technology, an amended advice letter would have to be filed with CPUC requesting amendments to the PPAs. The work required to redesign the project to use PV technology would delay the project schedule. It is not known whether CPUC would approve amendments to the PPAs allowing the technology change. It is also not known at what point a project schedule delay would affect project viability. For example, the PPA includes forecasted initial operation dates of September 2015 and December 2015. The CPUC is currently considering the Rio Mesa PPA. The Draft Resolution would deny cost recovery for the Rio Mesa 1 and Rio Mesa 2 PPAs because they compare poorly on price and value relative to other solar thermal projects offered to SCE (CPUC 2012a). An alternate Draft Resolution has been proposed that would deny cost recovery for Rio Mesa 1 PPA and approve cost recovery for the Rio Mesa 2 PPA (CPUC 2012b). The Resolutions are on the Public Agenda for the Commission Meeting scheduled for October 11, 2012.

Finally, the applicant notes that "PV projects require a site slope of less than two percent. Much of the Rio Mesa SEGF project site exceeds this criteria." Staff disagrees with this slope constraint. Central station solar photovoltaic screening criteria usually uses a five percent slope requirement.

## Environmental Analysis

**Alternatives Table 5** presents a summary comparison of impacts of the proposed Rio Mesa SEGF project with impacts of the Solar PV Alternative. Comparative discussions for each environmental topic area follow the table.

**Alternatives Table 5**
**Summary Comparison of the Proposed Project's Impacts to the Solar PV Alternative**

| | **Proposed Project** | **Solar PV Alternative** | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Air Quality** | | | |
| Construction-related emissions | SM | SM | Similar |
| Project operations emissions | SM | SM | Less |
| Greenhouse Gas | LS | LS | Slightly Less |
| **Biological Resources** | | | |
| Impacts to vegetation and special status plants | SM | SM | Similar |
| Impacts to waters of the US | SM | SM | Similar |
| Impacts to waters of the state including microphyll woodland habitat | PSU | PSU | Similar |
| Impacts on desert tortoise | SM | SM | Similar |
| Impacts on special-status terrestrial wildlife species (other than desert tortoise) | SM | SM | Similar |
| Impacts on avian species, including raptors | SU | SM | Much less |
| **Cultural Resources** | | | |
| Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites or ethnographic resources, or impact built environments on or beyond the site | UNK at this time | UNK at this time | UNK at this time |
| **Geology and Paleontology** | | | |
| Potential impacts from strong seismic shaking | SM | SM | Less |
| Potential impacts from soil failure caused by hydro-collapse and/or dynamic compaction | SM | SM | Less |
| Potential impacts on paleontological resources | SU | SU | Less |
| **Hazardous Materials** | | | |
| Risk of fire or explosion during commissioning or operations | SM | SM | Less |
| Risk of hazardous material spill off-site during hazardous materials transportation | SM | SM | Similar |
| Risk of hazardous material spill off-site resulting from hazardous materials storage and use on-site | SM | SM | Similar |

**Alternatives Table 5**
**Summary Comparison of the Proposed Project's Impacts**
**to the Solar PV Alternative**

| | Proposed Project | Solar PV Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| Risk of drawdown of emergency response services causing impact off-site | SM | SM | Similar |
| **Land Use** | | | |
| Compatibility with land use plan, policy, or regulation | LS | LS | Similar |
| **Noise and Vibration** | | | |
| Potential for noise to impact noise-sensitive receptors | SM | SM | Less |
| **Public Health** | | | |
| Potential for project operations to cause air toxics-related impacts that could affect public health | LS | LS | Less |
| **Socioeconomic Resources** | | | |
| Adversely impact acceptable levels of service for police protection (law enforcement), schools, parks, and recreation | SM | SM | Similar |
| Displace substantial numbers of people and/or existing housing | LS | LS | Similar |
| Induce substantial population growth in the area | SM | SM | Similar |
| **Traffic and Transportation** | | | |
| Damage to Roads and Bridges | SM | SM | Slightly less |
| Glint Impacts to Motorists and Pilots – heliostats | SM | SM | Much less |
| Level of Service on Roads and Highways – Construction | SM | SM | Much less |
| Level of Service on Roads and Highways – Operation | LS | LS | Similar |
| Glare Impacts to Motorists and Pilots – solar receiver steam generator | LS | LS | Much Less |
| **Transmission Line Safety and Nuisance** | | | |
| Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure | SM | SM | Similar |
| **Visual Resources** | | | |
| Visual change/contrast of project facilities, excluding glare effect | SU | SU | Less |
| Potential to create a new source of glare from solar receivers | SU | LS | Much less |

**Alternatives Table 5**
**Summary Comparison of the Proposed Project's Impacts to the Solar PV Alternative**

| | Proposed Project | Solar PV Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Waste Management** | | | |
| Material/waste generated during the construction and operation would be managed in an environmentally safe manner, i.e. recycling or disposal | SM | SM | Similar |
| Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities | SM | SM | Similar |
| Potential for impacts on human health and the environment related to past or present soil or water contamination | SM | SM | Similar or slightly greater |
| **Soil and Surface Water** | | | |
| Soil erosion by wind and water during project construction or operations | SM | SM | Greater |
| Potential contamination of groundwater resources from infiltration | SM | SM | Similar |
| Environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly | SM | SM | Less |
| **Water Supply** | | | |
| Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level | LS | LS | Less |

Notes: — = no impact
UNK = significance of impact is unknown
B = beneficial impact
LS = less-than-significant impact, no mitigation required
SM or PSM = significant or potentially significant impact that can be mitigated to less than significant
SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

## Air Quality

The number of permitted fuel-consuming and air pollutant emitting sources would be significantly fewer under the Solar PV Alternative. This alternative would not be subject to Energy Commission jurisdiction and would be permitted locally, including the air permits from the air district. Construction-related emissions and impacts would be **similar to Rio Mesa SEGF** for this alternative. Operational impacts related to criteria pollutant emissions for the utility-scale PV projects would include normal maintenance truck activity, possibly including periodic fire water pump engine testing, and use of water trucks coinciding with the infrequent work to wash the PV modules. Use of fossil fuel-fired supplemental boiler operation is not required under this alternative. Impacts on air quality from operation of the Solar PV Alternative would be **less than Rio Mesa SEGF**. While a PV alternative would not require use of a fossil fuel-fired supplemental boiler, PV has a lower capacity factor (average approximately 23 percent) than solar power tower technology (average approximately 30 percent) so would generate fewer megawatt hours of renewable energy on the same footprint.[3] The overall cumulative reduction in GHG emissions from the PV power plant would be **slightly less than with the proposed Rio Mesa SEGF project**. The Solar PV Alternative would not worsen current conditions or make a cumulatively considerable contribution to any significant cumulative impact associated with air quality.

## Biological Resources

Solar PV technology employs either fixed-tilt or tracking solar panels to collect incident radiation. Each of these two options would have similar potential impacts to biological resources, and this discussion applies to both types of PV solar collectors. Assuming a project footprint with similar boundaries as the proposed Rio Mesa SEGF project, impacts to all terrestrial special-status species and habitats, including waters of the state and waters of the U.S., would be **similar to the proposed Rio Mesa SEGF**. A generic PV project would require additional grading and leveling of the site compared with the Rio Mesa SEGF. However, the proposed project would result in a **similar loss of habitat** throughout the entire project footprint.

If reconfiguration of the proposed project site was needed to accommodate PV technology, the extent of impacts on biological resources could change. Staff concludes that impacts on desert tortoise, waters of the U.S., waters of the state, and other special-status plants and wildlife would likely increase or decrease, roughly in proportion to expansion or reduction of the project footprint.

Operational impacts to birds and perhaps bats from collision with heliostats or flying through the zones of concentrated solar energy above the heliostat fields would be **much less for the Solar PV Alternative than for the proposed Rio Mesa SEGF**. PV technology does not employ mirrors (heliostats) focused on central collector towers. PV technology would not create a zone of concentrated solar energy above the project area and there would be no singeing or burning impacts to birds. Birds would be at risk of collision with the solar PV panels, although staff believes that the collision risk would be less than the risk of collisions with heliostats for the proposed project due to the low reflectivity of PV panels. Habitat loss for birds and bats would be dependent on the project footprint, but would be would be similar to habitat loss for other species (above) and **similar to the proposed Rio Mesa SEGF**.

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[3] Solar PV and Solar thermal capacity factors may vary greatly. The National Renewable Energy Laboratory Utility-Scale Energy Technology Capacity Factors indicates a range of recent capacity factor estimates for renewable energy technologies. http://www.nrel.gov/analysis/tech_cap_factor.html, July 2010.

## Cultural Resources

Construction and operation of the Solar PV Alternative at the proposed project site would result in a similar extent of physical ground disturbance on the project site compared with the proposed Rio Mesa SEGF project. Additional analyses will be completed for publication in the FSA for the Rio Mesa SEGF including presenting information regarding impacts to archaeological, historical, and Native American resources of the Solar PV Alternative and a comparison with the proposed project.

## Geology and Paleontology

Construction and operation of the Solar PV Alternative at the proposed project site could have **less impacts compared to the proposed Rio Mesa SEGF**. The Solar PV Alternative would not require the deep or otherwise specialized foundations that would be required for the collector towers and the numerous heliostat foundations of the proposed project. The elimination of deep foundations would decrease the potential for encountering fossil bearing strata and, due to elimination of tall tower structures, the project as a whole would have a decrease in seismic susceptibility. The Solar PV Alternative would not worsen current conditions, and would not result in impacts that are cumulatively CEQA significant. Potential impacts on geological and paleontological resources under this alternative would be **less than Rio Mesa SEGF**.

## Hazardous Materials

The Solar PV Alternative would involve use of photovoltaic cells to create electrical power at the proposed Rio Mesa SEGF site instead of the present technology. This alternative would be located at the same site and would have no potential for off-site impacts from required use of hazardous materials at the site. Thus, this alternative would be **similar to the proposed project in terms of posing an accidental release risk**.

## Land Use

The California Energy Commission has permitting authority over solar thermal electric generation facilities. A solar photovoltaic system has no thermal component in the generation of the electricity. This project alternative would be permitted and analyzed by the County of Riverside.

The Riverside County General Plan designates the land use in the Rio Mesa SEGF area as “Open Space-Rural” and “Agriculture.” General Plan, Land Use Element Policy LU 15.15 states the county is to “permit and encourage, in an environmentally and fiscally responsible manner, the development of renewable energy resources and related infrastructure, including but not limited to, the development of solar power plants in the County of Riverside.”

Ordinance No. 348.4705 amended the County of Riverside’s Zoning Ordinance to permit “solar power plants” on lots ten (10) acres or larger in the N-A and W-2 zone classifications with approval of a conditional use permit by the county. As such with the approval of a conditional use permit, the Solar PV Alternative would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project, **similar as for the Rio Mesa SEGF**.

A Solar PV Alternative would develop the alternative within the land owned by MWD. Because the alternative would not change the location or footprint of the proposed project, land use impacts would be **similar as to the Rio Mesa SEGF**.

## Noise and Vibration

Photovoltaic cells convert solar radiation directly into electrical current. No mechanical equipment (which is the major source of noise) is used for this technology. The only source of noise would be the inverters, which are generally quiet at relatively short distances. Impacts related to noise would be **less than Rio Mesa SEGF** under this alternative.

## Public Health

The Solar PV alternative would not require combustion-related boiler emissions. Due to very infrequent washings of PV panels, toxic air emissions related to using diesel powered equipment to transport equipment for solar collector surface washings would be substantially reduced. Some high-performance solar PV cells are known to contain small amounts of cadmium, selenium, and arsenic, and these substances could be emitted if any solar cells were broken. However, staff does not consider any such emission hazards to be significant at the present state of the photovoltaic technology. Staff thus considers potential public health risks from this alternative technology to be **less than the proposed Rio Mesa SEGF project**.

As discussed above, no significant impacts on public health would occur under the proposed project. Based on staff's analysis, there is no important difference in the level of impacts on public health under any project alternative. For the alternatives analyzed in this staff assessment, impacts on public health are less than significant.

## Socioeconomic Resources

If the Solar PV alternative was developed, potential impacts on law enforcement services, schools, and parks and recreation would be **similar to the proposed Rio Mesa SEGF**, which staff concludes would be less than significant. The Solar PV alternative would not induce substantial population growth in the area or displace substantial numbers of people and/or existing housing.

The socioeconomic benefits from construction employment and wages, purchase of materials and supplies, increased taxes and fees, and reduction in vacant housing would **be similar to the Rio Mesa SEGF**. However, the number of construction and operation workers required for a solar PV project is different compared with the proposed Rio Mesa SEGF. For comparison purposes, the 550 MW Topaz Solar Farm PV project (San Luis Obispo County) would require 400 construction workers per day, 500 during peak construction, and only 15 workers during operation. The average and peak workforce for the Rio Mesa SEGF are 840 and 2,200 with 100 workers during operation. The construction would occur over approximately 36 months and is similar to the construction period for the Rio Mesa SEGF. Because the construction workforce is smaller, the employment opportunities for a solar PV alternative would be **less than for the proposed project**. The construction and operation of a Solar PV project would be an economic benefit to the local economy **similar to that of the Rio Mesa SEGF**.

## Traffic and Transportation

Fewer workers are generally required for construction of solar photovoltaic facilities. For example, the Topaz Solar Farm Project in San Luis Obispo County and the Desert Sunlight Solar Farm in Riverside County are both 550-MW projects similar in power-generating capacity to the 500-MW Rio Mesa SEGF. While the Rio Mesa SEGF would require approximately 2,200 workers per day during the peak construction period, the Topaz Solar Farm Project and Desert Sunlight Solar Farm would only require approximately 500 and 630 workers, respectively, per day during peak construction (BLM 2011b, San Luis Obispo County 2011).

Because fewer workers generate fewer construction-related trips, the Solar PV Alternative may result in less damage to roads and bridges near the project site. As with the Rio Mesa SEGF construction, heavy haul trucks, which are the most damaging to roads and bridges, would be used to construct the Solar PV Alternative, resulting in potential damage to roads and bridges. Impacts to level of service would also be reduced due to the reduced labor requirement. Overall, this alternative would likely result in **slightly less damage to roads and bridges and level of service compared with the Rio Mesa SEGF**.

