Final Staff Assessment

BEACON SOLAR ENERGY PROJECT

Application For Certification (08-AFC-2)
Kern County

CALIFORNIA ENERGY COMMISSION

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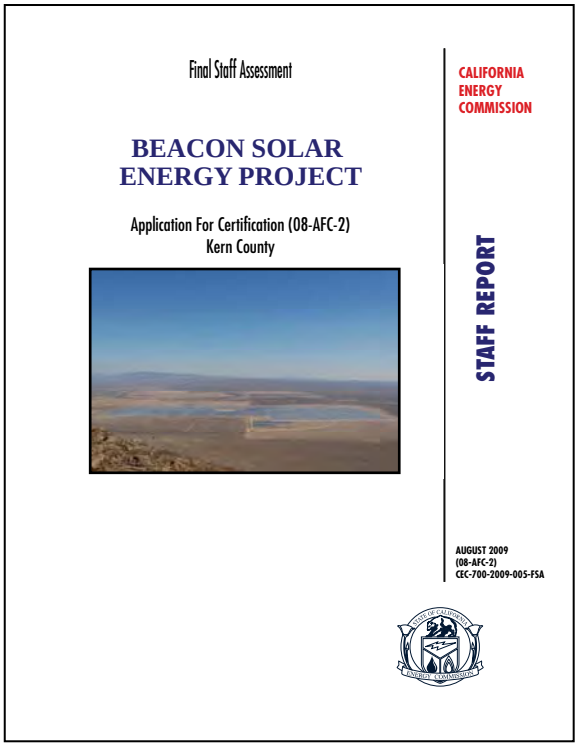

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BEACON SOLAR ENERGY PROJECT
(08-AFC-2)
FINAL STAFF ASSESSMENT

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INTRODUCTION

This Final Staff Assessment (FSA) contains the California Energy Commission staff's independent evaluation of the Beacon Solar Energy Project (BSEP) Application for Certification (08-AFC-2). The FSA examines engineering, environmental, public health and safety aspects of the BSEP project, based on the information provided by the applicant and other sources available at the time the FSA was prepared. The FSA contains analyses similar to those normally contained in an Environmental Impact Report (EIR) required by the California Environmental Quality Act (CEQA). When issuing a license, the Energy Commission is the lead state agency under CEQA and its process is functionally equivalent to the preparation of an EIR.

The Energy Commission staff has the responsibility to complete an independent assessment of the project's engineering design and identify the potential impacts on the environment, the public's health and safety, and determine whether the project conforms to all applicable laws, ordinances, regulations and standards (LORS). Upon identifying any potentially significant environmental impacts, staff recommends mitigation measures in the form of conditions of certification for construction, operation and eventual closure of the project.

The FSA which will serve as staff's formal testimony in evidentiary hearings to be held by the Energy Commission Committee assigned to hear this case. The Committee will hold evidentiary hearings and will consider the recommendations presented by staff, applicant, interveners, government agencies, and the public prior to proposing its decision. In the last step, the full Energy Commission will issue the final decision.

ENERGY COMMISSION'S "IN LIEU" PERMITTING PROCESS

Staff has implemented an objective of the Renewable Energy Action Team (REAT), as identified in the Governor's Executive Order S-14-08, to create a "one stop" process for permitting renewable energy generation facilities under California law. This permit streamlining process is being implemented according to the Energy Commission's "in lieu permit" authority established under the Warren-Alquist Act. Accordingly, staff coordinated a joint environmental review with other agencies such as the U.S. Fish and Wildlife Service, California Department of Fish and Game, California State Water Resources Control Board, Kern County Air Pollution Control District and Kern County to ensure that substantive requirements of these agencies, including requirements of state and local permits that would ordinarily be issued but for the Energy Commission's exclusive jurisdiction, are incorporated into the Commission's certificate if the project is approved. By implementing this cooperative approach, staff was able to reduce the overall permit processing time otherwise necessary to issue an Incidental Take Permit, Streambed Alteration Agreement, Waste Discharge Requirements and General Permit for dredge and fill of waters of the State.

PROJECT LOCATION AND DESCRIPTION

The proposed 2,012-acre project site is located in eastern Kern County at the western edge of the Mojave Desert, just east of the southern end of the Sierra Nevada mountain range. The site is located approximately four miles northwest of California City's northern boundary, approximately 15 miles north of the town of Mojave, and approximately 24 miles northeast of the City of Tehachapi. Koehn Lake is located approximately five miles to the east-northeast, and Red Rock Canyon State Park is located approximately four miles to the north.

The site is vacant and previously disturbed from past agricultural activities, which ceased in the early 1980s. The site is relatively flat with elevations ranging from approximately 2,220 feet above mean sea level in the southwest to 2,025 feet in the northeast. Pine Tree Creek is a dry desert wash that trends south-southwest to north-northeast through the center of the site. The applicant proposes to reroute the wash to the southern and eastern boundaries of the project site. There is also a fault zone crossing the site from southwest to northwest resulting in up to a 10-foot step change in elevation across the fault zone. The fault zone is described in more detail in the **Geology and Paleontology** section of this FSA.

The applicant's basic process for solar electric power generation would be to utilize parabolic trough solar collectors to concentrate solar energy onto heat collection elements (HCE) that contain a fluid, referred to as *heat transfer fluid* (HTF). After being heated by the solar troughs, the HTF is run through a heat exchanger where it heats water into steam. In the next stage, the steam is converted into electricity utilizing a Rankine-cycle reheat steam turbine electric generator, which is housed in the power block facility. After the steam is cycled through the turbine, it is processed through a cooling tower where it is condensed back to a liquid form (water) and recycled through the system again to drive the steam turbine generator.

The project site arrangement generally consists of a 1,266-acre, rectangular arrangement of parabolic trough solar collectors surrounding a centrally located power block. The power block facility houses the majority of electrical generation equipment and related systems, with exception of the solar field. The solar collectors would be constructed in long rows (troughs) across the project site and aligned side by side in a north-south orientation to allow the troughs to slowly rotate from east to west, tracking the movement of the sun. Adjoining the solar field, immediately to the west, are various support facilities, including administration and storage buildings, and evaporation ponds.

PUBLIC AND AGENCY COORDINATION

On March 27, 2008, the Energy Commission staff issued a notification of receipt of the Application for Certification (AFC), together with a project description, to property owners within 1,000 feet of the proposed project and those located within 500 feet of the linear facilities. Staff sent a similar notification and a copy of the AFC to a comprehensive list of agencies and libraries. Staff's notification letters requested public and agency review and comment on the AFC, and invited continued participation in the Energy Commission's certification process.

The Energy Commission's Public Adviser's Office (PAO) reviewed information available from the applicant and others and then conducted its own, extensive outreach efforts to identify certain local officials, as well as interested entities within a six-mile radius around the proposed site for the Beacon Solar Energy Project. These entities include schools, churches, community, cultural and health-care facilities, and day-care and senior-care centers, as well as business, environmental, governmental, and ethnic organizations. By means of mailing letters and bilingual (English and Spanish) notices, the PAO notified these entities of the Committee's Informational Hearing and Site Visit for the project, held on June 11, 2008, in California City. The PAO also identified and similarly notified 13 local officials with jurisdiction in the project area. These officials included the board of supervisors and the executive officer for Kern County, as well as the city council and manager for California City.

The PAO also arranged for advertisements in English and Spanish in the June 5, 2008 issue of the *Mojave Desert News* and requested public service announcements in English and Spanish at television and radio stations broadcasting in the project area.

In addition to the outreach efforts of the PAO, staff has continued to solicit comments on the AFC from local, state and federal agencies that have an interest in the project including Kern County Planning Department and Public Works Department, Kern County Air Pollution Control District, Cal-Trans, Lahontan Regional Water Quality Control Board, U.S. Fish and Wildlife Service, and California Department of Fish and Game. Staff has also considered the comments of interveners, community groups, and individual members of the public.

PUBLIC WORKSHOPS

On July 22, 2008, staff conducted a publicly noticed Data Response and Issue Resolution workshop at the California City Council Chambers and discussed the topics of Air Quality, Biology, Cultural Resources, Socioeconomics, Soils, Transmission System Engineering, Waste Management, and Water Resources. The purpose of the workshop was to provide members of the community and governmental agencies opportunity to obtain project information, and to offer comments they may have had regarding any aspect of the proposed project.

On August 25, 2008, staff conducted a second publicly noticed Data Response and Issue Resolution workshop at the office of the U.S. Fish and Wildlife Service in Ventura, California and discussed potential project-related impacts to desert tortoise, Mohave ground squirrel, and other species of special concern.

On November 6 2008, staff conducted a third publicly noticed Data Response and Issue Resolution workshop at the California City Council Chambers and discussed the proposed evaporation ponds, the proposed rerouting of Pine Tree Creek, mitigation plans and compensation ratios for special status species and associated habitat, water usage, potential impacts to groundwater, and evaluation of locations within the site and transmission line boundaries that may be eligible for listing on the California Register of Historic Resources.

On April 14, 2009, staff conducted a fourth publicly noticed workshop at the California City Council Chambers and discussed staff's Preliminary Staff Assessment (PSA). Staff solicited and addressed public comments during the morning and afternoon workshop sessions.

LIBRARIES

On March 27, 2008, the Energy Commission staff sent the BSEP Application for Certification to various libraries located in Kern County (California City Branch, Mojave Branch, Wanda Kirk Branch, Ridgecrest Branch, and Tehachapi Branco) and to libraries in Eureka, Fresno, Los Angeles, Sacramento, San Diego, and San Francisco. On April 1, 2009, staff sent the PSA to the same libraries and asked the librarian to make the document available to the public.

ENVIRONMENTAL JUSTICE

California law defines environmental 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 a 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). The screening process relies on Year 2000 U.S. Census data to determine the presence of minority and below-poverty-level populations.

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%; or (2) or when one or more U.S. Census blocks in the potentially affected area have a minority population of greater than 50%.

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

Staff has followed each of the above steps for the following 11 sections in the FSA: Air Quality, Hazardous Materials, Land Use, Noise, Public Health, Socioeconomics, Soils and Water, Traffic and Transportation, Transmission Line Safety/Nuisance, Visual Resources, and Waste Management. Over the course of the analysis for each of the 11 areas, staff considered potential impacts and mitigation measures and whether there would be a significant impact on an environmental justice population.

As a result of staff's analysis, staff determined there are no environmental justice issues for the proposed Beacon Solar Energy Project. Staff identified the following economic benefits from the project: capital costs; construction and operation payroll; sales taxes; and school impact fees.

PROJECT'S COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS); AND STATE WATER USE POLICIES

With the exception of **Soil and Water Resources**, staff believes that with the Commission's adoption of staff's proposed mitigation measures and the proposed conditions of certification, the BSEP project would comply with all applicable laws, ordinances, regulations, and standards (LORS). In addition to the LORS, there are state policies (not considered LORS) prohibiting the use of potable water for power plant cooling, as proposed by the applicant. The proposed BSEP would not comply with these state water use policies. See **Soil and Water Resources** and **Alternatives** sections for a discussion of LORS and state water use policies.

PROJECT'S ENVIRONMENTAL IMPACTS

With the exception of **Visual Resources**, staff believes that with the Commission's adoption of staff's proposed mitigation measures and the proposed conditions of certification, the BSEP project would not cause significant adverse impacts. The conclusions of each technical area are summarized in the table below and the subsequent text.

Executive Summary Table 1
Summary of Impacts to Each Technical Area

Technical Area	Complies with LORS	Impacts Mitigated
Air Quality	Yes	Yes
Biological Resources	Yes	Yes
Cultural Resources	Yes	Yes
Efficiency	Not Applicable	Not Applicable
Facility Design	Yes	Yes
Geology and Paleontology	Yes	Yes
Hazardous Materials	Yes	Yes
Land Use	Yes	Yes
Noise and Vibration	Yes	Yes
Public Health	Yes	Yes
Reliability	Not Applicable	Not Applicable
Socioeconomic Resources	Yes	Yes
Soil and Water Resources	***No***	Yes
Traffic and Transportation	Yes	Yes
Transmission Line Safety/Nuisance	Yes	Yes
Transmission System Engineering	Yes	Yes
Visual Resources	Yes	***No***
Waste Management	Yes	Yes
Worker Safety and Fire Protection	Yes	Yes

SOIL AND WATER RESOURCES

As proposed, the BSEP would not comply with several LORS nor comply with state policies regarding the use of fresh water, as defined in the Energy Commission's 2003 Integrated Energy Policy Report (IEPR) and the California Water Resources Control Board's Resolution 75-58. For a more detailed discussion of state water policy and related LORS, see staff's technical analyses in the **Soil and Water Resources**, and **Alternatives** sections.

VISUAL RESOURCES

The introduction of the BSEP would change the existing physical setting of the Fremont Valley floor from a moderately disturbed desert floor landscape to a highly human-altered landscape. This change principally would be due to 1,244 acres of the project site being covered with parabolic trough solar collectors. In addition, the introduction of the radiance from the parabolic trough arrays during operation would be prominent from elevated locations. Staff concludes the project would introduce a substantial significant "Aesthetic" impact under the California Environmental Quality Act and Guidelines at two sensitive viewpoints that would be unmitigable.

ALTERNATIVES SUMMARY

Although staff concluded the "no project' alternative is not a reasonable alternative to the proposed project, staff concluded there are at least four feasible project alternatives that are reasonable alternatives to the proposed BSEP. Each of the four alternatives is

a feasible alternative to the proposed BSEP because each alternative could reduce the BSEP's consumption of potable water by up to 97%. The first alternative would utilize the proven technology of dry cooling which does not require the use of water in the cooling process. The second alternative would utilize tertiary treated wastewater obtained from the Rosamond Community Services District. The third alternative would utilize tertiary treated wastewater from the city of California City. The fourth alternative would utilize photovoltaic (PV) solar panels for power generation, as PV panels do not require a cooling system or the related water use.

Both PV panels and dry cooling have the added benefit of not only eliminating 97% of the water use but also eliminating the need for evaporation ponds which are a source of concern to staff, the California Department of Fish and Game and the United States Fish and Wildlife Service (see the **Biological Resources** section for discussion of evaporation ponds). Staff has concluded that utilizing either PV technology or tertiary treated wastewater or dry cooling would facilitate the project's compliance with applicable LORS and state policies regarding the use of high quality, fresh water in power plant cooling systems. Staff's conclusion is that each of the separate alternatives is reasonable, technically feasible and economically feasible to incorporate.

NOTEWORTHY PUBLIC BENEFITS

BSEP offers the benefit of providing nearly 100% of its power generation from the sun. The daylight operating hours generally coincide with the hours when peaking capacity and energy is needed to support the California ISO transmission grid. In addition, staff has identified the following significant and environmentally important public benefits:

1. BSEP would contribute to meeting goals under California's Renewable Portfolio Standard Program (Senate Bill (SB) 1078; as amended by SB 107), which establishes that 20% of the total electricity sold to retail customers in California per year by December 31, 2010 must consist of renewable energy;

2. BSEP would contribute to meeting the Governor's Executive Order #S-14-08 which establishes that renewable energy must contribute 33% of the supply for meeting total state energy demands by 2020;

3. BSEP would contribute to the state accomplishing its goals for reducing global carbon emissions in accordance with the California Global Warming Solutions Act of 2006 (Assembly Bill 32); and

4. BSEP would generate both short term construction-related and long term operational-related increases in local expenditures and payrolls, as well as sales tax revenues.

INTRODUCTION

Eric K. Solorio

PURPOSE OF THIS REPORT

This Final Staff Assessment (FSA) is the California Energy Commission staff's independent analysis of the proposed Beacon Solar Energy Project (hereafter referred to as BSEP). For clarity, this FSA is a staff document. It is neither a California Energy Commission Committee document nor a draft decision. The FSA describes the following:

- the proposed project;
- the existing environment;
- whether the facilities can be constructed and operated safely and reliably in accordance with applicable laws, ordinances, regulations, and standards (LORS);
- the environmental consequences of the project including potential public health and safety impacts;
- the potential cumulative impacts of the project in conjunction with other existing and known planned developments;
- mitigation measures proposed by the applicant, staff, interested agencies, local organizations, and interveners which may lessen or eliminate potential impacts;
- the proposed conditions under which the project should be constructed and operated, if it is certified; and
- project alternatives.