In contrast to the Rio Mesa SEGF's heliostats (mirrors), solar photovoltaic panels absorb energy rather than reflect it, as reflected energy results in loss of energy output. Therefore, glint impacts to motorists and pilots would be **much less than those resulting from the Rio Mesa SEGF**.

This alternative would not include a glare-producing solar receiver steam generator (SRSG), and as discussed earlier, photovoltaic panels absorb the vast majority of energy and do not produce significant glare. Therefore, the Solar PV Alternative would result in glare impacts that would be **much less than those of the Rio Mesa SEGF**.

## Transmission Line Safety and Nuisance

Under the solar PV alternative, photovoltaic cells would be used at the proposed Rio Mesa SEGF site instead of the proposed technology. Since this alternative would be located at the proposed Rio Mesa SEGF site, staff expects the utilized transmission lines and related impacts to be similar, conferring no benefit regarding the field and non-field impacts of concern in staff's "Transmission Line Safety and Nuisance" testimony in this staff assessment. This means that the magnitude of these transmission line-related impacts would be similarly less than significant. This impact would be **similar to Rio Mesa SEGF**.

## Visual Resources

Solar PV technology may employ a variety of fixed or tracking solar panel designs to collect solar radiation. In all cases known to staff, the height of PV panels would generally be similar to the heliostats under the proposed Rio Mesa SEGF. However, a PV facility would not require solar towers, steam generation and cooling system, or other major structures, as under the proposed project. At a distance, PV fields would appear low-lying and follow the existing ground plane. Due to the level terrain of the project site and much of its surroundings, PV fields, when viewed at middle-ground distance (1/2 to 5 miles) from locations with similar elevation as the project site, would appear as a thin horizontal line conforming to the existing ground plane, with relatively low form contrast. Viewed from higher elevation viewpoints such as the Mule Mountains, the fields would be more visually prominent, contrasting with the surrounding natural ground plane in form, color, and texture. PV fields are generally dark in color. Though they would thus contrast somewhat with the lighter color of the naturally-occurring ground surface and vegetation, they would generally be visually recessive at middle-ground distances. To viewers at middle-ground distances to the east, such as motorists on Highway 78 and residents in and around Palo Verde and Ripley, the project would be seen from a similar low elevation as the relatively level project site. Visual foreshortening would thus reduce visibility of the PV field to a narrow horizontal line of slightly darker ground plane at the horizon to the west. Even from these middle-ground-distance viewpoints, the overall visual effect would be relatively subtle and visually subordinate. Exceptions to this subordinate appearance could result from short-term specular reflections of the sun off of the glass surface of some types of PV panels, primarily in the early morning or late afternoon. Such effects would require additional mitigation such as installation of opaque perimeter fencing or other type of screening.

Visual characteristics of PV fields would be more intrusive and out of character when viewed at foreground distances (under ½- mile). At foreground distance, the solar panels, as well as various salient features such as power collection lines and poles, maintenance facilities, switching and power conversion stations, fencing and other features may lend the facilities a visually cluttered, industrial character. The number of anticipated sensitive viewing locations at foreground distance however is limited. Principal such viewpoints include the Bradshaw Trail, which would be within one mile of the project for a roughly four-mile segment starting near the irrigation canal crossing of the trail to the east of the project site; and the OHV trail accessing the Hodge Mine, located a little over a mile from the site. These effects would be particularly prominent for the roughly two-mile segment of the Bradshaw Trail nearest to the project site, in which the PV field would be seen at distances of under 1/2-mile and as little as 50 feet in some locations. In that segment visual change due to the project would be strong.

As described in the analysis of the Rio Mesa SEGF, above, Bradshaw Trail is considered a KOP of moderately high overall visual sensitivity. In that context the strong level of contrast from the Solar PV Alternative as seen from the Bradshaw Trail could thus represent a significant impact.

The greatest visual impact of the proposed Rio Mesa SEGS project by far would be due to bright glare of the solar receivers over a wide viewing area. The Solar PV alternative would not employ solar receivers and would thus not have that type of far-ranging glare impact. The PV Alternative would have moderate or low levels of contrast beyond foreground distance and would thus have less-than-significant impacts from all KOPs except for Bradshaw Trail and vicinity. The Solar PV alternative would thus have **much less impact than the proposed project**.

## Waste Management

The location of the Solar PV Alternative would be the same as the proposed project and it would be no closer to any unidentified RECs. Similar to the proposed project, staff would require investigation and remediation of soil and groundwater contamination if it was encountered during construction and operation of this alternative.

A solar panel (photovoltaic module or photovoltaic panel) collects energy from the sun for the purpose of converting light into electricity. A solar panel is a packaged connected assembly of PV cells. The materials presently used in PV modules include but are not limited to mono-crystalline silicon, poly-crystalline silicon and thin-film/amorphous silicon. The crystalline silicon is not considered hazardous. The thin-film PV modules can be fabricated from amorphous silicon, cadmium telluride (CdTe), or copper indium gallium (di) selenride. CdTe is a commonly used solar cell material for the manufacture of thin film PV. The disposal and long term safety of cadmium telluride is a known issue in the large-scale commercialization of cadmium telluride solar panels (2012).

Construction and operation of a Solar PV Alternative site could produce more hazardous wastes than the Rio Mesa SEGF project, depending on the chosen PV module technology. Regardless of whether wastes are determined to be hazardous or not there is available Class II and III landfill capacity in Riverside County and available Class I capacity in California similar to the proposed project. Staff considers project compliance with LORS and staff’s conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the Solar PV Alternative. Impacts related to waste management would be **similar to the proposed Rio Mesa SEGF project** (URS 2012j). If hazardous wastes are inadvertently discharged on the site, site characterization and remediation requirements would remain the same as for the proposed project. Similar to the proposed project, staff considers project compliance with LORS and staff’s conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the Solar PV Alternative. Depending on the type of PV module selected the impact could be **slightly greater than Rio Mesa SEGF**.

## Soil and Surface Water

Solar PV technology employs either fixed or tracking solar panels to collect solar irradiance. PV systems do not use steam generators because all receiver units directly generate electricity and thus do not require thermal cooling equipment or other facilities associated with a traditional power plant. As a result, characteristic impacts on water quality caused by the presence of power plant facilities would be **less than Rio Mesa**

**SEGF** for a PV alternative, namely the disposal of industrial wastewater and the risk of storm water exposure to industrial chemicals. Domestic sanitary waste would still need a septic system for proper disposal but would be for fewer employees, so impacts related to sanitary waste **would be slightly less than as for Rio Mesa SEGF**.

As discussed previously, information in the final project approval documents for seven solar PV projects in California indicate an average land use efficiency of approximately 7.4 acres per MW. Higher land requirements for utility-scale PV power plants have also been stated in the range of about 9 acres per MW (REAT 2010). The probable need to reconfigure the proposed Rio Mesa SEGF site for installation of either fixed-tilt or tracking PV modules could require additional project acreage. Assuming a project with similar net MW output as the proposed project, a PV alternative could require additional acreage. Installation of the supports for the PV panels would likely require significant site grading. Impacts related to soil erosion during construction would be **greater than Rio Mesa SEGF**. Impacts related to soil erosion during project operations would be **less than the proposed Rio Mesa SEGF project**. Assuming additional dirt roads would be created throughout the potentially larger area for access and maintenance of the PV panels, the decrease in cleaning frequency would result in overall less dust creation from washer vehicles driving on these dirt roads.

### Water Supply

Solar PV technology employs either fixed or tracking solar panels to collect solar irradiance. PV systems do not use steam generators because all receiver units directly generate electricity and thus do not require thermal cooling equipment or other facilities associated with a traditional power plant. As a result, PV plants use less water than solar thermal plants. In addition, the number of plant personnel needed to operate the PV plant would be less and domestic water demands and sanitary waste would be less. Impacts related to water supply would be **less than for the Rio Mesa SEGF.**

Most of the water consumed by the solar power tower technology and by PV plants is by mirror and PV panel washing. The frequency of washing for PV panels is much less than the frequency of washing mirrors for the proposed project and would lead to a decrease in water consumption during operations. Impacts related to water supply would be **less than for the Rio Mesa SEGF.**

## PARABOLIC TROUGH ALTERNATIVE

### Overview

This alternative would involve construction of a utility-scale parabolic trough project at the proposed project site. A parabolic trough system converts solar radiation into electricity using sunlight to heat a thermal fluid, typically synthetic oil (i.e., the heat transfer fluid [HTF]). Parabolic trough power plants consist of horizontal, trough-shaped solar collectors that are arranged in parallel rows and aligned on a north-south horizontal axis. Each parabolic trough collector has a linear parabolic-shaped reflector that focuses the sun's rays on a linear receiver tube (i.e., heat collection element) suspended at the focal point of the curve-shaped collector. The trough rotates east to west to track the sun during the day, heating the HTF circulating in the collection element. The heated HTF is then piped through a series of heat exchangers where it releases its stored heat to generate high pressure steam. The steam is then fed to a traditional steam turbine generator where electricity is produced. **Alternatives Figure 8** includes photographs of existing parabolic trough project facilities.

Beginning in 1984, nine solar power plants using parabolic trough technology were constructed in the Mojave Desert in San Bernardino County. Solar Electric Generating Systems (SEGS) III through VII are at Kramer Junction (**Alternatives Figure 8**), SEGS VIII and IX are at Harper Lake, and SEGS I and II are at Daggett near Barstow. The nine SEGS projects have a combined total capacity of 354 MW. Natural gas-fired facilities provide additional operational flexibility for each of the SEGS projects. These power plants cover a combined total of more than 1,600 acres. Several online sources report that SEGS VIII and IX have operated successfully and without interruption from the beginning (i.e., since they began operating in 1990 and 1991, respectively).

In 2008 and 2009, the Energy Commission received AFCs for several renewable energy projects that were proposed to use parabolic trough technology. Staff is monitoring construction of two of the projects that were licensed by the Energy Commission in September 2010—the Abengoa Mojave Solar Project (AMSP) and the Genesis Solar Energy Project (GSEP). Neither of these projects includes energy storage.

AMSP is near Harper Lake in San Bernardino County, about 9 miles northwest of the community of Hinkley. The SEGS VIII and IX facilities are immediately northwest of the AMSP site. GSEP is in the Sonoran Desert of east central Riverside County, about 25 miles west of Blythe. Each project consists of two 125-MW power plants for a combined total capacity of 500 MW. Commercial operation of AMSP is anticipated in winter 2013. Commercial operation of the two GSEP power plants is anticipated to occur consecutively in spring 2013 and 2014. Natural gas-fired auxiliary boilers will provide equipment and HTF freeze protection for each 125-MW power island for the two projects.

When construction of AMSP is finished, it will cover approximately 1,765 acres. GSEP will cover approximately 1,800 acres. Land use efficiency for each project is a little over 7.0 acres per MW, which is comparable to an average land use efficiency of approximately 7.0 acres per MW for BrightSource Energy's proposed Rio Mesa SEGF and Hidden Hills SEGS projects.

AMSP will use wet cooling, and maximum operational water use for the project will total approximately 2,160 afy. GSEP will use dry cooling, requiring approximately 202 afy.

## Potential to Attain Project Objectives

**Construct and operate a 500 MW solar generating facility.** Development of an approximately 500-MW parabolic trough project at the proposed project site would meet this project objective.

**Locate the solar generating facility in an area of high insolation and near existing electric transmission equipment and natural gas infrastructure.** This alternative would satisfy these project objectives.

**Secure site control.** The Solar Trough Alternative would be built on the proposed project site so would meet the objective addressing obtaining site control and use within a reasonable time frame.

The Parabolic Trough Alternative could potentially satisfy the four project objectives either entirely or partially. It is unlikely that the proposed 3,805-acre project site could be used for construction of a parabolic trough project that would achieve the 500-MW capacity of the proposed project. The probable need to reconfigure the 3,805-acre project site and gain site control and use of any additional acreage that would be needed for this alternative could result in a project schedule delay. The applicant states that “an additional 21-23 percent land at a minimum would be required” to achieve the same energy production as an SPT alternative (BrightSource Energy 2012).

## Potential Feasibility Issues

Changing the project technology at the Rio Mesa SEGF site to a parabolic trough technology would require filing of an amended advice letter with CPUC requesting amendments to the PPAs. The work required to redesign the project and reconfigure the site to use a parabolic trough technology would delay the project schedule, and it is not known whether the CPUC would approve amendments to the PPAs allowing the technology change. It is not known at what point a project schedule delay would affect project viability.

Multiple large parabolic trough projects were approved by the BLM and Energy Commission in 2010 – including the Blythe Solar Power Project (BSPP) and the Palen Solar Power Project (PSPP). In 2012, the developer Solar Millennium sold the projects due to its bankruptcy. The current owners of both projects propose to use other solar technologies. The current owner of BSPP, NextEra, has filed an amendment to convert the BSPP to a 1,000 MW solar PV project. PSPP is now owned by BSE. No amendment for this project has been filed to date, but it is presumed that the owner would convert the project to a solar power tower project, the proprietary technology. The Abengoa Mojave Solar Project and the Genesis Solar Energy Project, both parabolic trough projects, are currently under construction. The CPUC Resolution approving the Abengoa Project PPA notes that the Abengoa contract is significantly more costly than other procurement opportunities available to PG&E and exceeds the average price of RPS contracts approved by the CPUC in 2011 (CPUC 2011c). The developer of the Genesis Solar Energy Project, NextEra, has more recently proposed solar PV projects, the McCoy Solar Energy Project and BSPP, rather than parabolic trough technologies. Given the current technology trends, staff questions whether parabolic trough projects are still financially viable in the 2012 market.

## Environmental Analysis

**Alternatives Table 6** presents a summary comparison of impacts of the proposed Rio Mesa SEGF project to the same or similar potential impacts of the Parabolic Trough Alternative. Comparative discussions for each environmental topic area follow the table.

**Alternatives Table 6**
**Summary Comparison of the Proposed Project's Impacts to the Parabolic Trough Alternative**

| | **Proposed Project** | **Parabolic Trough Alternative** | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| **Air Quality** | | | |
| Construction-related emissions | SM | SM | Similar |
| Project operations emissions | SM | SM | Slightly greater |
| Greenhouse Gases | LS | LS | Similar |
| **Biological Resources** | | | |
| Impacts to vegetation and special status plants | SM | SM | Slightly greater |
| Impacts to waters of the US | SM | SM | Slightly greater |
| Impacts to waters of the state including microphyll woodland habitat | PSU | PSU | Similar |
| Impacts on desert tortoise | SM | SM | Slightly greater |
| Impacts on special-status terrestrial wildlife species (other than desert tortoise) | SM | SM | Slightly greater |
| Impacts on avian species, including raptors | SU | SM | Much less |
| **Cultural Resources** | | | |
| Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites or ethnographic resources, or impact built environments on or beyond the site | UNK at this time | UNK at this time | UNK at this time |
| **Geology and Paleontology** | | | |
| Potential impacts from strong seismic shaking | SM | SM | Less |
| Potential impacts from soil failure caused by hydro-collapse and/or dynamic compaction | SM | SM | Less |
| Potential impacts on paleontological resources | SU | SU | Similar to |
| **Hazardous Materials** | | | |
| Risk of fire or explosion during commissioning or operations | SM | SM | Slightly reater |
| Risk of hazardous material spill off-site during hazardous materials transportation | SM | SM | Slightly greater |
| Risk of hazardous material spill off-site resulting from hazardous materials storage and use on-site | SM | SM | Similar |

**Alternatives Table 6**
**Summary Comparison of the Proposed Project's Impacts to the Parabolic Trough Alternative**

| | Proposed Project | Parabolic Trough Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| Risk of drawdown of emergency response services causing impact off-site | SM | SM | Slightly greater |
| **Land Use** | | | |
| Compatibility with land use plan, policy, or regulation | LS | LS | Similar |
| **Noise and Vibration** | | | |
| Potential for noise to impact noise-sensitive receptors | SM | SM | Similar |
| **Public Health** | | | |
| Potential for project operations to cause air toxics-related impacts that could affect public health | LS | LS | Similar |
| **Socioeconomic Resources** | | | |
| Adversely impact acceptable levels of service for police protection (law enforcement), schools, parks, and recreation | SM | SM | Similar |
| Displace substantial numbers of people and/or existing housing | LS | LS | Similar |
| Induce substantial population growth in the area | SM | SM | Similar |
| **Traffic and Transportation** | | | |
| Damage to Roads and Bridges | SM | SM | Slightly less |
| Glint Impacts to Motorists and Pilots – heliostats | SM | SM | Much less |
| Level of Service on Roads and Highways – Construction | SM | SM | Much less |
| Level of Service on Roads and Highways – Operation | LS | LS | Slightly greater |
| Glare Impacts to Motorists and Pilots – solar receiver steam generator | LS | LS | Much less |
| **Transmission Line Safety and Nuisance** | | | |
| Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure | SM | SM | Similar |
| **Visual Resources** | | | |
| Visual change/contrast of project facilities, excluding glare effect | SU | SU | Less |
| Potential to create a new source of glare from solar receivers | SU | LS | Much less |
| **Waste Management** | | | |
| Material/waste generated during the construction and operation would be managed in an environmentally safe manner, i.e. recycling or | SM | SM | Similar |

**Alternatives Table 6**
**Summary Comparison of the Proposed Project's Impacts to the Parabolic Trough Alternative**

| | Proposed Project | Parabolic Trough Alternative | |
|---|---|---|---|
| **Environmental Effect** | **Impact Significance** | **Impact Significance** | **Comparison to Proposed Project** |
| disposal | | | |
| Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities | SM | SM | Similar |
| Potential for impacts on human health and the environment related to past or present soil or water contamination | SM | SM | Similar |
| **Soil and Surface Water** | | | |
| Soil erosion by wind and water during project construction or operations | SM | SM | Greater |
| Potential contamination of groundwater resources from infiltration | SM | SM | Similar |
| Environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly | SM | SM | Similar |
| **Water Supply** | | | |
| Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level | LS | LS | Similar |

Notes: — = no impact
UNK = significance of impact is unknown
B = beneficial impact
LS = less-than-significant impact, no mitigation required
SM or PSM = significant or potentially significant impact that can be mitigated to less than significant
SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

## Air Quality

The number and type of emitting sources during project operations under the Parabolic Trough Alternative would be similar to those of the proposed project; however, this alternative would likely use a heat transfer fluid (HTF) in the receiver tubes of the parabolic mirrors during project operations. When HTF leaks from project apparatus (e.g. piping, flanges, etc.), it vaporizes into small amounts of volatile organic compounds (VOCs), which are ozone precursors. The local air district would most likely require controls to minimize ozone impacts at the project site. Overall, air quality **impacts would be slightly greater than Rio Mesa SEGF** for the Parabolic Trough Alternative.

Construction-related emissions and impacts would be similar to Rio Mesa SEGF for this alternative. Similar to the proposed project, this alternative would cause an overall cumulative reduction in GHG emissions from power plants; however, more stringent conditions of certification would be required compared to the proposed project to ensure that impacts of the Parabolic Trough Alternative would not be considered cumulatively significant for ozone.

## Biological Resources

Assuming a project footprint with similar boundaries as the proposed Rio Mesa SEGF project, impacts from the Parabolic Trough Alternative to all terrestrial special-status species and habitats, including waters of the state and waters of the U.S., would be **similar to the proposed project**. A generic solar parabolic trough project would require additional grading and leveling of the site compared with the Rio Mesa SEGF. However, the proposed project would result in a **similar loss of habitat** throughout the entire project footprint.

If reconfiguration of the proposed project site was needed to accommodate solar trough technology, the extent of impacts on biological resources could change. Staff concludes that impacts to desert tortoise, waters of the U.S., waters of the state, and other special-status plants and wildlife would likely increase or decrease, roughly in proportion to expansion of the project footprint. For most of these impacts, staff would recommend conditions of certification similar to those recommended for the proposed project, to reduce these impacts below a level of significance.

Parabolic trough technology can cause significant glint and glare impacts to wildlife, including golden eagles and other raptors, and other special status species. The glint and glare impacts of solar trough technology can cause light intensity unsafe for humans at a distance of approximately 60 feet from the solar field perimeter fencing (Energy Commission 2010c). Assuming that birds' tolerance to light intensity is similar to human tolerance, this impact to birds could be significant. In addition, birds would be at risk of colliding with parabolic mirrors, though staff believes that risk of collision would be much less than for the proposed project due to shape and reduced accessibility of the mirror surfaces to birds (due to the presence of the HTF tube in front of the mirrors and the concavity of the mirrors themselves). Finally, the risk to birds of burning or other damage from concentrated solar energy would be much less than for the proposed project. In sum, the risk of Parabolic Trough Alternative to birds including golden eagle, other raptors, and other special-status species would be **much less for the Parabolic Trough Alternative than for the proposed Rio Mesa SEGF**. Habitat loss for birds and bats would be dependent on project footprint, but would be would be similar to habitat loss for other species (above) and **similar to the proposed Rio Mesa SEGF**.

## Cultural Resources

Construction and operation of the Parabolic Trough Alternative at the proposed project site would result in a similar extent of physical ground disturbance on the project site compared with the proposed Rio Mesa SEGF project. Additional analyses will be completed for publication in the final staff assessment (FSA) for the Rio Mesa SEGF including presenting information regarding impacts to archaeological, historical, and Native American resources of the Parabolic Trough Alternative and a comparison with the proposed project.

## Geology and Paleontology

Construction and operation of the Parabolic Trough Alternative at the proposed project site could have the same impacts as the proposed Rio Mesa SEGF project. The Parabolic Trough Alternative would require drilled shaft foundations that would be significantly larger in diameter than the proposed project and would be excavated to a similar depth. In addition, the Parabolic Trough Alternative requires grading of the site to create a relatively flat surface so the mirrors can track within certain tolerances. Excavation would also be required for the power block and appurtenant facilities. These excavations could result in significant disturbance of subsurface soils and result in significant impacts to paleontological resources. However, these construction techniques would result in monitoring of all construction activities and disturbed soils would be monitored by qualified paleontological resources monitors in accordance with conditions of certification. When properly implemented, the conditions of certification would yield a net gain to the science of paleontology since fossils that would not otherwise have been discovered can be collected, identified, studied, and properly curated. Even with the specified monitoring, some fossils would be lost and/or destroyed. The proposed Rio Mesa SEGF would use vibratory inserted heliostat pedestals. This construction method would destroy all fossils encountered without providing for discovery, identification, study or curation of fossils. Due to the much smaller volume of soil disturbed for the heliostat pedestals when compared to the parabolic trough alternative, staff considers the numbers of fossils destroyed by the heliostat insertion would be similar to the numbers of fossils lost during construction of the parabolic trough alternative but no scientific knowledge would be realized. Therefore, the potential impacts from the Parabolic Trough Alternative would be **less than with the installation method for the proposed Rio Mesa SEGF**.

## Hazardous Materials

Using parabolic trough technology at the Rio Mesa SEGF site would require the use of significant amounts of HTF which is a combustible material and would increase the potential for off-site impacts in the event of an accidental release. However, the remote location of the facility would render the potential for impact less than significant even if an accidental release were to occur at the facility. This alternative would also involve transportation of significant amounts of combustible HTF to the site and could thus result in increased risk to road users and populations living along the transportation route to the facility. This impact is **slightly greater than the Rio Mesa SEGF**.

## Land Use

The Parabolic Trough Alternative would remain within the proposed project footprint. Because the alternative would not change the location or footprint of the proposed project, land use impacts would be **similar as with the Rio Mesa SEGF**.

## Noise and Vibration

Similar to the power tower technology, in an alternative project using the parabolic trough technology, the power blocks will be the chief noise producers. This technology, with its power blocks located in the center of each trough field, would have **similar noise impacts** as those expected from Rio Mesa SEGF.

## Public Health

The Parabolic Trough Alternative would require the use of similar equipment and apparatus for project operations as the proposed project. For both technologies, emissions would occur from vehicles and equipment that would be used to clean the mirrors. However, this alternative could cause emissions of small amounts of VOCs from potential leaks of HTF from flanges or that could be lost during routine maintenance activities such as HTF pipeline repair or replacement. Combustion-related criteria pollutants and hazardous air pollutants (HAPs) emissions are also possible from process boilers. Such emissions would occur at low levels; therefore, this alternative technology would not pose a significant risk from the emissions of concern in the public health analysis. This impact would be **similar to Rio Mesa SEGF**. No significant impacts would occur, and no conditions of certification would be required.

## Socioeconomic Resources

If the Parabolic Trough Alternative was developed, potential impacts on law enforcement services, schools, and parks and recreation would be **similar to the proposed Rio Mesa SEGF**, which staff concludes is less than significant. The parabolic trough alternative would not induce substantial population growth in the area or displace substantial numbers of people and/or existing housing.

The socioeconomic benefits from construction employment and wages, purchase of materials and supplies, increased taxes and fees, and reduction in vacant housing would be **similar to Rio Mesa SEGF**. However, the number of workers required for construction and operation of a solar power parabolic trough project would be somewhat different than the proposed Rio Mesa SEGF. For example, the originally proposed 500 MW Palen Solar Power project (Riverside County) would have required 566 daily construction workers and 134 workers for project operation. The applicable numbers for the Rio Mesa SEGF are 840 workers on average, 2,200 peak, during construction and 100 workers for operation. The construction of the Palen project would last for 39 months as compared to 35 months for the Rio Mesa SEGF. Because the construction workforce is smaller, the employment opportunities for a solar thermal trough project would be less, but the construction period would be four months longer. Slightly more workers would be needed during operations. The construction and operation of the parabolic trough project would be a beneficial impact to the local economy **similar to that of the Rio Mesa SEGF**.

## Traffic and Transportation

Fewer construction workers may be required for parabolic trough facilities. Staff examined the number of daily peak construction workers projected for four different parabolic trough projects: Blythe Solar Power Project (1000 MW), Palen Solar Power Project (500 MW), Abengoa Mojave Solar Project (250 MW), and Beacon Solar Energy Project (250 MW) (BS 2008, MS 2009, SM 2009a, SM 2009b). For these projects, staff calculated an average of 2.069 peak construction workers per megawatt. The Rio Mesa SEGF project would generate approximately 4.4 peak construction workers per megawatt. This means that a parabolic trough project with the same generating capacity as the Rio Mesa SEGF would likely generate approximately half as many construction workers as the Rio Mesa SEGF.

Because fewer workers generate fewer construction-related trips, the Parabolic Trough Alternative may result in less damage to roads and bridges near the project site. As with the Rio Mesa SEGF construction, heavy haul trucks, which are the most damaging to roads and bridges, would be used to construct the Parabolic Trough Alternative, resulting in potential damage to roads and bridges. Overall, this alternative would likely result in **slightly less damage to roads and bridges than the Rio Mesa SEGF**.

As discussed above, the Parabolic Trough Alternative would likely generate approximately half as much construction traffic as the Rio Mesa SEGF; therefore, impacts to level of service would be **much less than those from the Rio Mesa SEGF**.

The number of operations employees would likely be more than those needed for the Rio Mesa SEGF. The Rio Mesa SEGF would be staffed daily by approximately 100 workers. For comparison, staff examined the daily operations staff projected for the four different parabolic trough projects discussed earlier: Blythe Solar Power Project (221 daily workers), Palen Solar Power Project (134 daily workers), Abengoa Mojave Solar Project (208 daily workers), and Beacon Solar Energy Project (66 daily workers) (BS 2008, MS 2009, SM 2009a, SM 2009b). Staff calculated that these four projects averaged approximately 0.3145 daily operations workers per megawatt. In comparison, the Rio Mesa SEGF would employ 0.16 daily operations workers per megawatt. This means that a parabolic trough project with the same generating capacity as the Rio Mesa SEGF would likely employ approximately twice as many operations workers. In sum for traffic and transportation, impacts from this alternative would be **slightly greater than those generated by the Rio Mesa SEGF**.

### *Glint and Glare*

Parabolic trough technology uses parabolic mirrors which refocus solar radiation onto a receiver tube located at the focal point of the parabola. In comparison with reflections from the Rio Mesa SEGF's nearly planar heliostat mirrors, the parabolic mirror reflections are much more diffuse and produce a greatly reduced glare effect as a function of viewing range. Glint and glare impacts from the Parabolic Trough Alternative would be **much less than impacts from the Rio Mesa SEGF**. The receiver tubes themselves do not glow when heated but reflections off of and within the glass envelope make the tube appear to glow when tracking the sun. This can be a source of glare, but the receiver tubes are spatially distributed across the entire mirror field, as each individual receiver tube is associated with an individual parabolic mirror. This is unlike the Rio Mesa SEGF solar receiver in which the glare source is concentrated into a single location from all of the active heliostat mirrors. Therefore, glare impacts from the

Parabolic Trough Alternative would be **much less than impacts from the Rio Mesa SEGF**.