The analyses contained in this FSA are based upon information from the: 1) Application for Certification (AFC), 2) responses to data requests, 3) supplementary information from local, state, and federal agencies, interested organizations, and individuals, 4) existing documents and publications, 5) independent research, and 6) comments at workshops. The analyses for most technical areas include discussions of proposed conditions of certification. Each proposed condition of certification is followed by a proposed means of verification that the condition of certification has been met. The FSA presents final conclusions about potential environmental impacts and conformity with LORS, as well as proposed conditions that apply to the design, construction, operation, and closure of the facility.

The Energy Commission staff's analyses were prepared in accordance with Public Resources Code section 25500 et seq.; California Code of Regulations, title 20, section 1701 et seq.; and the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.).

ORGANIZATION OF THE FINAL STAFF ASSESSMENT

The FSA contains an Executive Summary, Introduction, Project Description, and Project Alternatives. The environmental, engineering, and public health and safety analysis of

the proposed project is contained in a discussion of 20 technical areas. Each technical area is addressed in a separate chapter. These chapters are followed by a discussion of facility closure, project construction and operation compliance monitoring plans, and a list of staff that assisted in preparing this report.

Each of the 20 technical area assessments includes a discussion of:

- laws, ordinances, regulations, and standards (LORS);
- the regional and site-specific setting;
- project specific and cumulative impacts;
- mitigation measures;
- closure requirements;
- conclusions and recommendations; and
- conditions of certification for both construction and operation (if applicable).

ENERGY COMMISSION SITING PROCESS

The Energy Commission has the exclusive authority to certify the construction, modification, and operation of thermal electric power plants 50 megawatts (MW) or larger. The 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). The Energy Commission must review thermal power plant applications for certification (AFC) to assess potential environmental impacts including potential impacts to public health and safety, potential measures to mitigate those impacts, and compliance with applicable governmental laws or standards (Pub. Resources Code, § 25519 and § 25523(d)).

The Energy Commission's siting regulations require staff to independently review the AFC and assess whether all of the potential environmental impacts have been properly identified, and whether additional mitigation or other more effective mitigation measures are necessary, feasible, and available (Cal. Code Regs., tit. 20, § 1742 and § 1742.5(a)).

In addition, staff must assess the completeness and adequacy of the measures proposed by the applicant to ensure compliance with health and safety standards, and the reliability of power plant operations (Cal. Code Regs., tit. 20, § 1743(b)). Staff is required to develop a compliance plan (coordinated with other agencies) to ensure that applicable laws, ordinances, regulations, and standards are met (Cal. Code Regs., tit. 20, § 1744(b)).

Staff conducts its environmental analysis in accordance with the requirements of CEQA. No additional environmental impact report (EIR) is required because the Energy Commission's site certification program has been certified by the California Resources Agency as meeting all requirements of a certified regulatory program (Pub. Resources Code, § 21080.5 and Cal. Code Regs., tit. 14, § 15251 (j)). The Energy Commission is the CEQA lead agency.

The staff prepares a Preliminary Staff Analysis (PSA) that presents for the applicant, intervenors, organizations, agencies, other interested parties, and members of the public staff's draft analysis, conclusions, and recommendations. Where it is appropriate, the PSA incorporates comments received from agencies, the public, and parties to the siting case and comments made at the workshops.

When necessary, staff provides a comment period to resolve issues between the parties and to narrow the scope of disputed issues presented at evidentiary hearings. During the comment period that normally follows the publication of the PSA, staff will conduct one or more workshops to discuss its findings, proposed mitigation, and proposed compliance-monitoring requirements. Based on the workshops and written comments, staff may refine its analysis, correct errors, and finalize conditions of certification to reflect areas where agreements have been reached with the parties and will then publish a Final Staff Assessment (FSA).

The FSA is only one piece of evidence that will be considered by the Committee (two Energy Commission Commissioners who have been assigned to this project) in reaching a decision on whether or not to recommend that the full Energy Commission approve the proposed project. At the public hearings, all parties will be afforded an opportunity to present evidence and to rebut the testimony of other parties, thereby creating a hearing record on which a decision on the project can be based. The hearing before the Committee also allows all parties to argue their positions on disputed matters, if any, and it provides a forum for the Committee to receive comments from the public and other governmental agencies.

Following the hearings, the Committee's recommendation to the full Energy Commission on whether or not to approve the proposed project will be contained in a document entitled the Presiding Member's Proposed Decision (PMPD). Following publication, the PMPD is circulated in order to receive written public comments. At the conclusion of the comment period, the Committee may prepare a revised PMPD. At the close of the comment period for the revised PMPD, the PMPD is submitted to the full Energy Commission for a decision.

AGENCY COORDINATION

As noted above, the 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 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 as applicable the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, California Coastal Commission, State Water Resources Control Board/Regional Water Quality Control Board, California Department of Fish and Game, and the California Air Resources Board.

OUTREACH

The Energy Commission's outreach program is primarily facilitated by the Public Adviser's Office (PAO). This is an ongoing process that to date has involved the following efforts:

LIBRARIES

On March 27, 2008, the Energy Commission staff sent the BSEP Application for Certification to various libraries located in Kern County (California City Branch, Mojave Branch, Wanda Kirk Branch, Ridgecrest Branch, and Tehachapi Branch) and to libraries in Eureka, Fresno, Los Angeles, Sacramento, San Diego, and San Francisco.

INITIAL OUTREACH EFFORTS

The PAO reviewed related information available from the applicant and others and then conducted its own, extensive outreach efforts to identify certain local officials, as well as interested entities within a six-mile radius around the proposed site for the Beacon Solar Energy Project. These entities include schools; churches; community, cultural and health-care facilities; and day-care and senior-care centers, as well as business, environmental, governmental, and ethnic organizations. By means of mailing letters and bilingual (English and Spanish) notices, the PAO notified these entities of the Informational Hearing and Site Visit for the project, held on June 11, 2008, in California City. The PAO also identified and similarly notified 13 local officials with jurisdiction in the project area. These officials included the board of supervisors and the executive officer for Kern County, as well as the city council and manager for California City.

In addition, the PAO arranged for advertisements in English and Spanish in the June 5, 2008 issue of the *Mojave Desert News* and requested public service announcements in English and Spanish at television and radio stations broadcasting in the project area.

Energy Commission regulations require staff to notice, at a minimum, property owners within 1,000 feet of a project and 500 feet of a linear facility (such as transmission lines, gas lines, and water lines). This was done for the BSEP project. Staff's ongoing public and agency coordination activities for this project are discussed under the Public and Agency Coordination heading in the **Executive Summary** section of the FSA.

ENVIRONMENTAL JUSTICE

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," focuses federal attention on the environment and human health conditions of minority communities and calls on federal agencies to achieve environmental justice as part of this mission. The order requires the U.S. Environmental Protection Agency (U.S. EPA) and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

For all siting cases, Energy Commission staff conducts an environmental justice screening analysis in accordance with the *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA (National Environmental Policy Act) Compliance Analysis,* dated April 1998. The purpose of the screening analysis is to determine whether a minority or low-income population exists within the potentially affected area of the proposed site.

California Statute section 65040.12(c) of the Government Code defines *environmental justice* to mean "fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies." Staff's specific activities, with respect to environmental justice for the BSEP project, are discussed in the **Executive Summary**.

PROJECT DESCRIPTION

Eric K. Solorio

INTRODUCTION

Beacon Solar, LLC, a Delaware limited liability company and wholly owned subsidiary of NextEra Energy Resources, LLC (applicant), filed an Application for Certification (AFC) with the California Energy Commission (Energy Commission) on March 14, 2008, to construct and operate a nominal 250 megawatt (MW) solar thermal power plant. Staff's initial data adequacy review of the Beacon Solar Energy Project (BSEP) AFC determined that it did not meet all the requirements for the 12-month process as established by section 1704, including appendix B of chapter 5, title 20, of the California Code of Regulations. Specifically, the AFC was deficient in six of 23 areas: air quality, biological resources, cultural resources, geologic hazards, land use, and socioeconomics. On April 21, 2008, the applicant provided additional information to supplement the AFC. At a business meeting held on May 7, 2008, the Energy Commission adopted the executive director's data adequacy recommendation, thereby deeming the AFC complete for filing purposes.

PROJECT PURPOSE AND OBJECTIVES

The project purpose is to benefit NextEra Energy Resources, LLC (NextEra) stockholders by earning a profit on investment while achieving the stated project objectives (BS 2008a and BS 2008i). As described in the AFC, the applicant's specific project objectives are as follows:

1. to construct, operate, and maintain an efficient, economic, reliable, safe, and environmentally sound solar-powered generating facility that will help achieve: (i) the state of California objectives mandated by SB 1078 (California Renewable Portfolio Standard Program), (ii) AB 32 (California Global Warming Solutions Act of 2006), and (iii) other local mandates adopted by the state's municipal electric utilities to meet the requirements for the long-term, wholesale purchase of renewable electric energy for distribution to its customers;

2. to develop a site with available water resources to allow wet cooling in order to optimize power generation efficiency and reduce project cost;

3. to develop a site with an excellent solar resource;

4. to develop a previously disturbed site with close proximity to transmission infrastructure in order to minimize environmental impacts;

5. to interconnect directly to the Los Angeles Department of Water and Power (LADWP) electrical transmission system; and

6. to develop a new utility-scale solar energy project using proven concentrated solar trough technology.

Based upon the applicant's design objectives, staff concluded the project's objectives also include operating for 30 years. It is worth noting that considering the applicant's stated objective of using on-site water for wet-cooling and overall processes and the fact that the AFC identifies the on-site water as being potable water, staff therefore infers that the applicant's objectives include the use potable water for wet cooling and overall power generation processes

PROJECT LOCATION AND SITE DESCRIPTION

The proposed 2,012-acre project site is located in eastern Kern County at the western edge of the Mojave Desert, just east of the southern end of the Sierra Nevada mountain range. The site is located approximately 4 miles northwest of California City's northern boundary, approximately 15 miles north of the town of Mojave, and approximately 24 miles northeast of the City of Tehachapi (see **Project Description Figure 1**). Koehn Lake is located approximately five miles to the east-northeast, and Red Rock Canyon State Park is located approximately four miles to the north.

The project site is approximately 2,012 acres and is previously disturbed from past agricultural activities, which ceased in the early 1980s. Photographs of the site are shown in **Project Description Figure 2**. The site is relatively flat, with elevations ranging from approximately 2,220 feet above mean sea level in the southwest to 2,025 feet in the northeast. Pine Tree Creek, a desert wash, trends south-southwest to north-northeast through the center of the site. There is also a fault zone crossing the site from southwest to northwest resulting in up to a 20-foot step change in elevation across the fault scarp. The fault zone is described in more detail in the **GEOLOGY AND PALEONTOLOGY** section of this Preliminary Staff Assessment (PSA).

PROJECT FEATURES

SOLAR FIELD, POWER GENERATION EQUIPMENT, AND PROCESS

This section describes the proposed project site arrangement, processes, systems, and equipment. The project site arrangement generally consists of a 1,266-acre, rectangular arrangement of parabolic trough solar collectors surrounding a centrally located power block. The power block facility houses the majority of electrical generation equipment and related systems, with exception of the solar field. The solar collectors would be constructed in long rows (troughs) across the project site and aligned side by side in a north-south orientation to allow the troughs to slowly rotate from east to west, tracking the movement of the sun. Adjoining the solar field, immediately to the west, are various support facilities, including administration and storage buildings, and evaporation ponds. The site also includes Pine Tree Creek, which currently bisects the site. Pine Tree Creek is a dry desert wash that the applicant proposes to reroute to the southern and eastern boundaries of the project site. Together, the solar field, support facilities, transmission lines, and the drainage feature consume the majority of the 2,012-acre proposed project site. Please refer to **Project Description Figure 3** to see an illustration of the proposed site arrangement and refer to **Project Description Figure 6** to see a photo of typical solar collector troughs.

The process for solar electric power generation would be to utilize parabolic trough solar collectors to concentrate solar energy onto heat collection elements (HCE) that contain a fluid, referred to as *heat transfer fluid* (HTF). After being heated in the solar troughs, the HTF is run through a heat exchanger where it heats water into steam. In the next stage, the steam is converted into electricity utilizing a Rankine-cycle reheat steam turbine electric generator, which is housed in the power block facility. After the steam is cycled through the turbine, it is processed through a cooling tower where it is condensed back to a liquid form (water) and recycled through the system again to drive the steam turbine generator. The solar heat used in the boiler (steam) process would be supplemented by two propane-fired auxiliary boilers that would provide steam to supplement plant start-up and also preheat HTF whenever its temperature drops below 76 degrees Fahrenheit (°F), (08-AFC 2-9). The total supplemental heat derived from the propane-fired auxiliary boilers is not expected to surpass 1 percent of power generation.

The power block facility would include the main electrical building, two propane-fired auxiliary boilers, an air emission control system for the combustion of propane in the auxiliary boilers, a steam turbine generator, a cooling tower, water treatment equipment, a hazardous materials storage area, propane storage and delivery system, auxiliary equipment (emergency diesel generator, diesel fire pump, etc.), a raw water storage tank (2.9 million gallons), a treated water storage tank (2.4 million gallons), a de-mineralized water storage tank (150,000 gallons), and a neutralization water storage tank (80,000 gallons). Other support facilities include:

- a land farm for remediation of contaminated soils;
- an administration building and warehouse;
- three 2-acre, evaporation ponds (6acres total);
- on-site access and maintenance roads (dirt road);
- rerouted and engineered desert dry wash; and
- perimeter fencing.

Please see **Project Description Figures 3, 4, and 5**.

WATER DEMAND AND SOURCE OF SUPPLY

If built as proposed, the project would consume approximately 1,400 acre-feet of potable water per year. There are 12 existing water supply wells that were previously used to support alfalfa farming on the project site. As shown on **Project Description Figure 3**, the applicant proposes that three of these wells (Nos. 41, 49, and 63) be used to supply the project's water needs. The wells draw water from a lower aquifer at a depth of approximately 600 feet below ground surface. The most significant demand for water would be the proposed wet cooling tower. Additional water would be required for make-up to the solar thermal and steam turbine system, washing of solar reflectors and collectors, potable water needs, and fire protection. The water is expected to be treated on site using a package water treatment system. The treatment system would be comprised of equipment for filtering, softening, de-mineralizing, and sanitizing the raw water.

WATER TREATMENT SYSTEMS

The water treatment process includes the post-treatment brine concentrator system, which allows the treatment process to be classified as a partial ZLD system. The discharge (blowdown) from the brine concentrator system consists of highly concentrated waste water that is directed to evaporation ponds.

The overall water treatment system will include a pre-treatment ion exchange unit to reduce scale-forming species from entering the cooling water system. The pre-treatment system will contain cation exchange vessels, a degasifier, and anion exchange vessels, along with associated piping, pumps, valves and tanks.

To further inhibit mineral scale formation, an organic phosphate inhibitor solution may be fed into the circulating water system in an amount proportional to the circulating water blowdown flow. The inhibitor solution feed equipment includes a bulk storage tank and two full-capacity metering pumps. To inhibit biofouling, sodium hypochlorite is shock-fed into the circulating water system as a biocide. The sodium hypochlorite feed equipment also includes a bulk storage tank and two full capacity metering pumps.

EVAPORATION PONDS

Three evaporation ponds will be required, each with a nominal surface area of two acres, for a total surface area of six acres. The ponds will be designed with an average depth of eight feet which allows for two feet of freeboard, three feet of wastewater and three feet of accumulated solids.

The pond liner system is expected to consist of a 60 mil high density polyethylene (HDPE) primary liner and a minimum 40 mil HDPE secondary liner. Between the liners is a synthetic drainage geonet that is used as part of the leachate collection and removal system (LCRS). There will be a hard surface protective layer on top of the 60 mil HPDE, which will consist of a non-woven geotextile, one foot thick granular fill/free draining material and a one foot thick hard surface such as roller-compacted concrete.

WASTEWATER AND SLUDGE

The BSEP would have two types of wastewater streams. The primary wastewater stream would come from cooling tower blowdown and be piped to on-site evaporation ponds where the solids would settle to the bottom and the water would evaporate. For safety and operational purposes, the ponds will be cleaned when three feet of sludge has accumulated in the base of the ponds, which is estimated to be every four and one-half years.

PROPANE STORAGE AND DELIVERY SYSTEM

The propane storage and delivery system would consist of an uploading station, storage tanks, vaporizing skids, and other ancillary equipment. Safety pressure relief valves, regulators, excess flow valves, and an emergency shutdown system would be included in the storage and delivery system. There would be two storage tanks designed and built in accordance with ASME Section VIII. Each tank would be constructed from carbon steel and have storage capacity of 18,000 gallons.

AIR POLLUTION CONTROL

Air pollution emissions from the combustion of propane in the auxiliary boilers would be controlled using the best available control technology (BACT). To ensure that the systems perform correctly, continuous emission monitoring for nitrogen oxides (NO_x), carbon monoxide (CO), and other pollutants would be performed. Annual propane usage is expected to be approximately 410,000 gallons.

HAZARDOUS WASTE MANAGEMENT

Several methods would be used to properly manage and dispose of hazardous wastes. Waste lubricating oil would be recovered and recycled by a waste oil recycling contractor. Chemicals would be stored in appropriate chemical storage facilities. Bulk chemicals would be stored in large storage tanks, while most other chemicals would be stored in smaller returnable delivery containers. All chemical storage areas would be designed to contain leaks and spills in concrete containment areas. The applicant would have an approved Risk Management Plan in place to deal with any potential problems related to the use and handling of hazardous waste.

FIRE PROTECTION

The fire protection system would be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water would be the raw water storage tank. An electric jockey pump and electric motor-driven main fire pump would be provided to increase the water pressure to the level required to serve all fire fighting systems. In addition, a backup diesel engine-driven fire pump would be provided to pressurize the fire loop if the power supply to the electric motor-driven main fire pump fails. Fire support services to the site would be under the jurisdiction of the Kern County Fire Department (KCFD). Station 14 is 19 miles from the project site, located at 1953 Highway 58, Mojave, California, and would be the first responder to BSEP with a response time of approximately 23 minutes. Kern County Fire Department also has mutual aid agreements with California City Fire Department and Edwards Air Force Base for responses requiring more assistance.

In Kern County, hazardous materials permits and spills are handled and investigated by KCFD. Kern County firefighters receive specialized training to address emergency responses to industrial hazards, and response would come from the same facilities as for fire services response.

TRANSMISSION SYSTEM INTERCONNECTION AND UPGRADES

The proposed BSEP project would be located approximately 1.5 miles north of the 230 kilovolt (kV) Barren Ridge Switching Stationed owned by the Los Angeles Department of Water and Power (LADWP). The BSEP project would interconnect to the Barren Ridge Switching Station as the primary point of interconnection (POI). According to an LADWP Systems Impact Study (SIS), dated July 31, 2008, the proposed primary POI configuration has demonstrated acceptable system performance, and system additions would be provided solely for the BSEP primary POI configuration at the Barren Ridge Switching Station (DB 2008l).

The new interconnection would be made by using the Option 1 route, as identified in the AFC. The Option 1 route would be approximately 3.5 miles in length. The interconnection would be made by installing a new 230-kV line using up to 39 concrete monopoles. Each monopole would average 79 feet in height and be spaced approximately 500 feet apart (see **Project Description Figure 3**).

LADWP is currently proposing to develop the Barren Ridge Renewable Transmission Project (BRRTP), which will include upgrades and building a new transmission line from Barren Ridge Switching Station to Castaic Power Plant near Santa Clarita. The upgrade is meant to serve new renewable power generation projects in the Mojave Desert and Tehachapi Mountain areas. However, as stated above, the BSEP project is not dependant on the BRRTP improvements.

TELECOMMUNICATIONS FACILITIES

The BSEP will obtain telecommunications service by connecting to existing capacity located on Neuralia Road, directly east of the project site. The new service connection will be made by obtaining an easement to use the existing utility poles and maintenance access road owned by Southern California Edision (SCE). The existing SCE electrical distribution line runs from Neuralia Road to through the project site.

PROJECT CONSTRUCTION AND OPERATION

If approved by the Energy Commission, the applicant expects project construction to take 25 months to complete, with an average workforce of 477 employees and a peak workforce of approximately 836 workers. Development and construction is expected to cost approximately $950 million. Typical operating hours for the project would be an average of approximately 12 hours per day equating to an annual average of 4,380 hours per year (DB 2008l).

FACILITY CLOSURE

The BSEP would be designed for an operating life of between 30 years to 40 years. Depending on maintenance factors, at an appropriate point beyond the designed operating life, the project would cease operation and close down. At that time, it would be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts.

Although the setting for this project does not appear to present any special or unusual closure problems, it is impossible to foresee what the situation would be in 30 years or more when the project ceases operation. Therefore, provisions must be made which provide the flexibility to deal with the specific situation and project setting at the time of closure. Facility closure would be consistent with laws, ordinances, regulations, and standards in effect at the time of closure.

REFERENCES

BS 2008a - FPL Energy/M. O'Sullivan (tn 45646). Application for Certification, dated 03/13/08. Submitted to CEC/Docket Unit on 03/14/08.

BS 2008c - Beacon Solar, LLC/G. Palo (tn 45972). AFC Volume 3 - Data Adequacy Supplement, dated 04/18/08. Submitted to CEC/Docket Unit on 04/21/08.

BS 2008f – FLP Energy (tn 46698). CEC Informational Hearing - Applicant's Slide Presentation, dated 06/11/08. Submitted to CEC/Docket Unit on 06/16/08.

BS 2008h - Beacon Solar, LLC/M. Argentine (tn 48141). Applicant's Response to Questions from Rancho Seco Residents, dated 09/19/08. Submitted to CEC/Docket Unit on 09/22/08.

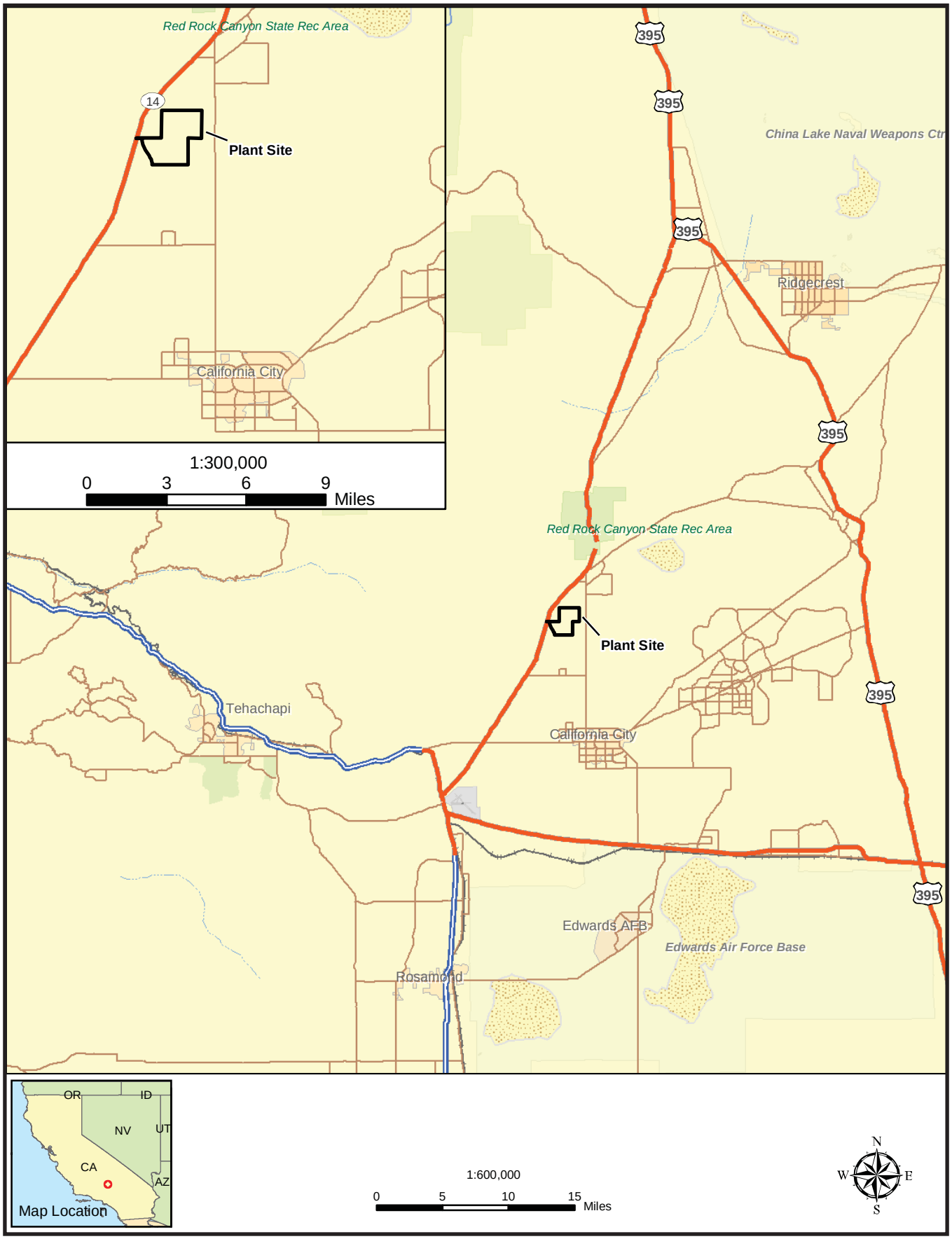
BS 2008i – Beacon Solar, LLC/M. Russell (tn 49439). Beacon Responses to Question Set #2 From Rancho Seco Residents, dated 12/05/2008. Submitted to CEC/Docket Unit on 12/17/08.

DB 2008l - Downey Brand/J. Luckhardt (tn 47885). Responses to Data Requests 50-52, dated 09/02/08. Submitted to CEC/Docket Unit on 09/02/08.

DB 2009r – Downey Brand/S. Rowlands (tn 52116). Applicant Project Design Refinements, dated 6/22/09. Submitted to CEC/Docket Unit on 6/22/09.

PROJECT DESCRIPTION - FIGURE 1

Beacon Solar Energy Project - Regional and Vicinity Map



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

AFC Figure 1-1

PROJECT DESCRIPTION - FIGURE 2

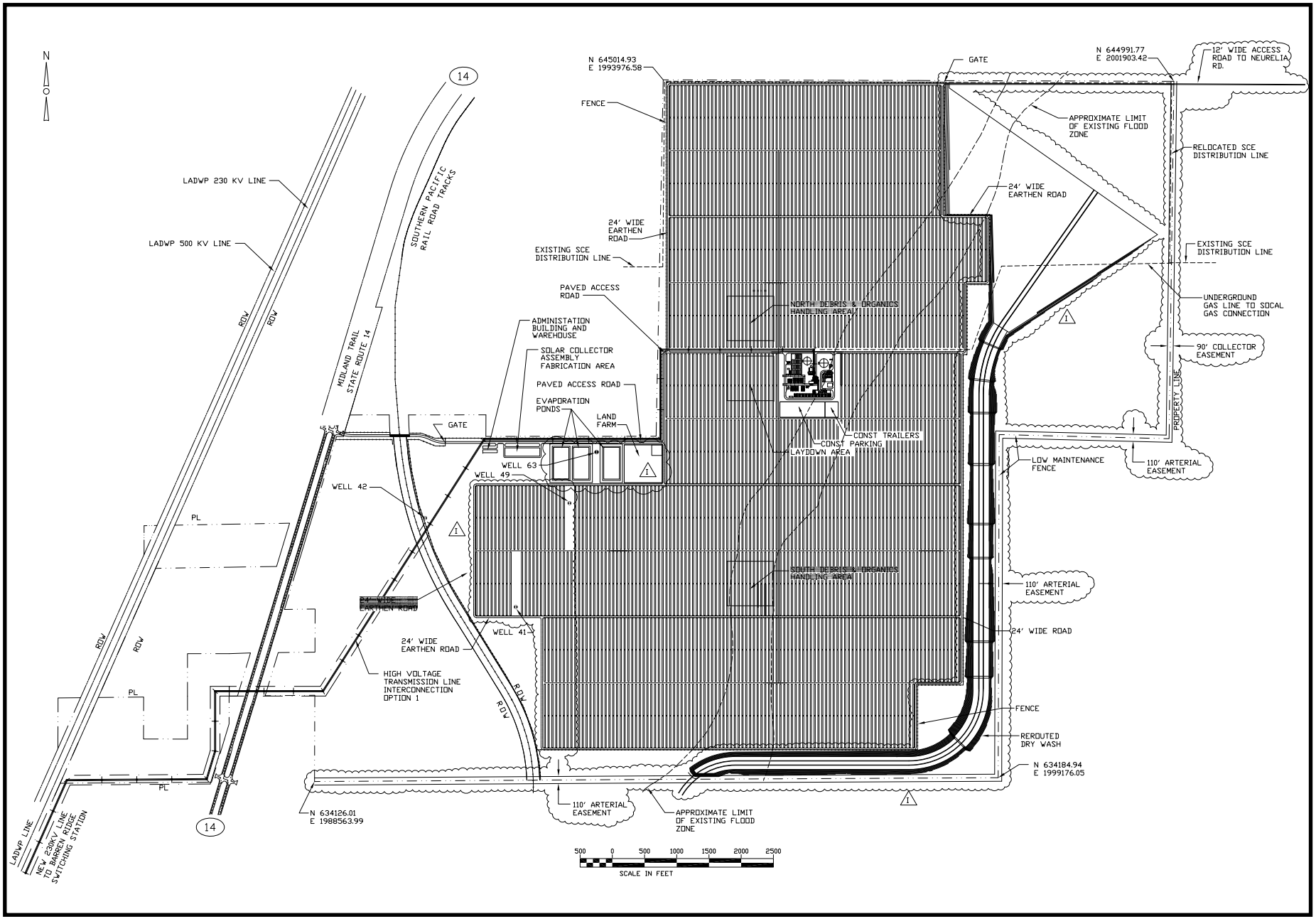
Beacon Solar Energy Project - Plant Site Photographs - Existing Conditions

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: AFC Figure 2-2

PROJECT DESCRIPTION - FIGURE 3

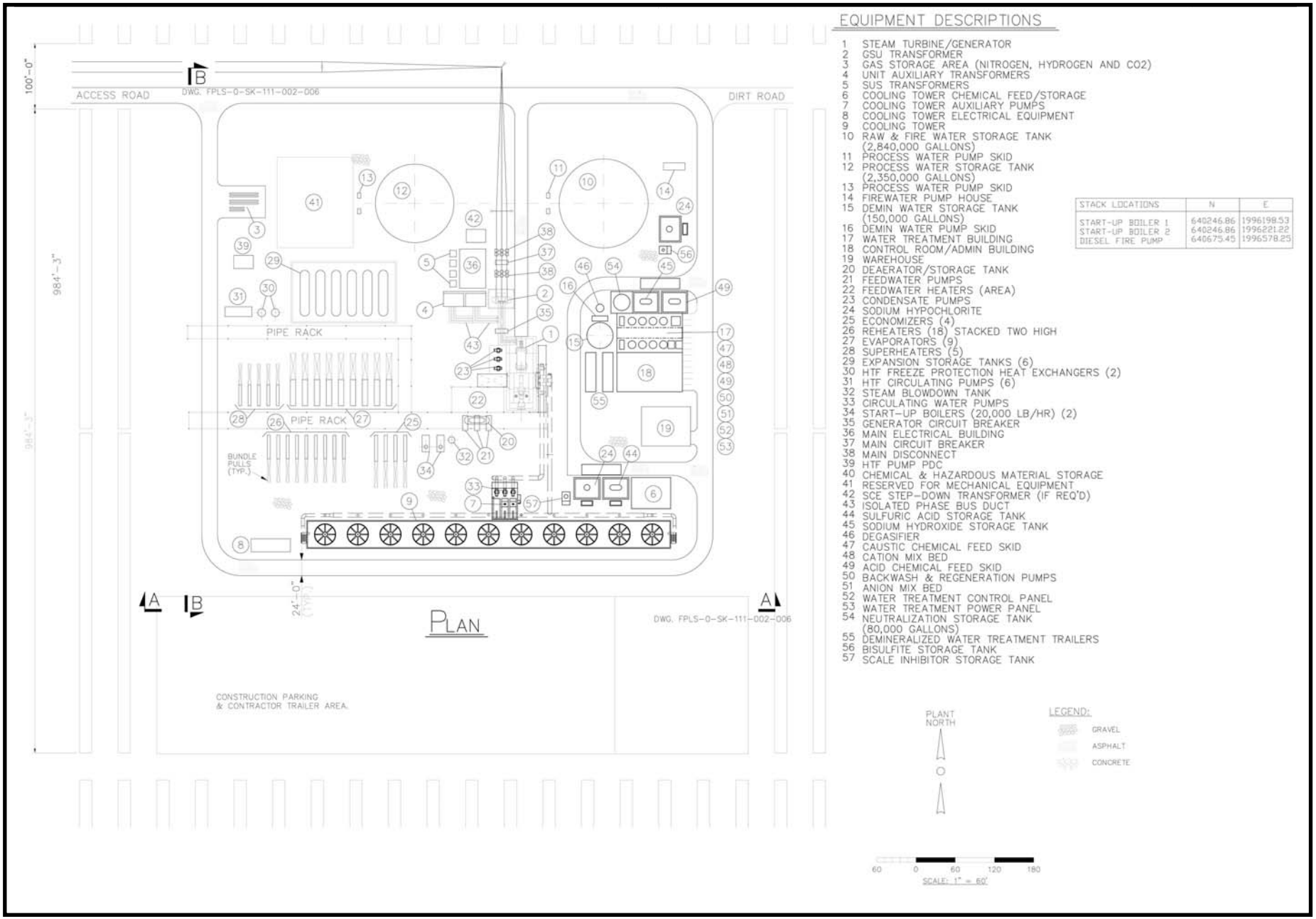
Beacon Solar Energy Project - General Arrangement Site Plan