## Transmission Line Safety and Nuisance

Under the Parabolic Trough Alternative, the utilized transmission lines and related impacts would be of the same magnitude as those discussed for the proposed Rio Mesa SEGF project in this staff assessment. This means that the magnitude of these transmission line-related impacts would be similarly less than significant. This impact would be **similar to Rio Mesa SEGF**.

## Visual Resources

Parabolic trough systems use large curved (parabolic) reflectors (focusing mirrors) that have oil-filled pipes running along their focal point. The mirrored reflectors track the sun on a single axis and focus sunlight on the tubes to heat the oil inside to as much as 750°F. The hot oil is sent to a heat exchanger to heat water into high temperature steam for running conventional steam turbines and generators, as with a traditional power plant. Trough systems thus require traditional power plant facilities, including visually prominent industrial features such as tall steam generators and cooling condensers, maintenance buildings, evaporation ponds, etc., with corresponding strong visual effects within foreground or greater distances.

Like the Solar PV Alternative discussed above, the mirror fields of parabolic trough projects are of low vertical profile, thus limiting visual effects of the mirrors when seen from viewpoints at a similar elevation to the field itself. At a distance, the mirrors would appear as a thin horizontal line paralleling the level site terrain, and would thus be relatively inconspicuous. When viewed from higher elevation positions, the mirror fields become more prominent, creating large areas of contrasting form, texture and color. Under typical lighting conditions, the mirror fields may appear similar to a lake surface due to diffuse reflection of the sky off the mirror surfaces. The overall impact of solar trough mirror fields from higher elevation viewpoints is thus dependent on viewing distance, light conditions and viewing angle, and level of viewer sensitivity.

In addition, the tall generation facilities would appear highly prominent and strongly contrasting at foreground distance, introducing a moderate to strongly contrasting industrial character within a radius of a mile or more.

Based on past project applications, land requirements for utility-scale parabolic trough power plants have been observed to be in the range of about six acres per megawatt. However, site design to accommodate the Parabolic Trough Alternative would probably require additional overall acreage due to the requirement for slopes less than 2 to 3 percent. Assuming a project site with the same net megawatt output as the proposed project, a parabolic trough alternative would require roughly the same amount of land or slightly greater, thus the extent of visual effects from the mirror fields would remain similar to the proposed project.

Staff has found that solar trough projects have the potential to generate transient, temporarily intrusive glare effects under certain conditions. For example, when mirrors are rotated from stow position to tracking position in the morning, and the reverse in the evening, they produce a bright, linear reflected solar image that may be visible to off-site observers, causing nuisance and discomfort glare (Energy Commission 2010e). However, such effects can generally be mitigated with appropriately placed opaque fencing at the site boundary. The Solar Trough Alternative would thus have somewhat greater impacts than the PV Alternative due to the more prominent generation facilities, greater mirror-field contrast from high elevation viewpoints, and potential for occasional, transient high-intensity glare effects. However, the overall difference between the Solar Trough and PV Alternatives would be moderate, and the significance of impacts at all KOPs would be similar.

In comparison to the proposed project, the Solar Trough Alternative would not employ solar receivers and thus not generate the continuous, far-ranging, high-intensity glare characterizing the proposed project. The Solar Trough Alternative would have moderate or low levels of contrast beyond foreground distance and would thus have less-than-significant impacts from all KOPs except for Bradshaw Trail and vicinity. The Solar Trough Alternative would thus have **much less impact than the proposed project**.

## Waste Management

The location of the Parabolic Trough Alternative would be the same as the proposed project and no closer to any unidentified RECs. Similar to the proposed project, staff would require investigation and remediation of soil and groundwater contamination if it was encountered during construction and operation of this alternative. Site characterization and remediation requirements would remain the same as for the proposed project.

The Parabolic Trough Alternative would produce less waste than the proposed Rio Mesa SEGF project based on a comparison with waste estimates provided for two parabolic trough projects that were licensed by the Energy Commission in 2010 (Genesis and Beacon Solar Energy Projects). Although the waste volume would decrease somewhat, there is adequate available Class III landfill capacity in Riverside County landfills for either the Rio Mesa SEGF or the Parabolic Trough Alternative so the **impacts would be similar**. Also, similar to the proposed project, staff considers project compliance with LORS and staff's conditions of certification to be sufficient to ensure that no significant impacts would occur as a result of waste management associated with the Parabolic Trough Alternative. This impact would be **similar to Rio Mesa SEGF**.

## Soil and Surface Water

Parabolic trough systems use large curved (parabolic) reflectors (focusing mirrors) that have oil-filled tubes running along their focal point. The heated oil is used to convert water to steam to generate electricity (REAT, 2010). Parabolic trough technology requires more grading than the proposed technology and, therefore, would result in additional soil erosion and require additional water during construction. Furthermore the use of oil as the HTF adds the potential for accidental oil spills that would have negative impact in terms of water quality as this oil would potentially contaminate soil and water resources, which would take additional measures to mitigate. The potential impacts would be **slightly greater using parabolic trough technology** versus direct conversion of water to steam.

### Water Supply

Both the parabolic trough technology and SPT technology use water for mirror washing. In addition, depending on what type of cooling system the parabolic trough is permitted to use, there could be a significant difference in water use. Use of wet cooling can consume 20 times more water than use of air or dry-cooled technology. Most of the recent parabolic trough power plant cases licensed by the Energy Commission would be dry-cooled. Staff anticipates that a parabolic trough alternative would be dry-cooled similar to the SPT technology and, therefore, there would be similar water use. Domestic water demand and sanitary waste would also be similar between the two technologies, because the number of plant personnel needed to operate both types of plants would be about the same. The potential impacts would be **similar using parabolic trough technology**.

## PROJECT ALTERNATIVES COMPARED TO THE PROPOSED PROJECT

The environmental effects of constructing and operating the proposed project are described in detail for each resource topic in the “Environmental Assessment” section of this staff assessment. The summary table shown in Alternatives Appendix-2 compares the environmental impacts of the proposed project to those that would be expected to occur with construction and operation of each of the project alternatives, including the no project alternative. Alternatives Appendix-2 is included at the end of this Alternatives section of the staff assessment.

## ENGINEERING ASSESSMENT OF THE ALTERNATIVES

## POWER PLANT EFFICIENCY AND RELIABILITY

This section evaluates the efficacy of each project alternative in providing an efficient and reliable source of power generation and compares the project alternatives using alternative technologies to the proposed project. The proposed Rio Mesa SEGF project would use an SPT, which is one of a variety of solar thermal power systems called concentrating solar power (CSP). Solar technologies in California include CSP and PV technologies. The SPT with Energy Storage Alternative and the Parabolic Trough Alternative in this analysis of project alternatives are CSP technologies.

### <u>Sonoran West Off-site Alternative</u>

This off-site alternative is located approximately 3.5 miles northwest of the Rio Mesa SEGF site and has a similar topography as the Rio Mesa SEGF site. The available *solar* *insolation*[4] is essentially the same for the two sites. Therefore, the performance of the SPT's thermal power cycle at the Sonoran West Off-site Alternative site would not change to any measureable degree. The power cycle efficiency, power plant reliability, and the solar array area displacement (i.e., the land area requirement for each of the two solar arrays) would not change.

## SPT with Energy Storage Alternative

Enhancement of the power tower technology with several hours of thermal energy storage (TES) using molten salt would provide more flexibility for incorporating the facility into the power grid by extending the application of generated energy beyond the hours of available sunlight. However, incorporating TES into the design of the project would use some of the heliostats for storage. There would be a slight reduction in land-use efficiency (acres per kilowatt) due to the additional space that would have to be set aside for the storage facility. The reduced land-use efficiency would be offset by the actual energy produced by an SPT project with storage. For example, a 200 MW solar thermal power plant without energy storage would be expected to generate 573 gigawatt hours (GWh) and a 200 MW plant with energy storage would be expected to generate 733 GWh (CPUC 2012a). Using this data, a 250 MW solar thermal plant without energy storage would be expected to generate about 716 GWh, less than would be expected from a 250 MW solar thermal plant that used 18 percent of the heliostats for storage (207 MW) which would produce about 750 GWhs.

## Reduced Acreage SPT with or without Energy Storage

This alternative is located at the Rio Mesa SEGF site so the performance of the SPT's thermal power cycle would not change to any measureable degree although with storage the MW would be less because some of the heliostats would be dedicated to storage. The power cycle efficiency, power plant reliability, and the solar array area displacement (i.e., the land area requirement for the solar array) would not change.

## Solar PV Alternative

PV cells convert solar radiation directly into electrical current. Photons of light excite electrons to a higher energy state, providing the potential to induce current. Direct current (DC) from the PV cells pass through an inverter, which converts DC to alternating current suitable for transmission to the electrical power grid.

Using average annual daily radiation as a benchmark, **Alternatives Table 7** shows the effectiveness of different types of solar collectors for the alternative renewable technologies evaluated in this staff assessment. The table lists the total daily values for the weather station nearest the project site, represented by monthly and average annual conditions and sorted by collector type. Data are shown for a double-axis flat-plate

[4] Sunlight intensity at a site or area is measured in units of solar insolation, which is often expressed as kilowatt hours per square meter per day (kWh/m2-day).

collector typical of a power tower heliostat; the daily insolation value is 9.4 kWh/$m^2$-day (Category 1.3). From **Alternatives Table 7**, the incident radiation for a flat-plate fixed-tilt PV panel is 6.6 kWh/$m^2$-day (Category 1.1) and 9.1 for a single-axis flat-plate collector typical of a tracking PV system (Category 1.2). Using comparative ratios, the flat-plate double-axis collectors associated with the SPT project perform 42 percent better than the fixed-tilt PV panels [(9.4-6.6)/6.6 = 0.42]. The performance factor between the single-axis tracking PV panels and the representative SPT heliostats is 3 percent [(9.4-9.1)/9.1 = 0.03]. To conclude, the SPT project heliostats function 42 percent better than the fixed-tilt PV panels, but the performance differential between the SPT heliostats and the single-axis tracking PV panels is insignificant[5].

**Alternatives Table 7**
**Average Daily Solar Radiation at Daggett, California**
**(kilowatt hours per square meter [kWh/$m^2$])**

| Tilt | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Category 1.1: Flat-Plate Collectors with Fixed-Tilt PV Modules** | | | | | | | | | | | | | |
| 34.9° | 5.3 | 6.0 | 6.8 | 7.4 | 7.4 | 7.4 | 7.2 | 7.3 | 7.3 | 6.8 | 5.2 | 6.6 | 6.6 |
| **Category 1.2: Flat-Plate Collectors with Single-Axis Tracking, North-South Axis, Tracking PV Modules** | | | | | | | | | | | | | |
| 34.9° | 6.5 | 7.5 | 9.0 | 10.3 | 10.9 | 11.2 | 10.7 | 10.6 | 10.1 | 8.8 | 7.2 | 6.3 | 9.1 |
| **Category 1.3: Flat-Plate Collectors with Double-Axis Tracking, SPT Heliostats** | | | | | | | | | | | | | |
| 34.9° | 6.9 | 7.7 | 9.0 | 10.4 | 11.3 | 12.0 | 11.4 | 10.8 | 10.1 | 9.0 | 7.5 | 6.8 | 9.4 |
| **Category 1.4: Single-Axis Direct Beam Concentrating Collectors, Parabolic Trough** | | | | | | | | | | | | | |
| 34.9° | 5.1 | 5.8 | 6.9 | 8.0 | 8.4 | 8.9 | 8.4 | 8.4 | 8.2 | 7.2 | 5.7 | 5.0 | 7.2 |

Source: Weather Bureau Army Navy (WBAN), excerpts from WBAN No. 23161 for Daggett, California, which is the closest measuring station to the proposed Rio Mesa SEGF site

## Parabolic Trough Alternative

A parabolic trough system is a CSP technology where heat transfer fluid (HTF) is pumped through a tube suspended at the focal point of a curve-shaped collector. This tube absorbs the radiation energy, heating the HTF to a temperature high enough to make steam. In turn, the steam drives a turbine and generates electricity. This system gets its name from the shape of the collector where the cross section is curved and its length is straight, giving it its characteristic trough shape.

As shown in **Alternatives Table 7**, the value for incident radiation for parabolic trough collectors is 7.2 (Category 1.4). Using the values in the table as a basis for comparison,

[5] Since 3 percent is less than the plus or minus 9 percent uncertainty in the historical measurements, the collection effectiveness of the Rio Mesa SEGF heliostats and a project using single-axis tracking flat plate PV collectors is similar.

the SPT technology uses land more effectively and collects solar energy 30 percent more efficiently than the parabolic trough technology [(9.4-7.2)/7.2 = 0.30].

Note that the comparison of ideal collector performance (see **Alternatives Table 7**) is a very simple measurement using side-by-side comparisons of the different solar technologies. Various site limitations could affect the ability of a project site (e.g., the Rio Mesa SEGF site) to be developed with an alternative renewable technology. The topography of an area could limit the development potential of a site and/or ground slope needed to receive maximum solar energy by the collectors. Requirements for the geometric orientation of a collector array could dictate the configuration of a project site. Variations in available solar insolation could affect actual system performance in a particular area.

## Conclusion

The comparison of ideal collector performance shown in **Alternatives Table 7** is a simple measurement using side-by-side comparisons of the alternative solar technologies. Various site limitations would affect actual system performance.

The SPT system proposed for Rio Mesa SEGF compares equally with the conditions where the facility is relocated or enhanced using TES. Although TES increases operational flexibility, it does not influence the performance of the heliostats for an SPT project with or without energy storage capabilities. The representative SPT project compares favorably to parabolic trough because of the tracking limitations of trough collectors. Lastly, the SPT heliostats perform better than the fixed-tilt PV system, and equally as well as the tracking PV system. Other PV performance limitations, including its “on-off” intermittency when utilized on the electric power grid, make SPT a more attractive technology from a project efficiency and reliability perspective.

# TRANSMISSION SYSTEM ENGINEERING

## Sonoran West Off-site Alternative

The Sonoran West Site is located adjacent to the Colorado River Substation.  In this case, the required generator tie-line would be shorter than the Rio Mesa SEGF site. However, the downstream transmission system impact would be similar to the impact at as the Rio Mesa SEGF site.

## Technology Alternatives

All of the proposed site and technology alternatives would not have more significant impacts than the proposed Rio Mesa SEGF.  The other alternatives, even different technologies, would generate at the same or less amount of power output and would interconnect to the same Colorado River Substation.  Power would be distributed to the same transmission system.  Therefore, the downstream transmission system impacts would be the similar to the impacts of the proposed Rio Mesa SEGF.

## Conclusion

At this time, the Phase II Study is not available for staff to review. Without the Phase II Interconnection Study, staff cannot determine the downstream transmission system impacts caused by the Rio Mesa SEGF. The downstream transmission impacts will be identified by the Independent System Operator (California ISO) in their Queue Cluster 3/Queue Cluster 4 Phase II Interconnection Study (Phase II Study). Nevertheless, the impact would be similar because it would involve the same substation.

# ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The State CEQA Guidelines call for identification of an environmentally superior alternative and specify that “[i]f the environmentally superior alternative is the ‘no project’ alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives” (Cal. Code Regs., tit. 14, § 15126.6[e][2]).

From the perspective of purely minimizing effects on the existing environment, the no project alternative would be the superior alternative because it would result in no changes in the existing condition. However, the no project alternative would not meet the key project objective of constructing and operating a renewable electrical generation facility capable of helping meet California’s RPS requirements.

As discussed above, the extension of existing conditions at the proposed Rio Mesa SEGF site could result in varying degrees of changes to resource conditions for biological resources, cultural resources, soil and surface water, and water supply. Because no construction is proposed under the no project alternative, no further analysis of these predicted changes to resource conditions is required.

Based on the alternatives analysis, the environmentally superior alternative is the no project alternative. Among the action alternatives (excluding the no project alternative), the Solar Photovoltaic Alternative is preferred for biological resources and visual resources. For paleontological resources, the Sonoran West Off-Site Alternative would be preferred. At this time, the Sonoran West Off-Site Alternative appears to be preferred to the proposed site for cultural resources; however, additional analysis will be completed for publication in the FSA that may provide additional information regarding the cultural resources comparison between the two sites. Given the information available at this time, the environmentally superior alternative appears to be the Solar Photovoltaic Alternative.

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# APPENDIX ALTERNATIVES-1: OTHER RENEWABLE ENERGY TECHNOLOGIES

## INTRODUCTION

This appendix briefly discusses several renewable energy technologies that are not evaluated in the Alternatives section because they would not be feasible at the proposed project site.[6] These technologies are included in this appendix for informational purposes.

California uses five primary renewable resource types represented by existing facilities (Energy Commission 2011a):

- Solar – including solar thermal and solar photovoltaic (PV)
- Wind
- Geothermal
- Biomass – fuel derived from organic sources (not fossil fuels), including solid biomass, digester gas, landfill gas, and biodiesel
- Small hydroelectric (30 megawatts [MW] or less)

Additionally, a description of solid oxide fuel cells is included because fuel cell technology is being deployed throughout California.

## RENEWABLE SOLAR TECHNOLOGIES

In 2010, solar generation provided 3 percent of in-state renewable generation (0.4 percent of total in-state energy generation) (Energy Commission 2010), although this percentage has increased since this time. Renewable solar technologies in California fall into two general categories—concentrating solar power (CSP) and photovoltaic (PV). CSP technologies are those that concentrate the sun's energy to produce heat. The heat drives either a steam turbine or an external heat engine to produce electricity. The Rio Mesa Solar Energy Generating Facility (SEGF) solar power tower and solar trough technology are CSP technologies currently in use in California. The **ALTERNATIVES** section of this staff assessment for the proposed Rio Mesa SEGF

[6] Section 15126.6(f) of the California Environmental Quality Act (CEQA) Guidelines discusses how the "rule of reason" governs the selection of the range of alternatives for examination in an environmental impact report (EIR), stating that "[a]n EIR need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative" (Cal Code Regs., tit. 14, § 15126.6[f][3]). CEQA does not require an EIR to "consider every conceivable alternative to a project. Rather it must consider a reasonable range of potentially feasible alternatives that will foster informed decision making…" (Cal Code Regs., tit. 14, § 15126.6[a]). These regulations also apply to the document used as a substitute for an EIR in a certified program (Cal. Code Regs., tit. 14, §§ 15251 and 15252).

project includes an analysis of a parabolic trough alternative; therefore, the technology is not described in this appendix.

In PV technologies, the photons in sunlight are converted directly to electricity. Distributed energy resources include various fuels and technologies; the **ALTERNATIVES** section of this staff assessment includes a discussion and analysis of the utility-scale and distributed generation PV.

## CONCENTRATED PHOTOVOLTAIC TECHNOLOGY

### Overview

Concentrated photovoltaic (CPV) systems have an optical component, which *concentrates* significant amounts of sunlight onto *multi-junction* solar cells (EnergyTrend 2011). These special cells have higher energy conversion efficiency, potentially greater than 40 percent, but are typically more expensive than high-efficiency silicon solar cells. The system's optical unit functions like a telescope, concentrating sunlight on solar modules mounted on a tracking system that automatically tracks the position of the sun from sunrise to sunset. Concentration allows for a decreased cell area for these special cells relative to conventional photovoltaic cells. CPV has the ability to ramp to gigawatts of production very rapidly (CPV Consortium 2012). While CPV systems have a much higher efficiency than traditional silicon-based PV, this is offset by their ability to only use direct sunlight because of their concentrating component. Clouds and overcast conditions create diffused light that essentially cannot be concentrated.

Energy Commission staff researched the availability of CPV projects in the United States (U.S.) through the Solar Energy Industries Association (SEIA), a national trade organization of the U.S. solar energy industry, and the availability of CPV projects internationally through the various companies that manufacture and develop this technology. CPV technology front-runners are Amonix, Inc. (Amonix 7700 CPV Solar Power Generator); Soitec (Concentrix™); and SolFocus, Inc. (SF-1136SX Concentrator Photovoltaic System). Other manufacturers of CPV technology include SunPower Corporation (SunPower® C7 Tracker); Entech Solar, Inc. (SolarVolt™); and GreenVolts, Inc., a previous recipient of a grant from the Energy Commission’s Public Interest Energy Research Program.

GreenVolts’ CPV system has a total installed capacity of 0.5 MW at six locations in California and Arizona. Several sites are also in development with capacities ranging from 200 kilowatts (kW) to 1.0 MW; Pacific Gas & Electric Company (PG&E) has a 2.5-MW power plant near Tracy, California, representing the first power purchase agreement to be signed by PG&E using this technology (Energy Commission 2011b). CPV projects in California, Arizona, Colorado, and New Mexico, both operational and under development, range from 1.0 MW, 5.0 MW, 30 MW and peaking at 50 MWs.

Imperial Solar Energy Center West in Imperial County has been approved for development with a capacity of up to 150 MW (Tenaska Solar Ventures 2012). This project has been approved with the flexibility of using either CPV or PV technology.

Companies with international development of CPV projects are SolFocus and Amonix. SolFocus has developed two pilot projects in Chile (8.8 kW each), a pilot project in South Africa (8.4 kW), two projects in Spain (200 kW, 300 kW), one project in Italy (8.4 kW), a pilot project in Malta (8.4 kW), a combined 1.28 MW for multiple customers in Greece, one project in Saudi Arabia (132 kW), one project in Malaysia (8.4 kW), and one project in Australia (235 kW) (SolFocus 2012). SolFocus announced on March 29, 2012, its plans to launch a 450-MW CPV plant in Baja California, Mexico, with construction proceeding in 50-MW sections. Construction is anticipated to begin in late 2012 and be operational by the end of 2013. Amonix has developed two projects in Spain (950 kW and 7.8 MW), both of which are operational (Amonix 2012).

With the exception of Tenaska Solar Venture’s Imperial Solar Energy Center West, and the 450-MW plant in Mexico, each of these technology front-runners has small-scale CPV facilities but nothing at the utility scale (20 MW or greater). Scaling technology to the utility-scale level involves the ability of the technology to function and generate energy at a larger scale, but it also includes cost considerations. Developing CPV technology at the utility scale internationally may have different cost considerations from development in the U.S.

## Decision to Eliminate the Technology from the Alternatives Analysis

Staff’s decision to eliminate the technology from the alternatives analysis is based on the state of the technology. Staff’s research indicates that CPV technology is not yet proven at the utility scale. CPV has been proven at the small scale and projected technology development shows potential to make it a utility-scale solar technology. While CPV systems show promise, they have rarely been implemented at a larger scale (20 MW or greater). Scaling up to utility scale presents different technical challenges and cost issues.

# NON-SOLAR RENEWABLE POWER GENERATION

# WIND ENERGY

## Overview

Wind turbines, like windmills, are mounted on a tower to capture the most energy from the resource (NREL 2012a). Turbines catch the wind's energy with their propeller-like blades; usually two or three blades are mounted on a shaft to form a rotor. The wind’s force against the blade causes the rotor to spin like a propeller, and the turning shaft spins a generator to make electricity. Wind turbines can be used as stand-alone applications (e.g., for water pumping or communications). Wind turbines can be combined with a PV system. For utility-scale applications, large numbers of wind turbines are built in various configurations in the same general area to form a wind power plant. Small wind systems have potential as distributed energy resources. Utility-scale turbines range from 50 kW to  over 5 MW; the average wind turbine in the U.S. is rated at 1.5 MW (AWEA, 2012).

The U.S. Bureau of Land Management (BLM) maintains a website with information on wind energy development. Wind energy resources are categorized by wind-power density classes that range from class 1 (the lowest) to class 7 (the highest). Good wind resources are class 3 and above and have average annual wind speeds of at least 13 miles per hour (BLM 2012). Wind speed is a critical feature of wind resources.

In 2010, wind resources provided 21 percent of the state's in-state renewable generation (5 percent of total in-state energy generation, though this percentage has grown since 2010) (Energy Commission 2010, 2011a). Although wind is considered a mature technology, it continues to face challenges due to intermittency of the resource, lack of transmission access in remote areas, and environmental issues (Energy Commission 2011a). The majority of onshore wind development is concentrated in four regions of the state: Altamont Pass (east of San Francisco), Tehachapi (southeast of Bakersfield), Solano-Montezuma Hills (Solano County), and San Gorgonio (near Palm Springs, east of Los Angeles). Kern, San Joaquin, and Riverside counties also have large amounts of wind capacity, about 800 MW, 600 MW, and 500 MW, respectively (Energy Commission 2011a).

### Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations at the Rio Mesa SEGF site. Based on staff's research, wind technology is limited to areas with wind resources where the wind-power density is class 3 and above (average annual wind speeds of at least 13 miles per hour). According to the NREL California 50 Meter Wind Resource Map[7], there are a scattering of small areas with superb (class 7) wind resource in Riverside County. Many of these areas occur on ridge tops in wilderness or other protected designations or have already been built out (San Gorgonio Pass). Most other areas have marginal (class 2) to fair (class 3) wind resources. When protected areas are not considered, the proposed Rio Mesa SEGF site is in an extensive area with poor (class 1) wind resources, making it an unsuitable location for a wind energy project.

## GEOTHERMAL ENERGY

### Overview

Geothermal energy is heat from inside the earth. Geothermal power plants use steam produced from reservoirs of hot water found a few miles or more below the earth's surface to produce electricity (NREL 2012b). The steam rotates a turbine that activates a generator, which produces electricity. There are three types of geothermal power plants: dry steam, flash steam, and binary cycle. Geothermal is a mature industry, and geothermal power plants provide steady and predictable baseload power (National Geothermal Collaborative 2004).

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[7] Wind speed estimates at 50 meters (m) above the ground. The map depicts the resource that could be used for community-scale wind development using wind turbines at 50–60-m hub heights.

Geothermal energy is limited to areas with reservoirs of steam or hot water, known as hydrothermal resources, which are often associated with volcanic and seismically active regions. California has 25 known geothermal resource areas, including 14 resource areas with temperatures of 300 degrees Fahrenheit or greater. Forty-eight of the fifty-eight California counties have lower temperature resources for direct-use geothermal. The counties with high amounts of geothermal capacity include Sonoma County with 1,601 MW of capacity (more than 60 percent of all geothermal capacity installed in California), Imperial County with 650 MW, and Inyo County with 302 MW (Energy Commission 2011a). Geothermal plants provide 42 percent of in-state renewable generation (6.2 percent of total in-state energy generation) (Energy Commission 2010, 2011a). The counties with the greatest geothermal resource potential include Sonoma and Imperial.

Because hot water and steam cannot be transported long distances economically, use of geothermal resources is restricted to locations where they are found and initially available (National Geothermal Collaborative 2004). Geothermal steam resources can be depleted over time, leading to a reduction in electricity generation (Energy Commission 2011a). Geothermal exploration is time-consuming because of the difficulty in establishing what, exactly, is in the subsurface.

In Santa Rosa, California, treated wastewater from this and other nearby communities is being pumped to The Geysers (a large complex of geothermal power plants in Sonoma and Lake counties) to recharge the aquifer. Evidence suggests that the injection of treated wastewater is preserving the geothermal resource and having an added benefit of disposing of treated wastewater.

### Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations at the Rio Mesa SEGF site. Geothermal technology is limited to areas with geothermal resources. Although there are several geothermal springs, mostly in western Riverside County, there is only one state geothermal field in the County in the area surrounding Desert Hot Springs. There are no designated Known Geothermal Resource Areas in Riverside County. The proposed Rio Mesa SEGF site is not a feasible location for a geothermal project.

## BIOMASS ENERGY

### Overview

Biomass energy or *bioenergy* is the energy from plants and plant-derived materials. Wood is currently the largest biomass energy resource. Other biomass energy resources include food crops, grassy and woody plants, residues from agriculture or forestry, oil-rich algae, and the organic component of municipal and industrial wastes (NREL 2012c). Even the fumes from landfills (methane) can be used as a biomass energy source. The main biomass feedstocks for power are paper mill residue, lumber mill scrap, and municipal waste. The most common feedstocks used today are corn grain (to make ethanol) and soybeans (to make biodiesel) (NREL 2012c). Biopower is the use of biomass to produce energy and technologies include direct-firing, cofiring, gasification, pyrolysis, and anaerobic digestion.