SOURCE: 2009 Applicant Project Design Refinements

PROJECT DESCRIPTION - FIGURE 4

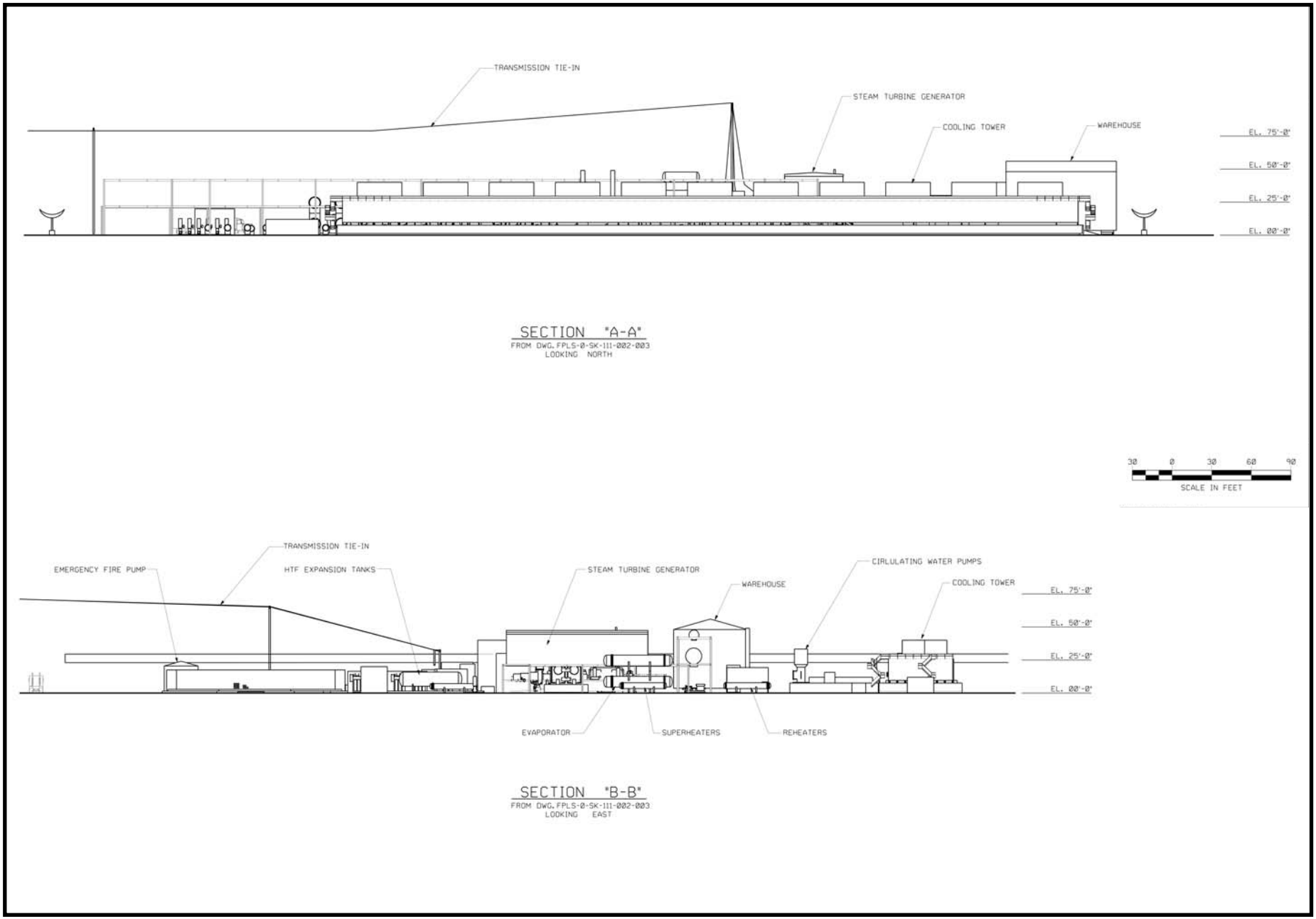
Beacon Solar Energy Project - General Arrangement Power Block Equipment Layout



SOURCE: AFC Figure 2-5

PROJECT DESCRIPTION - FIGURE 5

Beacon Solar Energy Project - General Arrangement Power Block Elevation Views



SOURCE: AFC Figure 2-6

PROJECT DESCRIPTION - FIGURE 6

Beacon Solar Energy Project - Typical Trough Solar Collector

SOURCE: AFC Figure 2-8

ENVIRONMENTAL ASSESSMENT

AIR QUALITY

Testimony of William Walters, P.E.

SUMMARY OF CONCLUSIONS

Staff finds that with the adoption of the attached conditions of certification the proposed Beacon Solar Energy Project (BSEP or Beacon) would comply with all applicable laws, ordinances, regulations, and standards (LORS) and would not result in any significant air quality-related impacts.

The BSEP project would emit significantly reduced greenhouse gas (GHG)[1] emissions per megawatt-hour produced than fossil fueled generation resources in California. The project is not subject to the requirements of SB 1368 (Perata, Chapter 598, Statutes of 2006) and the Emission Performance Standard, but would nevertheless comply with the Emission Performance Standard.

INTRODUCTION

This analysis evaluates the expected air quality impacts from the emissions of criteria air pollutants from both the construction and operation of the Beacon Solar Energy Project. Criteria air pollutants are defined as air contaminants that the state and/or federal governments have established an ambient air quality standard to protect public health.

The criteria pollutants analyzed are nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and particulate matter (PM). Two subsets of particulate matter are inhalable particulate matter (less than 10 microns in diameter - PM10) and fine particulate matter (less than 2.5 microns in diameter - PM2.5). Nitrogen oxides (NOx, consisting primarily of nitric oxide (NO) and NO_2) and volatile organic compounds (VOC) emissions readily react in the atmosphere as precursors to ozone and, to a lesser extent, particulate matter. Sulfur oxides (SOx) readily react in the atmosphere to form particulate matter and are major contributors to acid rain. Global climate change and greenhouse gas (GHG) emissions from the project are discussed in an Appendix Air-1 and analyzed in the context of cumulative impacts.

In carrying out this analysis, the California Energy Commission (Energy Commission) staff evaluated the following three major points:

- whether the BSEP is likely to conform with applicable federal, state, and Kern County Air Pollution Control District (District) air quality laws, ordinances, regulations and standards (Title 20, California Code of Regulations, section 1744 (b));
- whether the BSEP is likely to cause new violations of ambient air quality standards or contribute substantially to existing violations of those standards (Title 20, California Code of Regulations, section 1743); and

[1] Greenhouse gas emissions are not criteria pollutants, but they affect global climate change. In that context, staff evaluates the GHG emissions from the proposed project. Appendix Air-1, presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.

- whether mitigation measures proposed for the project are adequate to lessen potential impacts to a level of insignificance (Title 20, California Code of Regulations, section 1742 (b)).

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

The federal, state, and local laws and policies applicable to the control of criteria pollutant emissions and mitigation of air quality impacts for the BSEP are summarized in **Air Quality Table 1**. Staff's analysis examines the project's compliance with these requirements summarizes the applicable LORS.

Air Quality Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
40 Code of Federal Regulations (CFR) Part 52	Nonattainment New Source Review (NSR) requires a permit and requires Best Available Control Technology (BACT) and Offsets. Permitting and enforcement delegated to KCAPCD. Prevention of Significant Deterioration (PSD) requires major sources or major modifications to major sources to obtain permits for attainment pollutants. The BSEP is a new source thus the PSD trigger levels are 250 tons per year for NOx, VOC, SOx, PM10, PM2.5 and CO.
40 CFR Part 60	New Source Performance Standards (NSPS), Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Establishes emission standards for compressions ignition internal combustion engines, including emergency fire water pump engines.
State	
Health and Safety Code (HSC) Section 40910-40930	Permitting of source needs to be consistent with Air Resource Board (ARB) approved Clean Air Plans.
HSC Section 41700	Restricts emissions that would cause nuisance or injury.
California Code of Regulations (CCR) Section 93115	Airborne Toxics Control Measure for Stationary Compression Ignition Engines. Limits the types of fuels allowed, established maximum emission rates, establishes recordkeeping requirements on stationary compression ignition engines, including emergency fire water pump engines.

Applicable LORS	Description
Local (KCAPCD)	
Rule 201 - Permits Required	Establishes the requirement to obtain a Permit to Operate (PTO) for emission sources.
Rule 210.1 - New and Modified Stationary Source Review	Establishes the requirements that must be met to obtain a PTO, including the requirement to comply with Best Available Control Technology (BACT), provide emission offsets for emission increase above specified thresholds, provide a dispersion modeling analysis, an alternatives analysis, and a compliance certification (if applicable).
Rule 401 - Visible Emissions	Limits visible emissions from emissions sources, including stationary source exhausts and fugitive dust emission sources.
Rule 402 - Fugitive Dust	Limits fugitive emissions from certain bulk storage, earthmoving, construction and demolition, and manmade conditions resulting in wind erosion.
Rule 404.1 - Particulate Matter Concentration	The rule limits particulate matter (PM) emissions to less than 0.1 grains per standard cubic foot of gas at standard conditions.
Rule 407 - Sulfur Compounds	Limits discharge into the atmosphere of sulfur compounds exceeding 0.2% by volume concentration calculated as SO_2.
Rule 409 - Fuel Burning Equipment - Combustion Contaminants	Limits discharge into the atmosphere from fuel burning equipment combustion contaminants exceeding in concentration at the point of discharge, 0.1 grain per cubic foot of gas calculated to 12% of carbon dioxide (CO_2) at standard conditions.
Rule 411 – Storage of Organic Liquids	Sets standards for storage of organic liquids with a true vapor pressure of 1.5 pounds per square inch or greater.
Rule 414.2 – Soil Decontamination	Sets requirements for the VOC emissions from the handling and decontamination activities of VOC contaminated soils.
Rule 419 - Nuisance	Restricts emissions that would cause nuisance or injury to people or property (identical to California Health and Safety Code 41700.
Rule 422 - New Source Performance Standards	Incorporates the Federal NSPS (40 CFR 60) rules by reference.
Rule 425.2 - Boilers, Steam Generators and Process Boilers (Oxides of Nitrogen)	This rule limits NOx emissions from boilers, steam generators, and process heaters to levels consistent with Reasonably Available Control Technology (RACT).
Rule 429.1 - Cooling Towers (Hexavalent Chromium)	Prohibits the use of hexavalent chromium-bearing compounds in cooling towers

SETTING

CLIMATE AND METEOROLOGY

The proposed BSEP site located in the Mojave Desert is relatively flat, with elevations ranging from approximately 2,220 feet above mean sea level (amsl) in the southwest to 2,025 feet amsl in the northeast. The Mojave Desert has a typical desert climate, having extreme daily temperature changes, low annual precipitation, strong seasonal winds, and mostly clear skies. The annual highest temperature in the Mojave Desert exceeds 100°F and the average daily temperature variation is approximately 30 degrees in the

summer and 25 degrees in the winter. Winter temperatures are more moderate, with mean maximum temperatures in the 60s and lows in the 30s. Nearby California City has a total average annual precipitation of less than seven inches (WC 2008). Over 70% of the precipitation occurs in the winter season, between December and March. However, occasional heavy precipitation occurs in the summer due to thunderstorms.

The applicant collected recent (2002 to 2004) meteorological data from the Mojave-Poole Street monitoring station, located approximately 17 miles south of the BSEP site. The average annual wind rose for these three years at this monitoring station shows a prevailing wind from west to northwest occurring approximately 45% of the time, and a second prominent winds direction from the southwest and west-southwest occurring 25% of the time. Considering the topography near the project site it is likely that the winds from the southwest and west-southwest are somewhat more prominent than at Mojave.

EXISTING AMBIENT AIR QUALITY

The Federal Clean Air Act and the California Clean Air Act both require the establishment of standards for ambient concentrations of air pollutants, called ambient air quality standards (AAQS). The state AAQS, established by the California Air Resources Board, are typically lower (more protective) than the federal AAQS, which are established by the United States Environmental Protection Agency (USEPA). The state and federal air quality standards are listed in **Air Quality Table 2**. The averaging times for the various air quality standards, the times over which they are measured, range from one-hour to an annual average. The standards are read as a concentration, in parts per million (ppm), or as a weighted mass of material per a volume of air, in milligrams or micrograms of pollutant in a cubic meter of air (mg/m^3 or $\mu g/m^3$, respectively).

Air Quality Table 2
Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standard	California Standard
Ozone (O_3)	8 Hour	0.075 ppm [a] (147 μg/m^3)	0.070 ppm (137 μg/m^3)
	1 Hour	—	0.09 ppm (180 μg/m^3)
Carbon Monoxide (CO)	8 Hour	9 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
	1 Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 μg/m^3)	0.03 ppm (57 μg/m^3)
	1 Hour	—	0.18 ppm (339 μg/m^3)
Sulfur Dioxide (SO_2)	Annual	0.030 ppm (80 μg/m^3)	—
	24 Hour	0.14 ppm (365 μg/m^3)	0.04 ppm (105 μg/m^3)
	3 Hour	0.5 ppm (1300 μg/m^3)	—
	1 Hour	—	0.25 ppm (655 μg/m^3)
Particulate Matter (PM10)	Annual	—	20 μg/m^3
	24 Hour	150 μg/m^3	50 μg/m^3
Fine Particulate Matter (PM2.5)	Annual	15 μg/m^3	12 μg/m^3
	24 Hour	35 μg/m^3	—
Sulfates (SO_4)	24 Hour	—	25 μg/m^3
Lead	30 Day Average	—	1.5 μg/m^3
	Calendar Quarter	1.5 μg/m^3	—
Hydrogen Sulfide (H_2S)	1 Hour	—	0.03 ppm (42 μg/m^3)
Vinyl Chloride (chloroethene)	24 Hour	—	0.01 ppm (26 μg/m^3)
Visibility Reducing Particulates	8 Hour	—	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70%.

Source: ARB 2008a.

In general, an area is designated as attainment if the concentration of a particular air contaminant does not exceed the standard. Likewise, an area is designated as non-attainment for an air contaminant if that contaminant standard is violated. In circumstances where there is not enough ambient data available to support designation as either attainment or non-attainment, the area can be designated as unclassified. The unclassified area is normally treated the same as an attainment area for regulatory purposes. An area could be attainment for one air contaminant while non-attainment for another, or attainment for the federal standard and non-attainment for the state standard for the same air contaminant.

The project site is located in the Mojave Desert Air Basin[2] and is under the jurisdiction of the Kern County Air Pollution Control District. The Kern County portion of the Mojave Air Basin is designated as non-attainment for the state ozone standards, the federal 8-hour ozone standard, and the state PM10 standards. This area is designated as attainment or unclassified for the state and federal CO, NOx, SOx, and PM2.5 standards and the federal PM10 standard. **Air Quality Table 3** summarizes the area's attainment status for various applicable state and federal standards. The ambient air quality standards that staff uses as a basis for determining project significance are health-based standards. They are set at levels to adequately protect the health of all members of the public, including those most sensitive to adverse air quality such as the aged, people with existing illnesses, and infants and children, while providing a margin of safety.

Air Quality Table 3
Federal and State Attainment Status
Kern County Portion of the Mojave Desert Air Basin

Pollutant	Attainment Status [a]	
	Federal	State
Ozone	Former Subpart 1 Nonattainment [b]	Moderate Nonattainment
CO	Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
PM10	Attainment	Nonattainment
PM2.5	Attainment	Attainment

Source: ARB 2008b, U.S. EPA 2008, U.S. EPA 2009.
[a] Attainment = Attainment or Unclassified.
[b] Kern County is in the process of being re-classified to moderate nonattainment of the federal 8-hour state ozone standard.

Ambient air quality monitoring data for ozone, PM10, PM2.5, CO, NO_2, and SO_2, compared to most restrictive applicable standards for the years between 2002 through 2007 (the last year that the complete annual data is currently available) at the most representative monitoring stations for each pollutant are shown in **Air Quality Table 4** and the 1-hour and 8-hour ozone, and 24-hour PM10 data for the years 1996 through 2007 are shown in **Air Quality Figure 1**. All ozone, PM10 and PM2.5 data shown are from Mojave-923 Poole Street monitoring station. All CO data are from the Lancaster-43301 Division Street monitoring station. NOx data for the years 2002-2004 are from the Mojave-923 Poole Street monitoring station and for the years 2005-2007 are from the Trona Athol and Telegraph monitoring station. All 24-hour SOx data are from the Trona Athol and Telegraph monitoring station.

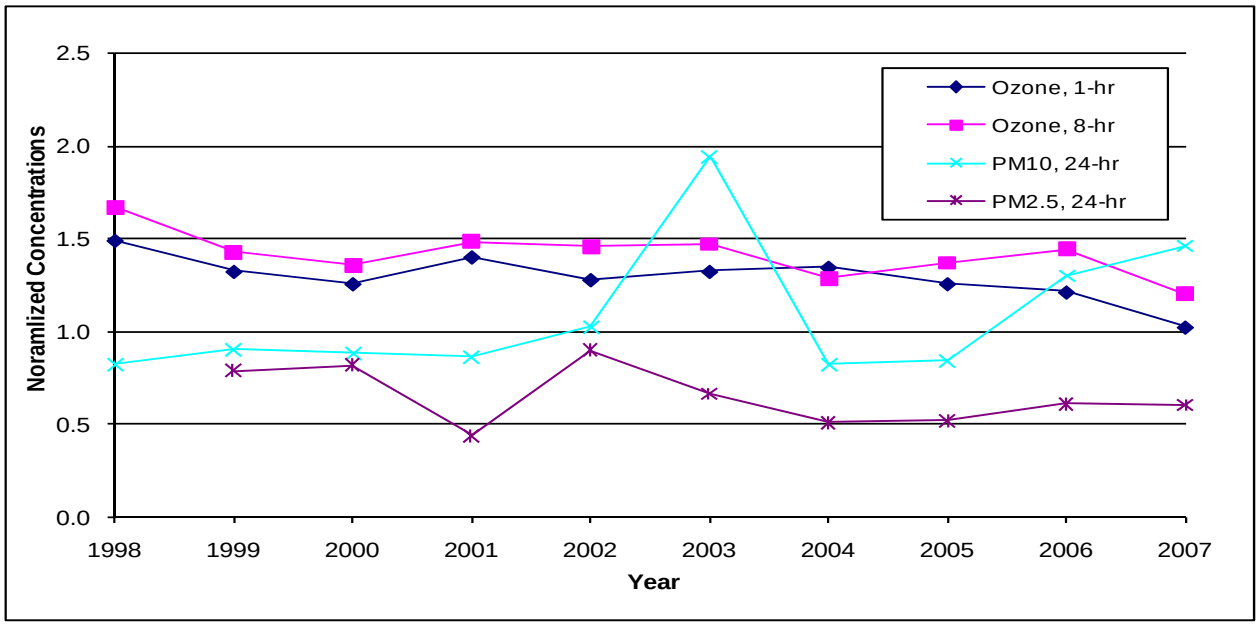
[2] The Mojave Desert Air Basin lies inland east of the San Joaquin Valley Air Basin to the west and north and east of the South Coast Air Basin. The desert portions of Kern, San Bernardino, Riverside, and Los Angeles counties are within its boundaries.

Air Quality Table 4
Criteria Pollutant Summary
Maximum Ambient Concentrations (ppm or µg/m^3)

Pollutant	Averaging Period	Units	2002	2003	2004	2005	2006	2007	Limiting AAQS
Ozone	1 hour	ppm	0.115	0.119	0.121	0.113	0.109	0.092	0.09
Ozone	8 hours	ppm	0.102	0.103	0.090	0.096	0.101	0.084	0.07
PM10 [a]	24 hours	µg/m^3	208	97.0	41.0	42.0	65.0	73.0	50
PM10	Annual	µg/m^3	21.4	19.3	18.3	--	19.5	--	20
PM2.5 [a]	24 hours	µg/m^3	31.4	23.2	17.8	18.1	21.3	21.1	35
PM2.5	Annual	µg/m^3	--	--	--	--	--	6.2 [b]	12
CO	1 hour	ppm	3.4	3.2	2.9	2.9	3.2	--	20
CO	8 hours	ppm	2.24	1.88	1.72	1.54	1.60	1.25	9.0
NO_2	1 hour	ppm	0.071	0.073	0.064	0.053	0.050	0.055	0.18
NO_2	Annual	ppm	0.009	0.009	0.008	0.005	0.004	0.004	0.03
SO_2	1 hour	ppm	0.012	0.008	0.019	0.018	0.033	--	0.25
SO_2	24 hours	ppm	0.007	0.003	0.005	0.004	0.004	0.005	0.04
SO_2	Annual	ppm	0.001	0.001	0.001	0.001	0.001	0.001	0.03

Source: ARB 2008c, ARB 2008d
Notes:
[a] Exceptional PM concentration events, such as those caused by wind storms may be included in the data presented.
[b] Annual average state PM2.5 data is not available from the Mojave Poole Street monitoring station, the value listed is a national annual average, where the previous year with a national annual average was 2001 with a value of 6.1 µg/m^3.

Air Quality Figure 1
1998-2007 Historical Ozone and PM Air Quality Data
Mojave Desert Air Basin



Source: ARB 2008c
Note: The exceptional PM10 event in 2002, believed to be caused by a wind storm or other natural phenomena, was replaced by the second highest concentration monitored in 2002. The highest measured ambient concentrations of various criteria air contaminants were divided by their applicable standard and provided as a graphical point. Any point on the chart that is greater than one means that the measured concentrations of such air contaminant exceed the standard, and any point that is less than one means that the respective standard is not exceeded for that year. For example the 1-hour ozone concentration in 1998 is 0.134 ppm/0.09 ppm standard = 1.49.

Ozone

Ozone is not directly emitted from stationary or mobile sources, but is formed as the result of chemical reactions in the atmosphere between directly emitted nitrogen oxides (NOx) and hydrocarbons (Volatile Organic Compounds [VOC]) in the presence of sunlight to form ozone. In general, the Western MDAB's elevated ozone concentrations are due to pollutant transport from the South Coast Air Basin (Los Angeles Area) and the San Joaquin Valley.

As **Air Quality Table 4** and **Air Quality Figure 1** indicate, the 1-hour and 8-hour ozone concentrations measured in Mojave have been slowly decreasing over time. The collected air quality data (not shown) indicate that the ozone violations occurred primarily during the sunny and hot periods typical during May through September.

Nitrogen Dioxide

The entire air basin is classified as attainment for the state and federal NO_2 standards. Approximately 90% of the NOx emitted from combustion sources is nitric oxide (NO), while the balance is NO_2. NO is oxidized in the atmosphere to NO_2, but some level of photochemical activity is needed for this conversion. The highest concentrations of NO_2 typically occur during the fall. The winter atmospheric conditions can trap emissions near the ground level, but lacking significant photochemical activity (sun light), NO_2 levels are relatively low. In the summer the conversion rates of NO to NO_2 are high, but the relatively high temperatures and windy conditions disperse pollutants, preventing the accumulation of NO_2. The NO_2 concentrations in the project area are well below the state and federal ambient air quality standards.

Carbon Monoxide

The area is classified as attainment for the state 1-hour and 8-hour CO standards. The highest concentrations of CO occur when low wind speeds and a stable atmosphere trap the pollution emitted at or near ground. The project area has a lack of significant mobile source emissions and has CO concentrations that are well below the state and federal ambient air quality standards.

Particulate Matter (PM10) and Fine Particulate Matter (PM2.5)

PM10 can be emitted directly or it can be formed many miles downwind from emission sources when various precursor pollutants interact in the atmosphere.

The area is non-attainment for the state PM10 standards, and is attainment for the federal PM10 standard. As shown in **Air Quality Figure 1**, PM10 concentrations were slightly below the state 24-hour PM10 standard for seven years in the recent 12-year history. The peak concentrations from 2002 through 2007 occurred during every season, although three of the years had peak concentrations in late summer. However, the highest of the peak concentrations occurred in the other three seasons and are likely to be due in part to high wind events. **Air Quality Figure 1** also indicates increasing PM10 concentrations since 2004.

Fine particulate matter, or PM2.5, is derived mainly from either the combustion of materials, or from precursor gases (SOx, NOx, and VOC) through complex reactions in the atmosphere. PM2.5 consists mostly of sulfates, nitrates, ammonium, elemental carbon, and a small portion of organic and inorganic compounds.

The Kern County portion of the Mojave Desert Air Basin is classified as attainment for both the state and the federal PM2.5 air quality standards, but not in attainment of the state PM10 standard. This divergence indicates that the ambient particulate matter levels are most likely due to localized fugitive dust sources, such as vehicles travel on unpaved roads, agricultural operations, or wind-blown dust.

Sulfur Dioxide

The entire air basin is classified as attainment for the state and federal SO_2 standards. Sulfur dioxide is typically emitted as a result of the combustion of a fuel containing sulfur. Sources of SO_2 emissions within the MDAB come from a wide variety of fuels: gaseous, liquid and solid; however, the total SO_2 emissions within the western MDAB are limited due to the limited number of major stationary sources and California's significant reduction in motor vehicle fuel sulfur content. The project area's SO_2 concentrations are well below the state and federal ambient air quality standards.

Summary

In summary, staff recommends the background ambient air concentrations in **Air Quality Table 5** for use in the modeling and impacts analysis. The maximum criteria pollutant concentrations from the past three years of available data collected at the monitoring stations within the Mojave Desert Air Basin are used to determine the recommended background values.

Air Quality Table 5
Staff Recommended Background Concentrations (µg/m^3)

Pollutant	Averaging Time	Recommended Background	Limiting Standard	Percent of Standard
NO_2	1 hour	103.6	339	31%
	Annual	9.5	57	17%
PM10	24 hour	73	50	146%
	Annual	19.5	20	98%
PM2.5	24 hour	17.8	35	57%
	Annual	6.2	12	52%
CO	1 hour	3,680	23,000	16%
	8 hour	1,778	10,000	18%
SO_2	1 hour	86.5	655	13%
	3 hour	77.8	1,300	6%
	24 hour	13.1	105	12%
	Annual	2.7	80	3%

Source: ARB 2008c, ARB 2008d, and Energy Commission Staff Analysis
Note: PM2.5 24-hour data shown in **Air Quality Table 4** are peak values; however, the standard is based on the three year average of the 98th percentile. The average of the available 98th percentile values from the period of 2005 to 2007 at the Mojave monitoring station was used as the basis for the PM2.5 24-hour background value.

Where possible, staff prefers that the recommended background concentrations come from nearby monitoring stations with similar characteristics. For this project the Mojave

monitoring station (ozone, PM10, PM2.5, and NO_2 [prior to 2005]) is located reasonably close to the project site and should be fairly representative of the more rural nature of the project site; while the Lancaster (CO) monitoring station is located in a more populated area and is located much closer to the influence of the South Coast Air Basin, so this monitoring location should provide conservatively high background concentrations for the project site, and the Trona (2005-2007 NOx and SO_2) monitoring station while located in a more remote area has two very large nearby emission sources of NOx and SOx (Searles Valley Minerals and Ace Cogeneration Company) so this monitoring station location should also provide conservatively high NOx and SOx background concentrations for the project site.

The background concentrations for PM10 are at or above the most restrictive existing ambient air quality standards, while the background concentrations for the other pollutants are all well below the most restrictive existing ambient air quality standards.

The pollutant modeling analysis was limited to the pollutants listed above in **Air Quality Table 5**; therefore, recommended background concentrations were not determined for the other criteria pollutants (ozone, lead, visibility, etc.).

PROJECT DESCRIPTION

The project would utilize two 30 million Btu/hr propane-fueled[3] auxiliary boilers to reduce startup time and to keep the temperature of the heat transfer fluid (HTF) above its freezing point (54 °F). The use of propane replaces the originally proposed use of natural gas and the need to construct a natural gas pipeline to the site. Propane will be trucked to the site and contained in two 18,000-gallon tanks.

The proposed solar energy facility would use an 11 cell wet cooling tower for power plant cooling. Water will be supplied from onsite groundwater wells, and will be treated as necessary for cooling tower and other onsite uses. On-site water treatment will include a post-treatment partial zero liquid discharge (ZLD) system that will increase water recycling and reduce the amount of raw water needed for the cooling tower make-up. The cooling tower purge water brine concentrate from the partial ZLD system will be piped to lined, onsite evaporation ponds that are sized to meet the solids generation for the life of the plant. Pond solids will be removed and shipped offsite for disposal in an appropriate landfill periodically dependent on the TDS concentration of the incoming raw water source.

The project would also have several other operating emission sources including: 1) twenty two 6,000-gallon HTF expansion tanks vented to a vapor control system; 2) an HTF vapor control system with carbon adsorption units is series; 3) a diesel-fueled 300 horsepower firewater pump engine for fire protection; 4) a contaminated soil bio-remediation area; 5) on-site mobile equipment needed for site maintenance (mirror

[3] For air quality permitting purposes the Kern County Air Pollution Control District is permitting the boilers to allow the use of Liquefied Petroleum Gases (LPG) which includes propane and mixtures of propane and butane. This provides slightly greater latitude for fuel procurement, but does not impact the required emission limits for the boilers. For the purposes of this analysis the term propane has been used consistently for the boiler fuel source.

washing) and operation; and 6) offsite vehicle emissions associated with truck hauling of raw materials (propane and water treatment chemicals) and pond wastes, and employee commute trips.

The project also includes new electrical interconnection to transmission system of the Los Angeles Department of Water and Power (LADWP). This will consist of the construction of a new, approximately 3.5-mile 230kV transmission line (of which approximately 1.6 miles will be within the 2,012-acre plant site boundary), that would run west from the power black across SR-14 and south across private property to the Barren Ridge Switching Station.

The applicant is currently proposing the use of groundwater from wells to be constructed onsite to supply plant site raw water needs. Therefore, no water pipeline is currently proposed to be constructed. Additionally process wastewater will kept onsite in evaporation ponds and sanitary wastewater will be sent to an onsite sanitary waste septic system, so no industrial waste water or sewer pipeline is proposed to be constructed. The raw water source may change to one or more of several other alternatives. These alternative raw water sources are reclaimed water from Rosamond or California City, or the use of ground water from the nearby Koehn Lake basin. If one of these alternative raw water sources are used then a water pipeline would need to be constructed from their source to the site.

Additionally, to meet Energy Commission staff recommendations, a second access road will be constructed for emergency access purposes. This emergency access road will be constructed from the northeast corner of the site to Neuralia Road.

PROJECT CONSTRUCTION

Beacon Solar Energy Project solar power plant would be constructed for approximately 25 months. Construction of the transmission line and the offsite access road would occur for three months and two months respectively, and all construction elements would occur concurrently. Construction emissions can be divided into two types; onsite emissions and offsite emissions. Onsite emissions results from site preparation and various construction activities using heavy-duty vehicles and equipment. Offsite emissions will occur from construction worker vehicles and material delivery trucks. The applicant's construction emission estimates are provided below in **Air Quality Tables 6** and **7**.