While biomass facilities can be located throughout California, due to the availability of fuel from forest and agricultural waste, most biomass development occurs in the northern part of the state (Energy Commission 2011a). The counties with the greatest biomass potential from all sources of feedstocks (forestry, agricultural and municipal waste) include Siskiyou, Humboldt, Shasta, Mendocino, Fresno, Tulare, Kern, San Bernardino, Los Angeles, Riverside and San Diego (Energy Commission 2011a). Biomass generation provides nearly 20 percent of in-state renewable generation (2.8 percent of total in-state energy generation) (Energy Commission 2010, 2011a). Additional potential may be limited due to cost, air quality issues, and regulatory barriers.

## Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations at the Rio Mesa SEGF site. Biomass technology is limited to areas with access to biomass feedstock. Riverside County has a moderate to high level of biomass feedstock in total (http://www.nrel.gov/gis/images/map_biomass_total_us.jpg), in part due to the large size of the county. When considered per unit area, Riverside County's biomass resource level is very low and centered around methane emissions associated with activities in the western part of the County or in farm and forest lands east of the project surrounding Blythe (http://www.nrel.gov/gis/images/map_biomass_km2.jpg; http://www.nrel.gov/gis/biomass.html). The proposed Rio Mesa SEGF site is not a feasible location for a biomass project.

# SMALL HYDROELECTRIC

## Overview

Hydropower is derived from the kinetic energy of flowing water as it moves downstream. Turbines and generators convert the energy into electricity, which is then fed into the electrical grid (U.S. Department of Energy 2011a). Small hydroelectric power is defined as systems with a capacity of 30 MW or less (Energy Commission 2011a). Less than 10 percent of the hydropower units in the state are 30 MW or smaller. Units located in natural waterways may be operated as run-of-the river where the amount of energy produced at any one time is determined by the current flow in the river. The amount of energy generated from small hydroelectric systems depends largely on the amount of snow and rainfall received, and the amount of hydroelectricity produced varies significantly from year to year (Energy Commission 2011a). Hydropower is considered to be a mature technology, and hydro projects with storage capability have some of the best operating characteristics of any renewable technology.

The three types of hydroelectric facilities are impoundment, diversion, and pumped storage. Some hydropower plants use dams and some do not. Pumped storage systems do not depend solely on runoff and are typically used to provide power during peak demand periods on very short notice. Some power plants are located on rivers, streams, and canals, but for a reliable water supply, dams are needed (U.S. Bureau of Reclamation 2005). Hydropower is available in 52 of the 58 state counties, but the counties with the highest potential energy are in the mountain ranges north and east of the Central Valley. Small hydroelectric power represents 15 percent of in-state renewable generation (2.2 percent of total in-state energy generation) (Energy Commission 2010, 2011a). The counties with the greatest small hydroelectric potential include Siskiyou, Shasta, Plumas, Butte, Sierra, Amador, Calaveras, Stanislaus, Tuolumne, Madera, and Fresno (Energy Commission 2011a).

While there are a variety of equipment options and plant configurations that can accommodate nearly every site condition, the remote location of hydroelectric resources adds challenges to resource development due to the interconnection requirements and suitable market and permitting requirements (Energy Commission 2011a).

### Decision to Eliminate the Technology from the Alternatives Analysis

This technology has practical limitations at the Rio Mesa SEGF site. Small hydroelectric technology is limited to areas where water is in motion. A sufficient quantity of falling water is needed for electricity generation, so hilly or mountainous areas with perennial flowing water are the best sites for hydroelectric resources. The proposed Rio Mesa SEGF site is not a feasible location for a small hydroelectric project.

## OTHER RENEWABLE POWER GENERATION

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## SOLID OXIDE FUEL CELLS

### Overview

A solid oxide fuel cell (SOFC) is an electrochemical conversion device that produces electricity directly from oxidizing a fuel. Fuel cells are characterized by their *electrolyte* material[8]; the SOFC has a solid oxide or ceramic electrolyte. Because of the all-ceramic make-up, the cells can operate at temperatures as high as 1,800 degrees F (1,000 degrees C), significantly hotter than any other major category of fuel cell. Advantages of the SOFC include high efficiency, reliability, and durability. The largest disadvantage is the high operating temperature, which results in longer start-up times and mechanical and chemical compatibility issues (U.S. Department of Energy 2011b). The SOFC cells can be configured either as rolled tubes (tubular) or as flat plates (planar) and manufactured using many of the techniques now employed today by the electronics industry. The fuel-to-electricity efficiencies of solid oxide fuel cells are expected to be around 50 percent. In applications designed to capture and utilize the system's waste heat, overall fuel use efficiencies could top 80-85 percent (U.S. Department of Energy 2011b). Examples of solid oxide fuel cells are provided below.

[8] In basic terms, an electrolyte is a solution or molten substance that conducts electricity.

Bloom Energy is a company headquartered in Sunnyvale, California that uses SOFC technology to generate electricity through an electro-chemical process (Bloom Energy 2012). Bloom Energy's fuel cells can operate on natural gas or renewable fuels (e.g., biogas[9]). Each fuel cell can produce about 25 watts of power, and each energy server consists of thousands of fuel cells enabling each energy server to provide 200 kW of power. . Bloom Energy is installing Bloom's Energy Server™ technology systems that are between 400 kW to 6.0 MW (Bloom Energy 2012). Almost all of Bloom Energy's installations in California are on the customer side of the meter. The technology is not limited to applications that generate several hundred kW to serve on-site load. There are grid benefits to locating the systems in areas with transmission and/or distribution line congestion (i.e., developed areas close to load centers), including mitigating voltage variances and increasing grid stability, but this is not a limiting factor, and fuel cell farms are also an option for centralized power production.

A new, small-scale SOFC system developed at the U.S. Department of Energy's (DOE) Pacific Northwest National Laboratory (PNNL) could be used for household and neighborhood power generation (U.S. Department of Energy 2012). A paper published in the Journal of Power Sources (Powell et al. 2012) describes the work performed by the DOE PNNL team and how SOFCs are being developed for a variety of applications because of their high efficiency over a wide range of power levels. Applications for SOFCs include 1.0–2.0 kW residential combined heat and power applications, 100–250 kW systems for distributed generation and grid extension, and megawatt-scale power plants using coal. The system developed by the DOE PNNL team is a small-scale SOFC power system that operates on methane, which is the primary component of natural gas. The paper describes the team's demonstration of a highly efficient small-scale (approximately 2.0 kW) SOFC system that can be readily scaled for a 100–250 kW natural gas-fueled distributed generation application (Powell et al. 2012).

Versa Power Systems is also developing SOFC technology, but it is in the demonstration phase of development and uses hydrogen combined with oxygen to produce electricity (Versa Power Systems 2012).

A fuel cell facility must use renewable fuel to be eligible for California's RPS program. Development of a Bloom's Energy Server system that runs on biogas requires access to the renewable fuel source. Currently there are scarce biogas resources for use under the state's RPS program, and this is proving to be a limiting factor for biogas projects of any type. A description of fuel cell facilities using renewable fuels is available in the Energy Commission publication, "Renewables Portfolio Standard Eligibility" (Energy Commission 2012).

[9] Certain businesses produce organic waste that can be repurposed into a clean, renewable fuel source called biogas. When biogas is conditioned to pipeline-quality natural gas, it becomes biomethane. Businesses that tend to have their own supplies of the waste needed to make biomethane include dairies, food processing companies, and wastewater treatment plants.

## Decision to Eliminate the Technology from the Alternatives Analysis

Use of this new technology for utility-scale installations in California is not yet a viable alternative. Based on staff's research, SOFCs are primarily being developed and installed for on-site generation of electricity. The work conducted by the DOE PNNL team indicates that a small-scale SOFC power system can be scaled for distributed generation applications.

Because the technology is new and has not been deployed on a utility scale, future deployment of large-scale systems in the state cannot be presumed. Also, only development of SOFC technologies using a renewable fuel source would be eligible for the state's RPS program.

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**Alternatives Appendix-2**
**Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative**

| Environmental Effect | Proposed RMSEGS Project | No-Project Alternative | Sonoran West Off-site Alternative | Solar Power Tower with Energy Storage Alternative | Reduced Solar Power Tower Alternative with or without Energy Storage | Solar Photovoltaic Alternative | Parabolic Trough Alternative |
|---|---|---|---|---|---|---|---|
| Air Quality | | | | | | | |
| Construction-related emissions | SM | — | Slightly less than Rio MESA SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Project operations emissions | SM | — | Similar to Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Slightly greater than Rio Mesa SEGF (SM) |
| Greenhouse Gases | LS | — | Similar to Rio Mesa SEGF (LS) | Less than Rio Mesa SEGF (LM) | Slightly greater than Rio Mesa SEGF (LS) | Slightly less than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) |
| Biological Resources | | | | | | | |
| Impacts to vegetation and associated wildlife | SM | Much less than RMSEGS (LS) | Similar to Rio Mesa SEGF, greater than Rio Mesa SEGF for sand dune habitat (SM) | Similar to Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Slightly greater than Rio Mesa SEGF (SM) |
| Impacts on waters of the U.S. | SM | Much less than RMSEGS (LS) | Much less than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Slightly greater than Rio Mesa SEGF (SM) |
| Impacts to Waters of the State including desert microphyll vegetation and associated wildlife habitat | PSU | Much less than RMSEGS (LS) | Similar to Rio Mesa (PSU) | Similar to Rio Mesa (PSU) | Much less than Rio Mesa (Expected SM) | Similar to Rio Mesa (UNK) | Similar to Rio Mesa (UNK) |

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**Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative**

| Environmental Effect | Proposed RMSEGS Project | No-Project Alternative | Sonoran West Off-site Alternative | Solar Power Tower with Energy Storage Alternative | Reduced Solar Power Tower Alternative with or without Energy Storage | Solar Photovoltaic Alternative | Parabolic Trough Alternative |
|---|---|---|---|---|---|---|---|
| Impacts on desert tortoise | SM | Much less than RMSEGS (LS) | Slightly greater than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Slightly greater than Rio Mesa SEGF (SM) |
| Impacts on special-status terrestrial wildlife species (other than desert tortoise) | SM | Much less than RMSEGS (LS) | Greater than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Slightly greater than Rio Mesa SEGF (SM) |
| Impacts on avian species, including raptors | SU | Much less than RMSEGS (LS) | Similar to or slightly less than Rio Mesa SEGF (SU) | Similar to Rio Mesa SEGF (SU) | Less than Rio Mesa SEGF (SU) | Much less than Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) |
| Cultural Resources | | | | | | | |
| Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites or ethnographic resources, or impact built environments on or beyond the site | UNK at this time | UNK at this time | UNK at this time | UNK at this time | UNK at this time | UNK at this time | UNK at this time |
| Geology and Paleontology | | | | | | | |
| Potential impacts from strong seismic shaking | SM | Much less than RMSEGS (LS) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (LS) | Less than to Rio Mesa SEGF (PSM) | Less than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (PSM) |
| Potential impacts from soil failure caused by hydro-collapse and/or dynamic compaction | SM | Much less than RMSEGS (LS) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (LS) | Less than Rio Mesa SEGF (PSM) | Less than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (PSM) |
| Potential impacts on paleontological resources | SU | Much less than RMSEGS (LS) | Much less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SU) | Less than Rio Mesa SEGF (SU) | Less than Rio Mesa SEGF (PSM) | Similar to Rio Mesa SEGF (PSM) |

**Alternatives Appendix-2**
**Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative**

| Environmental Effect | Proposed RMSEGS Project | No-Project Alternative | Sonoran West Off-site Alternative | Solar Power Tower with Energy Storage Alternative | Reduced Solar Power Tower Alternative with or without Energy Storage | Solar Photovoltaic Alternative | Parabolic Trough Alternative |
|---|---|---|---|---|---|---|---|
| Hazardous Materials | | | | | | | |
| Risk of fire or explosion during commissioning or operations | SM | — | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (LS) | Slightly greater than Rio Mesa SEGF (SM) |
| Risk of hazardous material spill off-site during hazardous materials transportation | SM | — | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Slightly greater than Rio Mesa SEGF (SM) |
| Risk of hazardous material spill off-site resulting from hazardous materials storage and use on-site | SM | — | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Risk of drawdown of emergency response services causing impact off-site | SM | — | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Slightly greater than Rio Mesa SEGF (SM) |
| Land Use | | | | | | | |
| Compatibility with land use plan, policy, or regulation | LS | — | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) |
| Noise and Vibration | | | | | | | |
| Potential for noise to impact noise-sensitive receptors | SM | — | Slightly less than Rio Mesa SEGF (SM) | Greater than Rio Mesa SEGF (SM) | Slightly less than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Public Health | | | | | | | |
| Potential for project operations to cause air toxics-related impacts that could affect public health | LS | — | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Less than Rio Mesa SEGF (LS) | Less than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) |

**Alternatives Appendix-2**
**Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative**

| Environmental Effect | Proposed RMSEGS Project | No-Project Alternative | Sonoran West Off-site Alternative | Solar Power Tower with Energy Storage Alternative | Reduced Solar Power Tower Alternative with or without Energy Storage | Solar Photovoltaic Alternative | Parabolic Trough Alternative |
|---|---|---|---|---|---|---|---|
| Socioeconomic Resources | | | | | | | |
| Adversely impact acceptable levels of service for police protection (law enforcement), schools, parks, and recreation | SM | — | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Slightly less than Rio Mesa SEGF (SM) | Similar to than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Displace substantial numbers of people and/or existing housing | LS | — | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) |
| Induce substantial population growth in the area | SM | — | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Traffic and Transportation | | | | | | | |
| Damage to Roads and Bridges | PSM | — | Less than Rio Mesa SEGF (PSM) | Similar to or slightly greater than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Slightly less than Rio Mesa SEGF (SM) | Slightly less than Rio Mesa SEGF (SM) |
| Glint Impacts to Motorists and Pilots – heliostats | PSM | — | Slightly greater than Rio Mesa SEGF (PSM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) |
| Level of Service on Roads and Highways – Construction | LS | — | Slightly less to Rio Mesa SEGF (SM) | Similar to or slightly greater than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) | Much less than Rio Mesa SEGF (SM) |
| Level of Service on Roads and Highways – Operation | LS | — | Similar to Rio Mesa SEGF (LS) | Similar to or slightly greater than Rio Mesa SEGF (LS) | Less than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Slightly More than Rio Mesa SEGF (LS) |