Air Quality Table 6
BSEP Construction - Maximum Daily Emissions [a]

Solar Facility Construction	Daily Emissions (lbs/day)					
	NOx	SOx	CO	VOC	PM10	PM2.5
Maximum Onsite Emissions	1037.3	0.9	714.4	119.3	215.7	102.9
Maximum Offsite Emissions	133.1	0.1	896.7	67.2	47.6	10.6
Maximum Daily Emissions	1089.4	1.0	1312.7	138.3	227.4	106.1
Transmissions Line Construction						
Construction Equipment	26.8	0.0	9.5	7.2	1.1	1.1
Onsite Motor Vehicle	3.2	0.0	1.3	0.3	76.9	16.4
Offsite Motor Vehicle	37.3	0.0	32.2	1.5	3.4	1.7
Maximum Total Emissions	67.3	0.1	43	9.0	81.4	19.2
Offsite Access Road Construction						
Maximum Daily Emissions	208.2	0.22	87.5	22.9	23.1	11.2
Material Delivery						
Heavy Delivery Trucks	108.92	0.12	33.99	8.26	7.03	4.84

Source: BS 2008a, DB 2008d, BS 2008g, DB 2009r and DB 2009t, and staff estimate for heavy delivery trips
[a] - The maximum daily emissions do not always occur on the same day for each pollutant or occur concurrently for the separate construction activities.

Air Quality Table 7
BSEP Construction - Total Emissions

Solar Facility Construction	Total Construction Emissions (tons)					
	NOx	SOx	CO	VOC	PM10	PM2.5
Onsite - Construction Equipment	93.19	0.09	105.84	12.19	4.76	4.25
Onsite - Motor Vehicle	0.72	0.00	1.19	0.14	0.02	0.02
Onsite - Asphaltic Paving	--	--	--	0.01	--	--
Onsite – Fugitive Dust	--	--	--	--	25.11	6.80
Onsite Subtotal	93.91	0.09	107.04	12.34	29.90	11.07
Offsite	18.27	0.01	132.21	10.03	7.03	1.40
Solar Facility Total	112.18	0.09	239.25	22.37	36.93	12.33
Transmissions Line Construction						
Construction Equipment	0.81	0.00	0.31	0.18	0.04	0.04
Onsite Motor Vehicle	0.06	0.00	0.03	0.01	0.00	0.00
Fugitive Dust	--	--	--	--	1.74	0.37
Offsite Motor Vehicle	0.66	0.00	0.77	0.04	0.02	0.02
Transmission Line Total	1.54	0.00	1.11	0.23	1.80	0.43
Offsite Access Road Construction						
Total Emissions	2.77	0.00	1.31	0.32	0.29	0.15
Material Delivery						
Heavy Delivery Trucks	13.42	0.01	4.19	1.02	0.87	0.60
Total Construction Emissions	129.91	0.10	245.86	23.94	39.89	13.51

Source: BS 2008a, DB 2008d, BS 2008g, DB 2009r and DB 2009t (assuming 22 days per month multiplied by the applicant's monthly emissions estimate for the offsite access road.)

Staff's review of the applicant's emission estimate indicates that there is a potential that the fugitive dust emissions have been underestimated due to a low silt content estimate used to determine the unpaved road dust and dozing/scraping/grading emission factors. The geotechnical report indicates that soil samples taken at shallow depths (5 feet at higher) had silt contents ranging from 12-60 percent. The silt content assumption used in the applicant's fugitive dust calculations was 7.5 percent. Additionally, the dust suppression control for unpaved road travel used for twice daily watering (68% control)

is identified as an SCAQMD approved value but it is not consistent with SCAQMD's currently documented water dust suppression control factor (55% control). However, staff believes that the recommended fugitive dust control mitigation measures, particularly the requirement to use soil stabilizers on the unpaved construction roads and on the unpaved plant roads as soon as they are constructed, will reduce the fugitive dust emission potential enough to compensate for these other emission estimate factors.

One aspect of the quantification of the construction emissions that were inadvertently not analyzed were the emissions associated with the delivery of the considerable amounts of construction materials such as the mirrors, the HTF heat collection elements and support structures. Staff has made a preliminary estimate that 2,465 trips from the Port of Long Beach/Los Angeles (round trip of 280 miles) will be necessary to bring in the solar trough and other engineered products with a maximum of ten trips per day[4]. The estimated total emissions from these truck trips have been added to **Air Quality Tables 6** and **7**. Approximately 25 percent of the added truck trip emissions would be emitted within eastern Kern County.

Alternative Water Source Construction Emissions

There are several potential alternative water sources that may be used for this project. These water source alternatives are as follows:

- Rosamond Alternative - reclaimed water piped from the City of Rosamond to the project site.
- CA City Alternative - reclaimed water piped from California City to the project site.
- Koehn Lake Alternative – groundwater piped from the Koehn Lake area to the project site.

Water pipelines would be necessary to be constructed from the source of each of these water supplies and for Koehn Lake water wells would have to be drilled. The length and size of these alternative water source pipelines would be as follows:

Water Source Alternative	Pipeline Length and Diameter
Rosamond Alternative	40 miles of 14 inch diameter pipe
CA City Alternative	16 miles of 12 inch diameter pipe
Koehn Lake Alternative	10 miles of 14 inch diameter pipe

The criteria pollutant emissions from the construction of these pipelines have been estimated using the applicant's original gas pipeline construction estimate where the ratio of the length and the diameter of the pipelines is used to interpolate the estimated

[4] This estimate is based on one truck trip for every 200 feet of solar trough, or 2,265 trips, plus an additional 200 truck trips to bring in the other engineered products (tanks, electrical equipment, etc.). Maximum daily trips are based on two times the number of trips averaged over the 25 month construction period assuming 5 days per week of delivery activity.

construction emissions. The gas pipeline was estimated to be a 17.6 mile long 8 inch pipeline. The alternative water source pipeline construction emissions for each of the three alternative water sources are provided in **Air Quality Table 8**.

Air Quality Table 8
BSEP Alternative Water Source Pipeline Construction - Total Emissions

Raw Water Source	Total Pipeline Construction Emissions (tons)					
	NOx	SOx	CO	VOC	PM10	PM2.5
Rosamond Alternative	72.32	0.08	76.77	11.89	15.81	6.61
CA City Alternative	25.95	0.03	27.55	4.27	5.67	2.37
Koehn Lake Alternative	18.92	0.02	20.09	3.11	4.14	1.73

Source: Staff estimate based on gas pipeline construction emissions from BS 2008a.

These construction emissions are a one-time event that would create temporary, adverse but, with the incorporation of staff recommended conditions of certification less than significant air quality impacts.

The alternative water source emission estimate only includes an estimate for pipeline construction. Well drilling emissions may also occur for the Koehn Lake Alternative if no existing wells can be used as is the case for the proposed onsite groundwater supply. Staff does not have enough information to provide an estimate of the well drilling emissions, but the overall magnitude is likely to be low in comparison to the pipeline construction emissions considering the shallow depth needed to pump brackish water from the vicinity of Koehn Lake, no more than 600 feet.

PROJECT OPERATION

The BSEP facility would be a nominal 250 Megawatt (MW) parabolic solar trough thermal solar electrical generating facility (BS 2008a). The direct air pollutant emissions from power generation are minimal; however, there are required auxiliary equipment and maintenance activities necessary to operate and maintain the facility.

The BSEP onsite stationary and mobile emission sources are as follows:

- Two 30 MMBtu propane-fueled boilers used to maintain the temperature of the heat transfer fluid (HTF) above freezing during cold months and pre-warming for daily startup year-round;
- An 11 cell cooling tower with a high efficiency mist eliminator;
- Onsite diesel and gasoline fueled maintenance vehicles used for mirror washing and other maintenance/operation support activities.
- A 300-bhp diesel-fired emergency fire water pump engine;
- Twenty two heat transfer fluid (HTF) expansion/ullage tanks with associated piping;
- An HTF system carbon adsorption based vapor emission control system;
- Spent HTF waste loadout; and
- A bio-remediation area to treat HTF contaminated soils.

The following assumptions were used to develop the hourly, daily, and annual emissions estimate for BSEP operation:

A. Maximum Hourly Emissions

- Both boilers, the cooling tower, the emergency fire pump engine, and HTF vent all operate for the full hour.
- There is one HTF waste loadout (using a truck) event.
- The maximum hourly use of the mirror wash truck, maintenance vehicles, weed abatement vehicle, and soil stabilization vehicles that operate for 24, 384, 40 and 40 miles per day, respectively, is one fifth of the daily mileage estimate.

B. Maximum Daily Emissions

- Both boilers operate for 14 hours per day.
- The cooling tower operates for 16 hours per day.
- The emergency fire pump engine operates for one hour per day.
- The HTF vent operates for two hours per day.
- There are two HTF waste loadout events per day.
- The mirror wash truck, maintenance vehicles, weed abatement vehicle, and soil stabilization vehicles operate for 24, 384, 40 and 40 miles per day, respectively.

C. Maximum Annual Emissions

- Both boilers operate for 1,000 hours per year.
- The cooling tower operates for 5,840 hours per year.[5]
- The emergency fire pump engine operates for 200 hours per year.
- The HTF vent operates for 730 hours per year.
- There are 12 HTF waste loadout events per year.
- The mirror wash truck, maintenance vehicles, weed abatement vehicle, and soil stabilization vehicles operate for 3,000, 96,000, 340, and 340 miles per year, respectively.

The BSEP onsite stationary source and mobile equipment emissions, including fugitive PM10 emissions, are estimated and summarized in **Air Quality Table 9**.

[5] This is a very conservative estimate. The applicant estimates that the actual operation of the cooling tower will be closer to 3,000 hours per year.

Air Quality Table 9
BSEP Operation - Maximum Hourly, Maximum Daily, and Annual Onsite Emissions[a]

	Maximum Hourly Emissions (lbs/hr)					
Emission Source	NOx	SOx	CO	VOC	PM10	PM2.5
Boilers 1 and 2 (combined emissions)	0.66	0.03	2.22	0.31	0.43	0.43
Cooling Tower	0.00	0.00	0.00	0.00	0.60	0.60
Emergency Fire Pump Engine	1.85	0.00	1.72	0.10	0.10	0.10
HTF Expansion Tanks and Fugitive Emissions	0.00	0.00	0.00	1.63	0.00	0.00
HTF Vent	0.00	0.00	0.00	0.63	0.00	0.00
Bio-Remediation Operation	0.00	0.00	0.00	0.00	0.00	0.00
Waste Loadout	0.00	0.00	0.00	7.07	0.00	0.00
Maintenance Vehicles (all types)	0.62	0.00	0.42	0.06	5.19	1.12
Total Maximum Hourly Emissions	3.13	0.03	4.36	9.80	6.32	2.25
Emission Source	Maximum Daily Emissions (lbs/day)					
Boilers 1 and 2 (combined emissions)	9.24	0.48	31.08	4.40	6.08	6.08
Cooling Tower	0.00	0.00	0.00	0.00	9.55	9.55
Emergency Fire Pump Engine	1.85	0.00	1.72	0.13	0.10	0.10
HTF Expansion Tanks and Fugitive Emissions	0.00	0.00	0.00	21.39	0.00	0.00
HTF Vent	0.00	0.00	0.00	1.25	0.00	0.00
Bio-Remediation Operation	0.00	0.00	0.00	0.10	0.00	0.00
Waste Loadout	0.00	0.00	0.00	14.15	0.00	0.00
Maintenance Vehicles (all types)	4.70	0.00	5.77	0.64	72.26	15.45
Total Maximum Daily Emissions	15.79	0.48	38.57	42.06	87.99	31.18
Emission Source	Annual Emissions (tons/year)					
Boilers 1 and 2 (combined emissions)	0.33	0.02	1.11	0.16	0.22	0.22
Cooling Tower	0.00	0.00	0.00	0.00	1.74	1.74
Emergency Fire Pump Engine	0.19	0.00	0.17	0.01	0.01	0.01
HTF Expansion Tanks and Fugitive Emissions	0.00	0.00	0.00	3.90	0.00	0.00
HTF Vent	0.00	0.00	0.00	0.23	0.00	0.00
Bio-Remediation Operation	0.00	0.00	0.00	0.02	0.00	0.00
Waste Loadout	0.00	0.00	0.00	0.08	0.00	0.00
Maintenance Vehicles (all types)	1.94	0.00	0.61	0.15	7.54	1.65
Total Annual Emissions	2.46	0.02	1.89	4.55	9.51	3.62

Source: BS 2008a, KCAPCD 2009
[a] The District included estimates of the fugitive VOC emissions from the HTF tanks and piping components and bio-remediation operation that were not included in the AFC, while they did not include an evaluation of the waste loadout and maintenance vehicle emissions, which staff has taken from the applicant's emission estimate in the AFC.

During the operation phase of the project, the facility's annual emissions are primarily generated from the two 30 MMBtu propane-fueled boilers, the 11 cell cooling tower (PM emissions), and the onsite maintenance vehicles. There are also occasionally high hourly or daily emissions and a small amount of annual emissions that result from the operation of the 300-bhp diesel-fired emergency fire water pump engine, the six heat transfer fluid (HTF) expansion/ullage tanks and piping system, and the HTF expansion tanks vapor control system, and spent HTF waste loadout.

The maximum daily boiler emissions are based on 14 hours per day per boiler, which is well above the expected average daily boiler use, which would be approximately two hours per day for pre-warming for daily startup and another 0.5 hours per day to 2.5 hours per day during cold months, October through February, for HTF freeze protection (DB 2008d). Freeze protection operation would be longer on extremely cold days, which is the basis for the maximum daily boiler use estimate.

Staff is concerned that the maintenance vehicle emissions required for the maintenance of this over 2,000 acre site could be underestimated, particularly the fugitive dust emissions, which like the construction emission estimates use emission factors that may not be properly calculated or use assumptions that properly reflect conditions at the site. Additionally, staff is concerned that the onsite contaminated soil bio-remediation area emissions are not properly estimated considering the vehicle/equipment emissions required to move the contaminated soils to the bio-remediation area, to mix the soils and treatment mixtures, and to remove the treated soils. Staff has recommended additional fugitive dust emission mitigation measures to minimize operating fugitive dust emission sources.

In addition to the onsite stationary and mobile emission sources there are a large number of assumed offsite deliveries for propane and water treatment chemicals and periodic evaporation pond solids waste haul trips. The BSEP offsite mobile emission sources are as follows:

- Propane delivery;
- Water treatment chemical delivery;
- Evaporation pond solids waste hauling; and
- Employee commuting.

The following assumptions were used by the applicant to develop the hourly, daily, and annual offsite mobile source emissions estimate for the BSEP operation:

A. Maximum Daily Emissions

- One propane delivery truck trip (160 mile round trip distance).
- Two chemical delivery truck trips (160 mile round trip distance).
- One nitrogen delivery truck trip (200 mile round trip distance).
- Twenty pond solids waste hauling trips (212 mile round trip distance).
- 60 employee trips (60 mile round trip distance).

B. Maximum Annual Emissions

- 131 propane delivery truck trips (160 mile round trip distance).
- 360 chemical delivery truck trips (160 mile round trip distance).
- 264 nitrogen delivery truck trips (200 mile round trip distance).
- 700 pond-solids waste hauling trips (212 mile round trip distance), which only occur every few years.
- 15,643 employee trips (60 mile round trip distance).

The BSEP offsite mobile source emissions, including fugitive PM10 emissions, are estimated and summarized in **Air Quality Table 10**.

Air Quality Table 10
BSEP Operation - Maximum Daily and Annual Offsite Emissions

	Maximum Daily Emissions (lbs/day)					
Emission Source	NOx	SOx	CO	VOC	PM10	PM2.5
Propane Delivery Trucks	6.22	0.01	1.94	0.47	0.40	0.26
Chemical Delivery Trucks	12.45	0.01	3.88	0.94	0.80	0.52
Nitrogen Delivery Trucks	7.78	0.01	2.43	0.59	0.50	0.32
Pond Solids Waste Haul Trucks	164.94	0.18	51.47	12.51	10.64	6.83
Employee Vehicles	6.16	0.00	42.12	3.12	3.72	0.90
Total Maximum Daily Emissions	197.54	0.20	101.85	17.64	16.07	8.82
Emission Source	Annual Emissions (tons/year)					
Propane Delivery Trucks	0.41	0.00	0.13	0.03	0.03	0.02
Chemical Delivery Trucks	1.12	0.00	0.35	0.08	0.07	0.05
Nitrogen Delivery Trucks	1.03	0.00	0.32	0.08	0.07	0.04
Pond Solids Waste Haul Trucks	2.89	0.00	0.90	0.22	0.19	0.12
Employee Vehicles	0.80	0.00	5.49	0.41	0.49	0.12
Total Annual Emissions	5.54	0.00	9.06	0.91	0.96	0.35

Source: DB 2009r, DB 2009t, and DB 2009z as revised by staff to correct errors and add employee vehicle emissions.

The offsite mobile source emissions estimate is conservative as it is based on 2009 average vehicle emission factors and these mobile source emissions should decrease over time due to vehicle turnover to newer lower emitting models.

Alternative Water Source Operating Emissions

The use of alternative water sources would impact air quality emissions as the alternative water sources would have higher or lower TDS levels than the applicant's proposed onsite water source, and this would either: 1) impact the cooling tower recirculating water TDS level and therefore impact the cooling tower particulate (PM10 and PM2.5) emissions; or 2) impact the amount of evaporation pond solids formed which would impact the number of pond solids waste haul trips.

It is unlikely that the Rosamond or CA City Alternative reclaimed water sources would have significantly higher TDS levels than the proposed onsite water source[6], so depending on the actual differences in TDS level, the impact of the partial ZLD water treatment system, and the cycles of concentration employed in the cooling tower the direct operating emissions from the cooling tower or pond solids waste hauling could be marginally higher or lower in comparison with the proposed water source. Staff does not have enough information to determine the likely emission increase or emission reduction for either of these direct emission sources.

The Koehn Lake Alternative will almost certainly increase direct operating emissions due to a significant increase in water TDS content. The maximum cooling tower emissions for the proposed onsite water source are based on a recirculating water total dissolved solids (TDS) concentration of 1,600 parts per million by weight (ppmw), which is also a specified limit in the conditions of certification. The applicant evaluated the use of Koehn Lake water and determined that without additional treatment it would increase

[6] Data for Rosamond (RLSD 2009a) and City of California (CofC 2009c) reclaimed water indicates that both reclaimed water supplies would have a TDS level of approximately 590 ppm versus the onsite groundwater TDS given by the applicant to range from 470 to 550 ppm.

TDS levels more than tenfold to 16,660 ppmw (DB 2009r), which at the same annual cooling tower usage estimate would increase annual PM10 emissions to more than 18 tons per year. However, the applicant noted in the second Preliminary Staff Assessment (PSA) workshop on July 1, 2009, that for this higher TDS level annual cooling tower operation basis was reduced to a less conservative and more realistic value of 3,300 hours per year providing an annual PM10/PM2.5 emission estimate of 10.22 tons/year, and the applicant also stated that regardless of the water supply quality the cooling tower and associated water treatment system would be operated in a manner to maintain project total stationary source particulate emission below 15 tons/year, which is the KCAPCD PM10 offset threshold.

Indirectly, these water source alternatives will decrease project efficiency through the requirement of additional electricity for pumping water from these sources to the site.

INITIAL COMMISSIONING AND CLOSURE

Initial commissioning refers to a period prior to beginning commercial operation when the equipment undergoes initial tests. Because of this project's use of a non-fuel fired generating technology staff does not expect significant changes in emissions from the facility commissioning activities compared to that of full production.

Eventually the facility would close, either as a result of the end of its useful life or through some unexpected situation such as a natural disaster or catastrophic facility breakdown. When the facility closes, all sources of air emissions would cease to operate and thus all impacts associated with those emissions would no longer occur. The only other expected emissions would be equipment and vehicle emissions and fugitive particulate emissions from the dismantling activities. These activities would be of much a shorter duration than construction of the project and would create reduced impacts from those evaluated for construction. However, fugitive dust controls would be necessary during the dismantling activities to mitigate potential short-term impacts.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Staff assessed three kinds of primary and secondary[7] impacts: construction, operational, and cumulative. Construction impacts result from the emissions occurring during site preparation and construction of the project. Operational impacts result from the emissions of the proposed project during normal operation, which includes all of the onsite auxiliary equipment (boilers, cooling tower, fire pump engine, etc.) and the maintenance vehicle emissions. Cumulative impacts result from the proposed project's incremental effect, together with other closely related past, present and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project. (Pub. Resources Code § 21083; Cal. Code Regs., tit. 14, §§ 15064(h), 15065(c), 15130, and15355.)

[7] Primary impacts potentially result from facility emissions of NOx, SOx, CO and PM10/2.5. Secondary impacts result from air contaminants that are not directly emitted by the facility but formed through reactions in the atmosphere that result in ozone, and sulfate and nitrate PM10/PM2.5.

METHOD AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

Staff used two main significance criteria in evaluating this project. First, all project emissions of nonattainment criteria pollutants and their precursors (NOx, VOC, PM10 and SO_2) are considered significant cumulative impacts that must be mitigated. Second, any AAQS violation or any contribution to any AAQS violation caused by any project emissions is considered to be significant and must be mitigated. For construction emissions, the mitigation that is considered is limited to controlling both construction equipment tailpipe emissions and fugitive dust emissions to the maximum extent feasible.

For operating emissions, when analyzing renewable projects with very low direct criteria pollutant emissions from stationary sources associated with electric generation that: 1) are located in areas with generally good air quality; and 2) are non-attainment of ambient air quality standards primarily or solely due to pollutant transport, the mitigation that is considered is limited to feasible emission controls. These feasible emission controls are applied to both the stationary sources (such as BACT) and the on-site non-stationary emission sources (such as maintenance vehicles) including associated fugitive dust emission sources.

The ambient air quality standards that staff uses as a basis for determining project significance are health-based standards established by the ARB and U.S. EPA. They are set at levels to adequately protect the health of all members of the public, including those most sensitive to adverse air quality impacts such as the aged, people with existing illnesses, children, and infants, including a margin of safety.

DIRECT/CUMULATIVE IMPACTS AND MITIGATION

While the emissions are the actual mass of pollutants emitted from the project, the impacts are the concentration of pollutants from the project that reach the ground level. When emissions are expelled at a high temperature and velocity through the relatively tall stack, the pollutants would be significantly diluted by the time they reach ground level. The emissions from the proposed project, both stationary source and onsite mobile source emissions, are analyzed through the use of air dispersion models to determine the probable impacts at ground level.

Air dispersion models provide a means of predicting the location and ground level magnitude of the impacts of a new emissions source. These models consist of several complex series of mathematical equations, which are repeatedly calculated by a computer for many ambient conditions to provide theoretical maximum offsite pollutant concentrations short-term (1-hour, 3-hour, 8-hour, and 24-hour) and annual periods. The model results are generally described as maximum concentrations, often described as a unit of mass per volume of air, such as micrograms per cubic meter ($\mu g/m^3$).

The applicant has used the EPA-approved ARMS/EPA Regulatory Model (AERMOD version 07026) air dispersion model to estimate the direct impacts of the project's NOx, PM10, CO, and SOx emissions resulting from project construction and operation.

Staff revised the background concentrations provided by the applicants, replacing them with the available highest ambient background concentrations for the last three years

from representative monitoring sites as show in **Air Quality Table 5**. Staff added the modeled impacts to these background concentrations then compared the results with the ambient air quality standards for each respective air contaminant to determine whether the project's emission impacts would cause a new violation of the ambient air quality standards or would contribute to an existing violation.

The inputs for the air dispersion models include stack information (exhaust flow rate, temperature, and stack dimensions), specific boiler emission data and meteorological data, such as wind speed, atmospheric conditions, and site elevation. For this project, the meteorological data used as inputs to the model included hourly wind speeds and directions measured at the Mojave Poole Street meteorological site during 2002 through 2004, which is the closest complete meteorological data source to the project site, and supplemented to fill missing data using the Lancaster William J. Fox Field Meteorological site. Concurrent upper air data from the Mercury Desert Rock Airport in Mercury, Nevada was also used. This meteorological data was approved for use by the KCAPCD. Additionally, the applicant obtained hourly ozone and NO_2 ambient data from the Mojave Poole Street monitoring station for 2002 to 2004 that was used in a more refined NO_2 impact modeling analysis using the Ozone Limiting Method (OLM) option that is available with AERMOD.

Construction Impacts and Mitigation

The following section discusses the project's short-term direct and cumulative construction ambient air quality impacts, as estimated by the applicant, and provides a discussion of appropriate mitigation.

Construction Impact Analysis

The applicant used the EPA guideline ARMS/EPA Regulatory Model (AERMOD) model to estimate ambient impacts. The emission sources for the construction site were grouped into two categories: equipment (off-road equipment); and vehicles (on-road equipment), where the exhaust and fugitive dust emissions for each type were added to the exhaust emissions for PM modeling. These two sources were modeled as rectangular 15 acre area sources, approximately 550 meters east-west and 110 meters north-south, near the center of the 2,000 acre site. The equipment area source was set at an initial release height of 3.7 meters and with an initial vertical dimension of 6.88 meters. The vehicle area source was set at an initial release height of 2.0 meters and with an initial vertical dimension of 2.13 meters.

Staff has reviewed the construction emissions air dispersion modeling procedures and has several concerns. First, the emissions were modeled as two overlaying 15 acre area sources quite some distance from the property fence line, while the project footprint covers much of the 2,000 acre site. Second, some of the emission inputs do not seem to match the maximum onsite emissions data provided by the applicant, such as the modeled NOx emissions that appear to be about 10% too low. Third, the initial release parameters, while reasonable for thermally buoyant engine exhausts, are likely too high for the fugitive dust sources for the PM10/PM2.5 modeling. Fourth, the use of small area sources concentrates the emissions, which may actually cause reduced dispersion to be estimated.

For the determination of one-hour average and annual average construction NOx concentrations the Ozone Limiting Method (OLM) was used to determine worst-case near field NO_2 impacts. The NOx emissions from internal combustion sources, such as diesel engines or gas turbines, are primarily in the form of nitric oxide (NO) rather than NO_2. The NO converts into NO_2 in the atmosphere, primarily through the reaction with ambient ozone, and NOx OLM assumes full conversion of stack NO emission with the available ambient ozone. The NOx OLM method used assumed an initial NO_2/NOx ratio of 0.1 for diesel equipment. Actual monitored hourly background ozone concentration data (2002 to 2004 Mojave Poole Street monitoring station data that corresponds with the meteorological files) were used by this modeling method to calculate maximum potential NO to NO_2 conversion to determine the maximum hourly NO_2 impacts.

Using estimated peak hourly, daily and annual construction equipment exhaust emissions, the applicant modeled construction emissions to determine impacts. To determine the construction impacts on ambient standards (i.e. 1-hour through annual) the on-site construction emission levels were modeled assuming that the emissions would occur during a daily construction schedule of 8 am to 4 pm. The predicted on-site emissions concentration levels were added to a conservatively estimated background of existing emission concentration levels to determine the cumulative effect. The results of the applicant's modeling analysis are presented in **Air Quality Table 11**. The construction modeling analysis includes both the onsite fugitive dust and vehicle exhaust emissions.

Air Quality Table 11
Maximum Project Construction Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [1] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	216.7	103.6	320.3	339	94%
	Annual	1.1	9.5	10.6	57	19%
PM10	24-hr	36.9	73	109.9	50	220%
	Annual	0.29	19.5	19.8	20	99%
PM2.5	24-hr	15.2	17.8	33.0	35	94%
	Annual	0.13	6.2	6.3	12	53%
CO	1-hr	1,371	3,680	5,051	23,000	22%
	8-hr	173.8	1,778	1,952	10,000	20%
SO_2	1-hr	1.6	86.5	88.1	665	13%
	3-hr	0.54	77.8	78.3	1300	6%
	24-hr	0.07	13.1	13.2	105	13%
	Annual	0.001	2.7	320.3	80	3%

Source: BS 2008a, BS 2008b.
Note
1. Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.

Staff's review of the applicant's modeling analysis found that the construction emissions were not well placed geographically within or around the site. This was particularly true for the annual modeling runs where all of the emissions were placed in a single 15 acre area near the center of the 2,000 acre site, which was not even centered on the main site facilities. Staff has completed a revised modeling analysis for NO_2 and PM10/PM2.5 impacts that increases the area of emissions and better places the majority of the

emissions over the site's main construction areas. The applicant's impact analysis along with a review of the emission estimates indicate that there is no potential for significant CO or SO_2 impacts with or without the on-site maintenance vehicle emissions, so they were not remodeled. The results of staff's modeling analysis are presented in **Air Quality Table 12.**

Air Quality Table 12
Project Construction Emission Impacts – Staff's Modeling Analysis

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr [b]	228.3	103.6	331.9	339	98%
	Annual [c]	2.0	9.5	11.5	57	20%
PM10	24-hr	74.2	73	147.2	50	294%
	Annual	0.76	19.5	20.3	20	101%
PM2.5	24-hr	4.40	17.8	22.2	35	63%
	Annual	0.20	6.2	6.4	12	53%

Source: Staff Analysis.
Notes:
[a] Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.
[b] The 1-hour NO_2 maximum was determined using NOx_OLM modeling and comparison of actual hourly NO_2 background with the modeled NO_2 impacts.
[c] The annual NO_2 results were corrected based on the U.S.EPA default ambient ratio method of 0.75 (NO_2/NOx).

Staff's modeling results indicate the potential for higher localized impacts from the construction activities than determined by the applicant. In particular there is a potential for elevated PM10 and NO_2 levels near the project fence line, including the potential for NO_2 impacts very close to the state 1-hour standard and further exacerbation of existing violations of the state PM10 standards. Staff notes that the maximum local background 24-hour measurements of PM10 may be significantly impacted by wind-blown dust. However, in light of the existing PM10 and ozone non-attainment status for the project site area, staff considers the construction NOx, VOC, and PM emissions to be potentially significant and, therefore, staff is recommending that the off-road equipment and fugitive dust emissions be mitigated to the extent feasible.

Construction Mitigation

Staff recommends that construction emission impacts be mitigated to the greatest feasible extent including all required measures from the District's rules and regulations, as well as, other measures considered necessary by staff to fully mitigate the construction emissions.

Applicant's Proposed Mitigation

To mitigate the impacts due to construction of the facility the applicant has proposed, or stipulated to, nearly identical conditions of certification as staff recommended mitigation measures **AQ-SC1** through **AQ-SC5**, as discussed below under staff proposed mitigation (BS 2008a). However, the versions of those measures, particularly **AQ-SC5** are somewhat dated versions of these staff recommended conditions.

Adequacy of Proposed Mitigation

The applicant has essentially stipulated to previous versions of staff's construction air quality mitigation conditions, so this stipulation is generally considered adequate with minor modifications to incorporate the latest staff recommendations and site specific concerns.

Staff Proposed Mitigation

Staff recommends construction PM10 and NOx emission mitigation measures as articulated in Conditions of Certification **AQ-SC1** through **AQ-SC5** that include modified versions of similar conditions proposed by the applicant in the AFC. In particular, the there are slight modifications to the fugitive dust controls necessary to control the higher fugitive dust emission potential for this type of project, and modifications to the off-road equipment mitigation measure to update it to both current staff standards and again in consideration of the high unmitigated emission potential for the construction of this project.

Staff recommends **AQ-SC1** to require the applicant to have an on-site construction mitigation manager who would be responsible for the implementation and compliance of the construction mitigation program. The documentation of the ongoing implementation and compliance with the construction mitigation program would be provided in the monthly construction compliance report that is required in staff's recommended Condition of Certification **AQ-SC2**.

Recommended Condition of Certification **AQ-SC3** formalizes the fugitive dust control requirements. These requirements include requiring paving of the main access road to the main power block before construction begins on that part of the site, and the requirement that durable non-toxic soil stabilizers be used on the onsite unpaved plant roads as soon as they are constructed.

Recommended Condition of Certification **AQ-SC4** would limit the potential offsite impacts from visible dust emissions, to respond to situations when the control measures required by **AQ-SC3** are not working effectively to control fugitive dust from leaving the construction site area.