**Alternatives Appendix-2**
**Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative**

| Environmental Effect | Proposed RMSEGS Project | No-Project Alternative | Sonoran West Off-site Alternative | Solar Power Tower with Energy Storage Alternative | Reduced Solar Power Tower Alternative with or without Energy Storage | Solar Photovoltaic Alternative | Parabolic Trough Alternative |
|---|---|---|---|---|---|---|---|
| Glare Impacts to Motorists and Pilots – solar receiver steam generator | LS | — | Slightly greater than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (LS) | Much less than Rio Mesa SEGF (LS) | Much less than Rio Mesa SEGF (LS) |
| Transmission Line Safety and Nuisance | | | | | | | |
| Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure | SM | — | Slightly less than Rio Mesa SEGF (SM) | Similar to RMSEGS (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Visual Resources | | | | | | | |
| Visual change/contrast of project facilities, excluding glare effect | SU | Much less than Rio Mesa SEGF (LS) | Slightly greater than Rio Mesa SEGF (LS) | Similar to RMSEGS (SU) | Similar to Rio Mesa SEGF (LS) | Less than Rio Mesa SEGF (LS) | Less than Rio Mesa SEGF (LS) |
| Potential to create a new source of glare from solar receivers | SU | Much less than Rio Mesa SEGF (LS) | Slightly greater than Rio Mesa SEGF (SU) | Similar to RMSEGS (SU) | Similar to Rio Mesa SEGF (SU) | Much less than Rio Mesa SEGF (SU) | Much less than Rio Mesa SEGF (SU) |
| Waste Management | | | | | | | |
| Material/waste generated during the construction and operation would be managed in an environmentally safe manner, i.e. recycling or disposal | SM | — | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities | SM | — | Similar to Rio Mesa SEGF (PSM) | Similar to Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (PSM) | Similar to Rio Mesa SEGF (PSM) |

**Alternatives Appendix-2**
**Summary Comparison of the Proposed Project's Impacts to the Project Alternatives and the No-Project Alternative**

| Environmental Effect | Proposed RMSEGS Project | No-Project Alternative | Sonoran West Off-site Alternative | Solar Power Tower with Energy Storage Alternative | Reduced Solar Power Tower Alternative with or without Energy Storage | Solar Photovoltaic Alternative | Parabolic Trough Alternative |
|---|---|---|---|---|---|---|---|
| Potential for impacts on human health and the environment related to past or present soil or water contamination | SM | — | Slightly greater than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to or slightly greater than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Soil and Surface Water | | | | | | | |
| Soil erosion by wind and water during project construction or operations | SM | Much less than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Greater than Rio Mesa SEGF (SM) | Greater than Rio Mesa SEGF (SM) |
| Potential contamination of groundwater resources from infiltration | SM | Much less than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly | SM | Much less than Rio Mesa SEGF (LS) | Similar to Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |
| Water Supply | | | | | | | |
| Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level | LS | — | Similar to Rio Mesa SEGF (SM) | Greater than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Less than Rio Mesa SEGF (SM) | Similar to Rio Mesa SEGF (SM) |

Notes: — = no impact
UNK = significance of impact is unknown
B = beneficial impact
LS = less-than-significant impact, no mitigation required
SM or PSM = significant or potentially significant impact that can be mitigated to less than significant
SU or PSU = significant and unavoidable or potentially significant and unavoidable impact that cannot be mitigated to less than significant

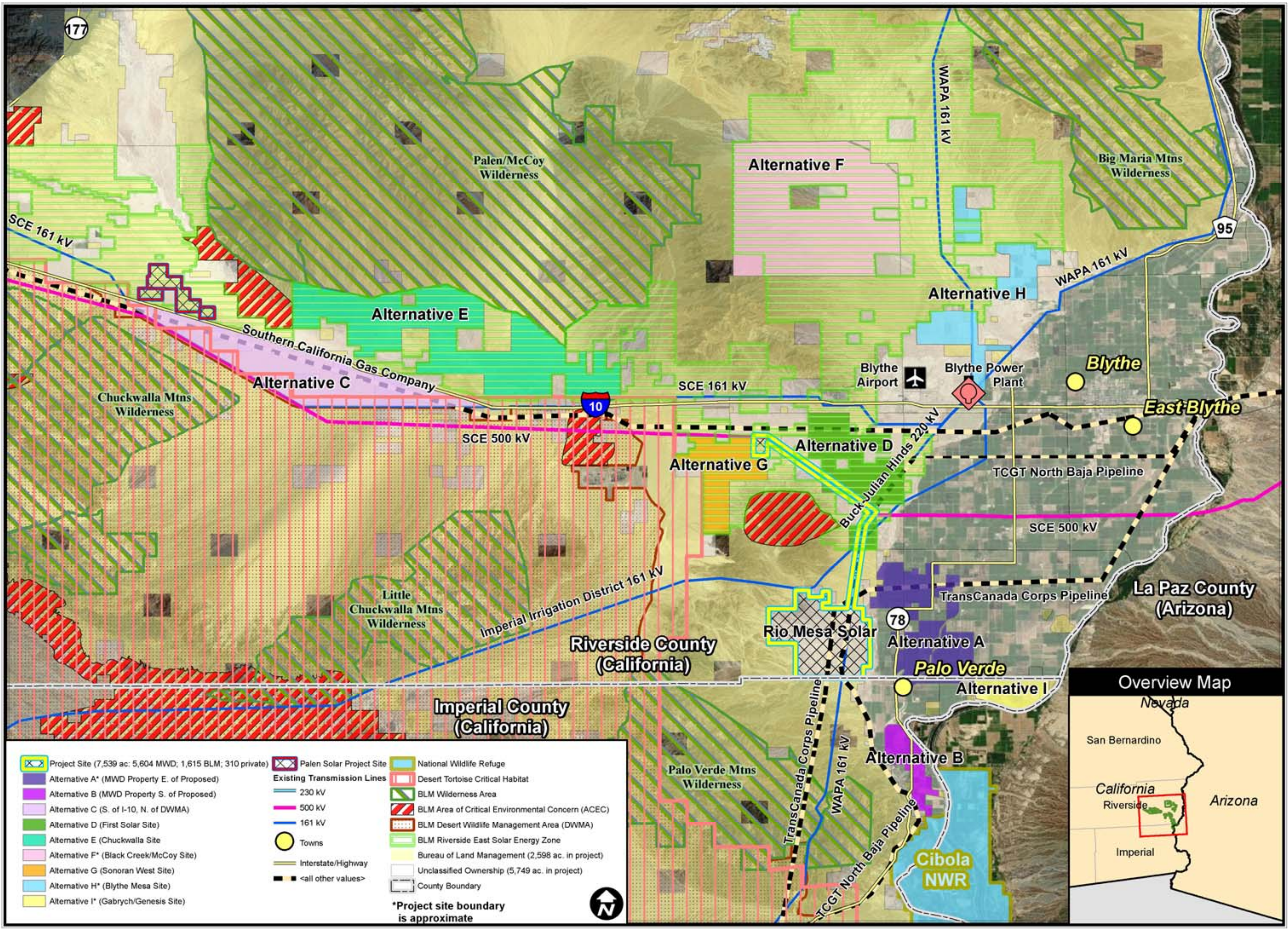
## APPENDIX ALTERNATIVES-3: STAFF CONTRIBUTORS TO THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This appendix lists staff responsible for specific technical analyses in the **Alternatives** section of this staff assessment. Staff names are listed with their area of technical expertise.

| Technical Area | Staff |
|---|---|
| Air Quality | Wenjun Qian, Ph.D. |
| Biological Resources | Scott White<br>Jennifer Lancaster |
| Cultural Resources | Amber Grady<br>Beth Bagwell, Ph.D.<br>Jerry Schaefer |
| Geology and Paleontology | Casey W. Weaver, CEG |
| Hazardous Materials Management | Geoff Lesh, P.E.<br>Rick Tyler |
| Land Use | Mark Hamblin |
| Noise and Vibration | Shahab Khoshmashrab, P.E. |
| Power Plant Efficiency and Reliability | Ed Brady, P.E. |
| Public Health | Huei-An (Ann) Chu, Ph.D. |
| Socioeconomic Resources | Christina Snow |
| Traffic and Transportation | Andrea Koch |
| Transmission Line Safety and Nuisance | Obed Odoemelam, Ph.D. |
| Transmission System Engineering | Laiping NG |
| Visual Resources | Bill Kanemoto<br>Gregg Irvin |
| Waste Management | Ellie-Townsend-Hough |
| Soil and Surface Hydrology | Abdel-Karim Abulaban, Ph.D. |
| Water Supply | Christopher Dennis |

**ALTERNATIVES - FIGURE 1**

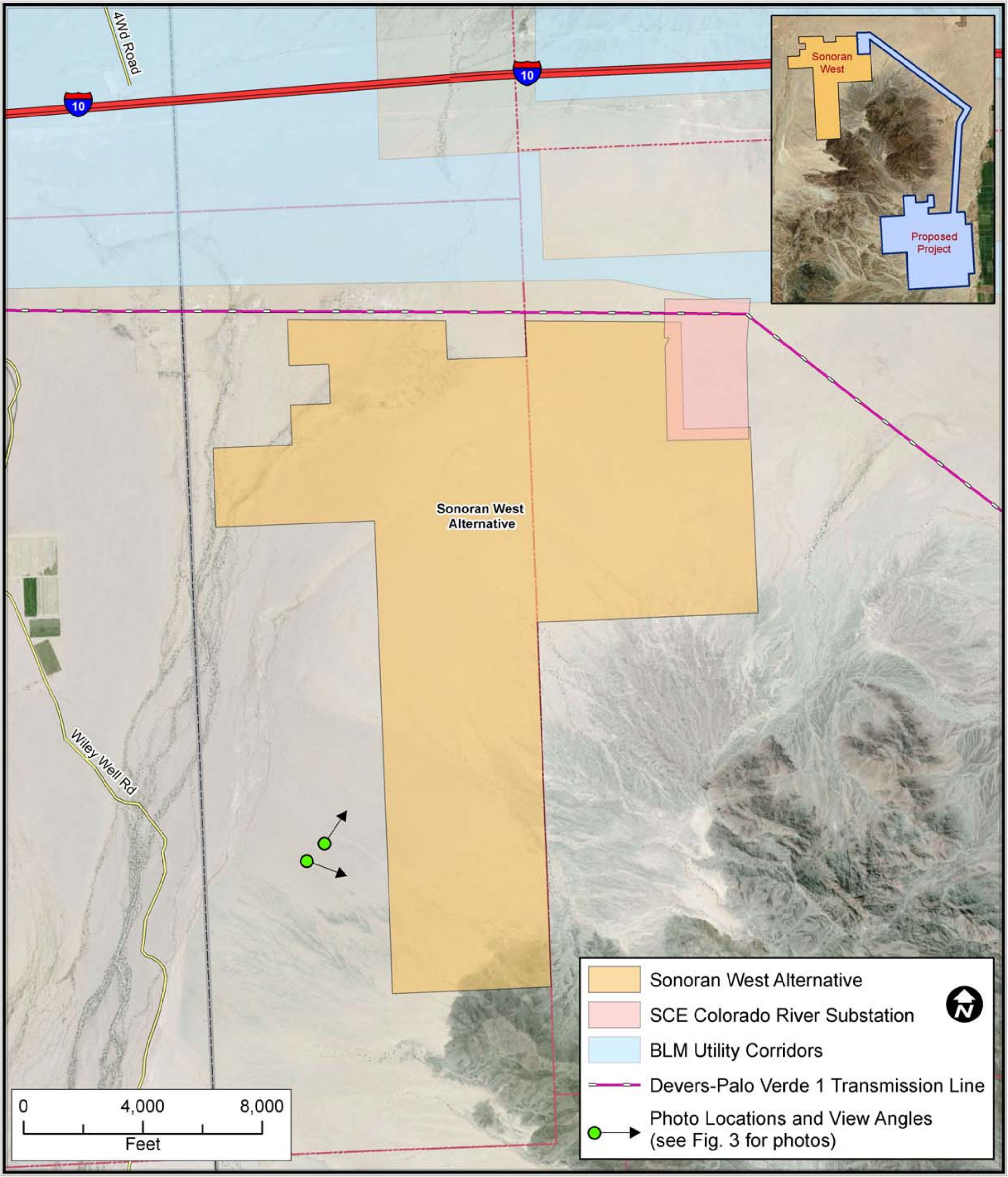
Rio Mesa Solar Electric Generating Facility – Off-Site Alternatives, Land Use, and Utilities




**CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: California Energy Commission - BLM - USFWS - PLATTS - Bing Aerial Image - Based on AFC Fig. 6.4-1

**ALTERNATIVES - FIGURE 2**
Rio Mesa Solar Electric Generating Facility – Sonoran West Off-site Alternative




**CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: California Energy Commission - BLM - Bing Aerial Image

**ALTERNATIVES - FIGURE 3**
Rio Mesa Solar Electric Generating Facility – Photographs of the Sonoran West Off-site Alternative

3a. View from 0.5 mile west of the Sonoran West Alternative, looking southeast across the site. Photo locations shown in Figure 2.

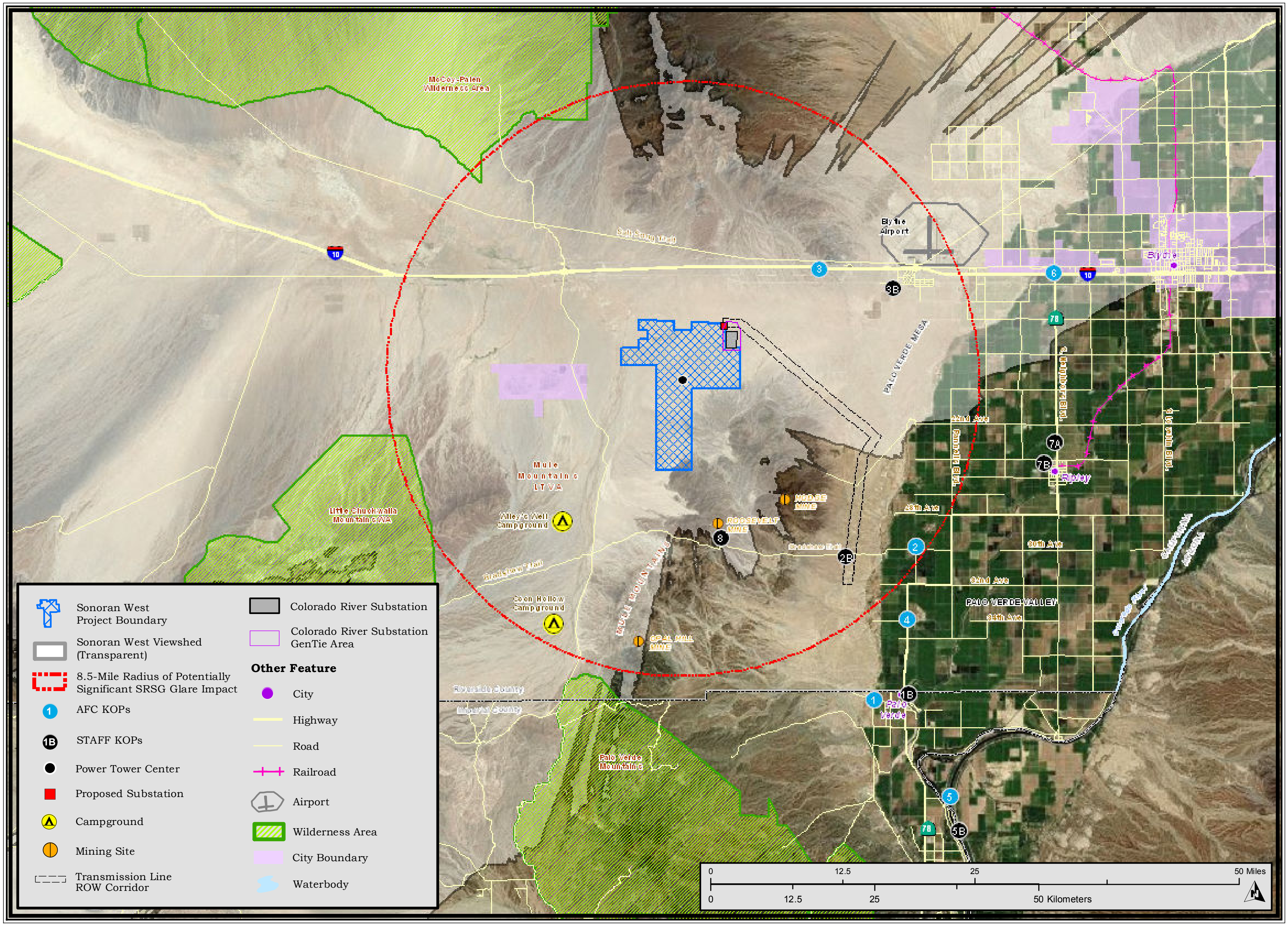
3b. View from 0.5 mile west of the Sonoran West Alternative, looking northeast across the site. Photo locations shown in Figure 2.

**CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION**

SOURCE: California Energy Commission Staff

# ALTERNATIVES - FIGURE 4

Rio Mesa Solar Electric Generating Facility - Sonoran West Alternative Viewshed - Figure 8



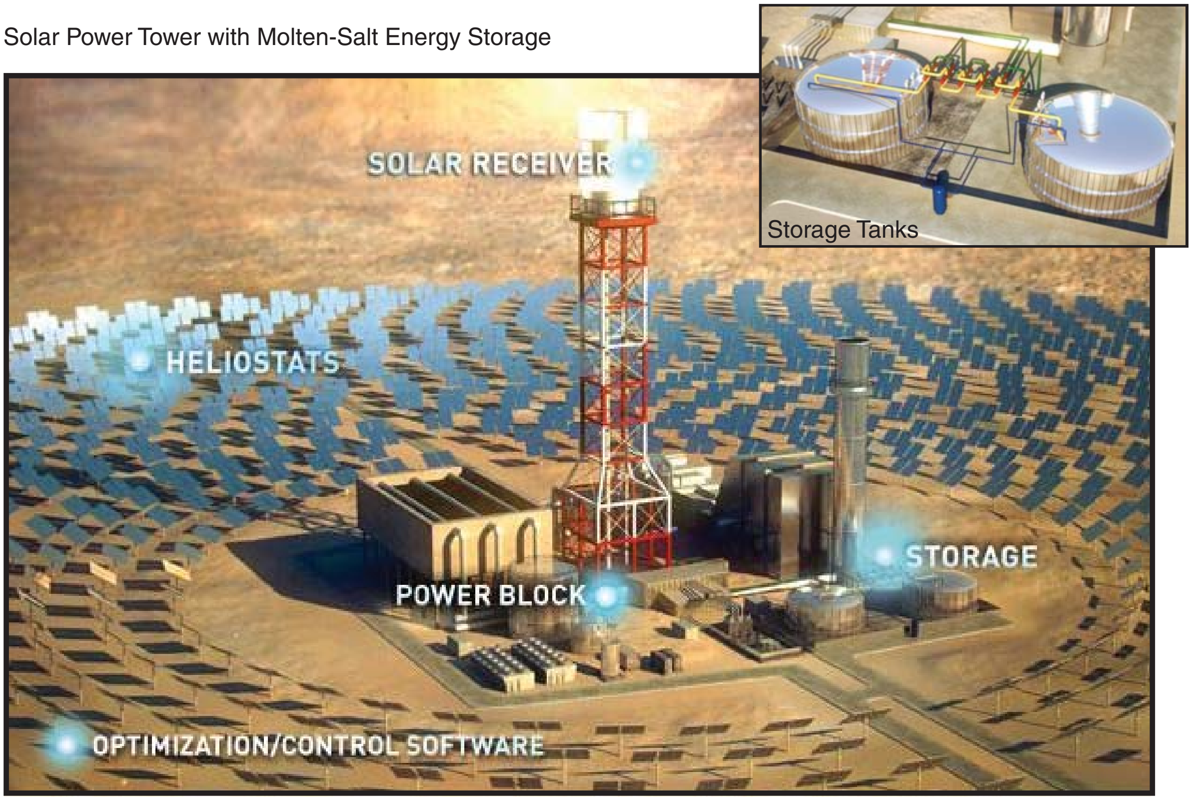

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: URS, ESRI, BLM & Tele Atlas Data

## ALTERNATIVES - FIGURE 5

Rio Mesa Solar Electric Generating Facility - Solar Power Tower with Energy Storage Alternative

Solar Power Tower with Molten-Salt Energy Storage




Source: Bright Source Energy

Completed 540-foot Solar Power Tower for the Crescent Dunes Solar Energy Project in Tonopah, NV


Source: SolarReserve

# RIO MESA SOLAR ELECTRIC GENERATING FACILITY (11-AFC-4)
# PRELIMINARY STAFF ASSESSMENT – Part B
# PREPARATION TEAM

Executive Summary ........................................................................................ Pierre Martinez, AICP

~~Introduction ................................................................................................ Pierre Martinez, AICP~~

~~Project Description ........................................................................................ Pierre Martinez, AICP~~

## Environmental Assessment

~~Air Quality ............................................................................ Wenjun Qian, Ph.D. and David Vidaver~~

Biological Resources ...................... Scott D. White, Jennifer Lancaster, Rick Tyler, Geoff Lesh, P.E., ............................................................................................................ and Alvin Greenberg, Ph.D.

Cultural Resources ................. Elizabeth A. Bagwell, Glenn J. Farris, Thomas Gates, Amber Grady, ............................................................................................ Michael A. McGuirt, and Melissa Mourkas

~~Hazardous Materials Management ...................................................... Geoff Lesh, PE and Rick Tyler~~

Land Use ........................................................................................................ Mark R. Hamblin

~~Noise and Vibration ........................................................................................ Shahab Khoshmashrab~~

~~Public Health ........................................................................................ Huei-An (Ann) Chu, Ph.D.~~

~~Socioeconomics ........................................................................................................ James Adams~~

~~Water Supply………………………………Christopher Dennis, CHG and Abdel-Karim Abulaban, P.E.~~

~~Soils and Surface Water ................................................................ Abdel-Karim Abulaban, P.E.~~

~~Traffic and Transportation ...................................................... Andrea Koch and Gregg Irvin, Ph.D.~~

~~Transmission Line Safety and Nuisance ...................................................... Obed Odoemelam, Ph.D.~~

~~Visual Resources ........................................................ William Kanemoto and Gregg Irvin, Ph.D.~~

~~Waste Management ........................................................................ Ellie Townsend-Hough, REA~~

~~Worker Safety and Fire Protection ...................................................... Geoff Lesh, P.E. and Rick Tyler~~

## Engineering Assessment

~~Facility Design ........................................................................................ Shahab Khoshmashrab~~

~~Geology and Paleontology ........................................................................ Casey Weaver, CEG~~

~~Power Plant Efficiency ........................................................................................ Edward Brady~~

~~Power Plant Reliability ...................................................... Edward Brady and Shahab Khoshmashrab~~

~~Transmission System Engineering ...................................................... Laiping Ng and Mark Hesters~~

**Alternatives**............................................................Susan Lee and Emily Capello

~~**General Conditions**.......................................................................Christine Stora~~

**Project Assistant**..............................................................Alicia Campos

**BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA**
**1516 NINTH STREET, SACRAMENTO, CA 95814**
**1-800-822-6228 – WWW.ENERGY.CA.GOV**

***APPLICATION FOR CERTIFICATION FOR THE RIO MESA SOLAR ELECTRIC GENERATING FACILITY***

DOCKET NO. 11-AFC-04
PROOF OF SERVICE
(Revised 8/14/12)

APPLICANTS' AGENTS

BrightSource Energy, Inc.
Todd Stewart, Senior Director
Project Development
1999 Harrison Street, Suite 2150
Oakland, CA 94612
tstewart@brightsourceenergy.com

BrightSource Energy, Inc.
Michelle Farley
1999 Harrison Street, Suite 2150
Oakland, CA 94612
mfarley@brightsourceenergy.com

BrightSource Energy, Inc.
Brad DeJean
1999 Harrison Street, Suite 2150
Oakland, CA 94612
bdejean@brightsourceenergy.com

APPLICANTS' CONSULTANTS

Grenier and Associates, Inc.
Andrea Grenier
1420 E. Roseville Parkway
Suite 140-377
Roseville, CA 95661
andrea@agrenier.com

URS Corporation
Angela Leiba
4225 Executive Square, Suite 1600
La Jolla, CA 92037
angela_leiba@urscorp.com

COUNSEL FOR APPLICANTS

Ellison, Schneider, & Harris
Christopher T. Ellison
Brian S. Biering
2600 Capitol Avenue, Suite 400
Sacramento, CA 95816-5905
cte@eslawfirm.com
bsb@eslawfirm.com

INTERESTED AGENCIES

Mojave Desert AQMD
Chris Anderson, Air Quality Engineer
14306 Park Avenue
Victorville, CA 92392-2310
canderson@mdaqmd.ca.gov

California ISO
e-recipient@caiso.com

Bureau of Land Management
Cedric Perry
Lynnette Elser
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553
cperry@blm.gov
lelser@blm.gov

Katherine Lind
Tiffany North
Office of Riverside County Counsel
County of Riverside
3960 Orange Street, Suite 500
Riverside, CA 92501
klind@co.riverside.ca.us
tnorth@co.riverside.ca.us

INTERVENORS

Center for Biological Diversity
Lisa T. Belenky, Senior Attorney
351 California Street, Suite 600
San Francisco, CA 94104
lbelenky@biologicaldiversity.org

Center for Biological Diversity
Ileene Anderson
Public Lands Desert Director
PMB 447, 8033 Sunset Boulevard
Los Angeles, CA 90046
ianderson@biologicaldiversity.org



*indicates change

ENERGY COMMISSION – DECISIONMAKERS

CARLA PETERMAN
Commissioner and Presiding Member
carla.peterman@energy.ca.gov

KAREN DOUGLAS
Commissioner and Associate Member
karen.douglas@energy.ca.gov

Kenneth Celli
Hearing Adviser
ken.celli@energy.ca.gov

Eileen Allen
Commissioners' Technical
Advisor for Facility Siting
eileen.allen@energy.ca.gov

Jim Bartridge
Advisor to Presiding Member
jim.bartridge@energy.ca.gov

Galen Lemei
Advisor to Associate Member
galen.lemei@energy.ca.gov

Jennifer Nelson
Advisor to Associate Member
jennifer.nelson@energy.ca.gov

ENERGY COMMISSION STAFF

Pierre Martinez
Project Manager
pierre.martinez@energy.ca.gov

Lisa DeCarlo
Staff Counsel
lisa.decarlo@energy.ca.gov

ENERGY COMMISSION – PUBLIC ADVISER

Jennifer Jennings
Public Adviser's Office
publicadviser@energy.ca.gov



*indicates change

## DECLARATION OF SERVICE

I, Alicia Campos, declare that on October 15, 2012, I served and filed a copy of the attached document **Preliminary Staff Assessment – Part B** dated October 15, 2012. This document is accompanied by the most recent Proof of Service list, located on the web page for this project at: http://www.energy.ca.gov/sitingcases/riomesa/index.html.

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit or Chief Counsel, as appropriate, in the following manner:

(C*heck all that Apply*)

For service to all other parties:

_X_ Served electronically to all e-mail addresses on the Proof of Service list;

____ Served by delivering on this date, either personally, or for mailing with the U.S. Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses marked ***"hard copy required"** or where no e-mail address is provided.

*AND*

For filing with the Docket Unit at the Energy Commission:

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____ by depositing an original and 12 paper copies in the mail with the U.S. Postal Service with first class postage thereon fully prepaid, as follows:

CALIFORNIA ENERGY COMMISSION – DOCKET UNIT
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1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.ca.gov

*OR, if filing a Petition for Reconsideration of Decision or Order pursuant to Title 20, § 1720:*

____ Served by delivering on this date one electronic copy by e-mail, and an original paper copy to the Chief Counsel at the following address, either personally, or for mailing with the U.S. Postal Service with first class postage thereon fully prepaid:

California Energy Commission
Michael J. Levy, Chief Counsel
1516 Ninth Street MS-14
Sacramento, CA 95814
michael.levy@energy.ca.gov

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Originally Signed By:
Alicia Campos
Siting, Transmission and Environmental Protection Division



*indicates change