Staff recommends Condition of Certification **AQ-SC5** to mitigate the PM and NOx emissions from the large diesel-fueled construction equipment. Implementation of this mitigation measure would provide additional primary and secondary PM mitigation to supplement the recommended fugitive dust mitigation measures. This condition requires the use of EPA/ARB Tier 2 engine compliant equipment for equipment over 100 horsepower where available, a good faith effort to find and use available EPA/ARB Tier 3 engine compliant equipment over 100 horsepower, and also includes equipment idle time restrictions and engine maintenance provisions. The Tier 2 standards include engine emission standards for NOx plus non-methane hydrocarbons, CO, and PM emissions; while the Tier 3 standards further reduce the NOx plus non-methane hydrocarbons emissions. The Tier 2 and Tier 3 standards became effective for engine/equipment model years 2001 to 2003 and models years 2006 to 2007, respectively, for engines between 100 and 750 horsepower.

Based on the relatively short-term nature of the worst-case construction impacts, and staff's recommendation of requiring all feasible construction emission mitigation measures, staff believes that the construction air quality impacts would be less than significant with the implementation of the mitigation measures contained in the recommended Conditions of Certification.

Alternative Water Source Construction Impact Analysis

The emissions from the construction of either the Rosamond pipeline or the California City pipeline would occur over long distances, and with staff's recommended construction mitigation measures would not cause significant air quality impacts. The emissions from well drilling (Koehn Lake alternative only) would be limited in duration, is not expected to be located near any existing receptors, and with staff's recommended construction mitigation measures would not cause significant air quality impacts.

Operational Impacts and Mitigation

The following section discusses the project's direct and cumulative ambient air quality impacts, as estimated by the applicant, and evaluated by staff. Additionally, this section discusses the recommended mitigation measures.

Operational Modeling Analysis

The applicant has provided a modeling analysis using the EPA-approved AERMOD model to estimate the impacts of the project's non-vehicular NOx, PM10, CO, and SOx emissions resulting from project operation (BS 2008a), which was updated after the PSA to consider the increased SOx emissions from the change to propane fueled boilers (DB 2009r, DB2009t). Additionally, after the PSA, the applicant remodeled the particulate emissions (PM10 and PM2.5) to include the onsite maintenance emission sources with their modeling results being somewhat higher than those predicted by staff in the PSA. Therefore, these new applicant modeled values are replacing the staff modeled values for PM10 and PM2.5 that were provided in the PSA. Similar to the assessment of construction impacts, staff added the modeled impacts to the available highest ambient background concentrations recorded during the previous three years from nearby monitoring stations to assess the project's operational impacts.

Staff tabulated the modeling analysis in **Air Quality Table 13**. The data show that the project's stationary sources do not cause any new violations of NO_2, PM2.5, CO or SO_2 air quality standards, even using the worst case ambient concentrations recorded.

Air Quality Table 13
Project Operation Emission Impacts – Applicant's Modeling Analysis

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	79.7	103.6	183.3	339	54%
	Annual	0.01	9.5	9.5	57	17%
PM10	24-hr	29.1	73	102.1	50	204%
	Annual	2.1	19.5	21.6	20	108%
PM2.5	24-hr	6.3	17.8	24,1	35	69%
	Annual	0.5	6.2	6.7	12	56%
CO	1-hr	75.4	3,680	3,755	23,000	16%
	8-hr	16.3	1,778	1,794	10,000	18%
SO_2	1-hr	5.2	86.5	91.7	665	14%
	3-hr	4.2	77.8	82.0	1300	6%
	24-hr	0.8	13.1	13.9	105	13%
	Annual	0.01	2.7	2.7	80	3%

Source: BS 2008a, BS 2008b, DB 2009r and DB 2009s.
Note:
[a] Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.

The applicant did not model the NOx emissions from the operational, on-site vehicles. Staff has completed a revised modeling analysis for NO_2 impacts that includes the on-site maintenance vehicle tailpipe emissions. The applicant's impact analysis along with a review of the emission estimates indicate that there is no potential for significant CO or SO_2 impacts with or without the on-site maintenance vehicle emissions, so they were not remodeled. The results of staff's modeling analysis are presented in **Air Quality Table 14.**

Air Quality Table 14
Project Operation Emission Impacts – Staff's Modeling Analysis

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	102.5	103.6	206.1	339	61%
	Annual	0.24	9.5	9.7	57	17%

Source: Staff Analysis.
Note:
[a] Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.

Staff's modeling analysis indicates higher short-term and long-term NO_2 impacts than estimated by the applicant. However, the results of both modeling analyses indicate that the project's stationary source operational impacts would not create violations of NO_2, PM2.5, SO_2, or CO standards, but could further exacerbate violations of the PM10 standards. In light of the existing PM10 and ozone non-attainment status for the project site area, staff considers the potential operating emissions to be potentially significant and, therefore, staff is recommending the emissions from both the stationary and maintenance activities be mitigated using feasible emission control measures.

Alternative Water Source Operational Modeling Analysis

The applicant provided a PM10 and PM2.5 modeling analysis to address increased cooling tower emissions associated with the Koehn Lake Alternative and their assumed increase in cooling tower water TDS levels for that water supply. The results of this analysis are provided in **Air Quality Table 15**.

Air Quality Table 15
Project Operation Particulate Emission Impacts – Koehn Lake Alternative

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
PM10	24-hr	29.1	73	102.1	50	204%
	Annual	2.3	19.5	21.8	20	109%
PM2.5	24-hr	6.3	17.8	24,1	35	69%
	Annual	0.6	6.2	6.8	12	57%

Source: DB 2009r and DB 2009s.
Note:
[a] Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.

These modeling results, as compared with those shown in **Air Quality Table 13**, show that the worst-case 24-hour PM10 and PM2.5 impacts are driven by other emissions sources than the cooling tower, and that the increase in cooling tower emissions from the Koehn Lake Alternative only marginally increase the worst-case receptor's annual PM10 and PM2.5 impacts that were determined for the proposed project.

Chemically Reactive Pollutant Impacts

The project will have direct emissions of chemically reactive pollutants (NOx, SOx, and VOC), but will also have indirect emission reductions associated with the reduction of fossil-fuel fired power plant emissions due to the project displacing the need for their operation. The exact nature and location of such reductions is not known; however, it is not unreasonable to assume that some of those reductions will occur in upwind areas such as the South Coast Air Basin since the electricity supplied by this project will be directed to LADWP transmission lines. However, the overall magnitude and downwind impact of those upwind emission reductions is speculative and staff's impact analysis has not considered these potential reductions as an offset source for the project's emissions, so the discussion below focuses on the direct emissions from the project within Kern County.

Ozone Impacts

The project's gaseous emissions of NOx, SO_2, VOC, and ammonia can contribute to the formation of secondary pollutants: ozone and PM10/PM2.5.

There are air dispersion models that can be used to quantify ozone impacts, but they are used for regional planning efforts where hundreds or even thousands of sources are input into the modeling to determine ozone impacts. There are no regulatory agency models approved for assessing single source ozone impacts. However, because of the known relationship of NOx and VOC emissions to ozone formation, it can be said that the emissions of NOx and VOC from the BSEP project do have the potential (if left

unmitigated) to contribute to higher ozone levels in the region. These impacts would be cumulatively significant because they would contribute to ongoing violations of the state and federal ozone ambient air quality standards.

PM2.5 Impacts

Secondary particulate formation, which is assumed to be 100% PM2.5, is the process of conversion from gaseous reactants to particulate products. The process of gas-to-particulate conversion, which occurs downwind from the point of emission, is complex and depends on many factors, including local humidity and the presence of air pollutants. The basic process assumes that the SOx and NOx emissions are converted into sulfuric acid and nitric acid first and then react with ambient ammonia to form sulfate and nitrate. The sulfuric acid reacts with ammonia much faster than nitric acid and converts completely and irreversibly to particulate form. Nitric acid reacts with ammonia to form both a particulate and a gas phase of ammonium nitrate. The particulate phase will tend to fall out; however, the gas phase can revert back to ammonia and nitric acid. Thus, under the right conditions, ammonium nitrate and nitric acid establish a balance of concentrations in the ambient air. There are two conditions that are of interest, described as *ammonia rich* and *ammonia poor*. The term ammonia rich indicates that there is more than enough ammonia to react with all the sulfuric acid and to establish a balance of nitric acid-ammonium nitrate. Further ammonia emissions in this case would not necessarily lead to increases in ambient PM2.5 concentrations. In the case of an ammonia poor environment, there is insufficient ammonia to establish a balance and thus additional ammonia would tend to increase PM2.5 concentrations.

The eastern Kern County portion of the Mojave Desert Air Basin has not undergone the rigorous secondary particulate studies that have been performed in other areas of California, such as the San Joaquin Valley, that have more serious fine particulate pollution problems. However, the available chemical characterization data shows that the annual ammonium nitrate and ammonium sulfate fine particulate concentrations in Lancaster from 1994 to 2001 were approximately 25% of the state annual ambient PM2.5 standard (ARB 2005). Because of the known relationship of NOx and SOx emissions to PM2.5 formation, it can be said that the emissions of NOx and SOx from the BSEP do have the potential (if left unmitigated) to contribute to higher PM2.5 levels in the region; however, the region is in attainment with PM2.5 standards and the low level of NOx and SOx emissions from this project would not significantly impact that status.

Impact Summary

The applicant is proposing to mitigate the project's stationary source NOx, VOC, SO_2, and PM10/PM2.5 emissions through the use of BACT. Additionally, staff recommends additional mitigation, specified in conditions of certification **AQ-SC6** and **AQ-SC7,** to reduce maintenance vehicle emissions, both tailpipe emission and fugitive dust emissions that could contribute to further ozone and PM10 violations.

In assessing the impacts of the two boilers, staff has analyzed when the units would operate on a routine basis and compare those impacts to ambient air quality conditions. Ozone violations typically occur between May and September. During that period, it would be expected that the boilers would be used to provide start-up steam demand

approximately two hours a day with NOx emissions of approximately 1.3 lbs/day and VOC emissions of about 0.6 lbs/day (DB 2008d). This level of emissions do not constitute a significant contribution to ozone formation. For PM10, although there may be some days during spring, summer and fall when the background levels of PM10 may exceed the standards, the very low emissions of approximately 0.6 lb/day would not contribute in a significant manner to those violations.

During the winter months, the boilers would be operated slightly more, about 2.5 hours more per day on average and as much as 14 hours per day to provide heat for the anti-freeze system for the heat transfer fluid (DB 2008d and BS2008a). During the winter, there are no violations of the ambient ozone standards, and thus the boilers NOx and VOC emissions would not contribute to any violations of the ozone standards. Even though very occasionally there are PM10 violations during the winter, the low level of emissions of PM10 (approximately 0.75 lb/day on average and 4.2 lbs/day maximum) would not contribute to a significantly to any PM10 violations. With the applicant proposed and staff recommended emission mitigation, it is staff's belief that the project would not cause significant secondary pollutant impacts.

Operations Mitigation

Applicant's Proposed Mitigation

Emission Controls

As discussed in the air quality section of the AFC (BS 2008a), the applicant proposes the following emission controls on the stationary equipment associated with the BSEP operation:

Boilers

The applicant's proposed Best Available Control Technology (BACT) for the two 30 MMBtu/hr boilers would include ultra-low NOx burners (for NOx), good combustion practices (for CO), and operate exclusively on CARB regulated propane (for VOC, PM and SOx) to limit boiler emission levels. The AFC (BS 2008a), Project Refinement Document (DB 2009r and DB 2009t), and FDOC conditions (KCAPCD 2009) provides the following BACT emission limits, each for the two boilers:

- NOx: 9.0 ppmvd at 3% O_2 (one-hour average)
- CO: 50 ppmvd at 3% O_2 (one-hour average)
- VOC: No specific concentration or emission limit
- PM10: No specific concentration or emission limit
- SO_2: No specific concentration or emission limit

Fire Water Pump Engine

The applicant's proposed Best Available Control Technology (BACT) for the fire pump engine is compliance with the New Source Performance Standards, Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion

Engines, specifically an NSPS compliant engine. To meet this requirement the applicant is proposing a CARB/EPA Tier 3 engine with the following emission limits:

- NOx: 3.0 grams per break horsepower (including non-methane hydrocarbons - NMHC)
- CO: 2.6 grams per break horsepower
- VOC: (see NOx above)
- PM10: 0.15 grams per break horsepower
- SO_2: 15 ppm sulfur content fuel

Cooling Tower

The applicant's proposed Best Available Control Technology (BACT) for the cooling tower is the use of a high efficiency mist eliminator with a guaranteed drift efficiency of 0.0005%.

HTF Expansion Tank Emissions

The applicant's proposed Best Available Control Technology (BACT) for the HTF Expansion Tank Emissions is a carbon adsorption unit with two carbon beds in series that will control VOC emissions by 99%.

Waste Loadout

The applicant has not proposed any specific emission controls for this minor emission source.

Contaminated Soils Bioremediation Area

The applicant has not proposed any specific emission controls for this minor emission source.

Maintenance Vehicles

The applicant has proposed to use only 2011 or later model year vehicles and to apply a soil binder to the on-site unpaved roads (DB 2009z).

Delivery Vehicles

The applicant has not proposed any specific emission controls for this emission source.).

Emission Offsets

The applicant has not proposed any emission offsets and the stationary source emissions for BSEP as currently proposed by the applicant would be well below District offset thresholds.

Adequacy of Proposed Mitigation

Staff concurs with the District's determination that the project's stationary source proposed emission controls/emission levels for criteria pollutants meets BACT requirements and that the proposed stationary source emission levels are reduced to

the lowest technically feasible levels. Staff's review of the applicant's emission estimates for their proposed vehicle fleet indicates that it is equivalent to staff's proposed vehicle mitigation included in the PSA; therefore, that mitigation measure has been modified to include the applicant's proposed vehicle mitigation.

Staff Proposed Mitigation

As mentioned earlier in the discussions of the ozone and PM10 impacts, staff believes that the project's direct stationary source ozone precursors and PM10 emissions are minimal, but along with the maintenance vehicles emissions and delivery vehicle would likely be significant if unmitigated. Additionally, staff believes a solar renewable project, which would have a 30 to 40-year life in a setting likely to continue to be impacted by both local and upwind emission sources, should address its contribution to potentially ongoing non-attainment status of the PM10 and ozone standards. Therefore, staff recommends formalizing the following three mitigation measures which applicant stipulated to, as well as, two additional mitigation measures recommended by staff:

- Require the use of model year 2011 or newer vehicles for onsite maintenance, or equivalently low emitting vehicles as long as those vehicles can be demonstrated to have a similar or lower emission profile than the applicant's proposed 2011 model year vehicles;
- Limit vehicle speeds within the facility to no more than ten miles per hour to address fugitive PM emissions from the site;
- Apply and maintain a non-toxic soil binder to the onsite unpaved roads to create a durable stabilized surface;
- Control techniques such as windbreaks, trackout controls, etc. should be identified in a fugitive dust control plan and used on areas that could be disturbed by vehicles or wind. Any windbreaks used would remain in place until the soil or road is stabilized: and
- Require heavy-duty diesel truck delivery and waste hauling contractors use newer diesel engines that meet or exceed CARB 2007 model year emission standards.

Staff recommendations for onsite maintenance vehicles and ongoing fugitive dust emissions control are specified in conditions of certification **AQ-SC6** and **AQ-SC7**, respectively. Staff recommendations for the offsite heavy haul truck emissions control is specified in condition of certification **AQ-SC9**.

Staff is proposing Condition of Certification **AQ-SC8** to ensure that the license is amended as necessary to incorporate changes to the air quality permits.

Staff has determined that the proposed emission controls and emission levels would mitigate all project air quality impacts to less than significant.

Staff has considered the minority population surrounding the site (see **Socioeconomics Figure 1**). Since the project's direct air quality impacts have been reduced to less than significant, there is no environmental justice issue for air quality.

Water Source Alternatives Operations Impact Analysis

Facility operating emissions would likely be similar if the two reclaimed water sources (Rosamond Alternative and CA City Alternative) were used, so with staff recommended mitigation the impacts would remain less than significant and no additional mitigation measures are recommended.

The applicant's analysis of worst case impacts from the Koehn Lake Alternative show only marginal increases in the worst-case PM10 and PM2.5 impacts. Therefore, with staff's recommended mitigation measures, the impacts would remain less than significant and no additional mitigation measures are recommended.

CUMULATIVE IMPACTS

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or . . . compound or increase other environmental impacts." (CEQA Guidelines, § 15355.) A cumulative impact consists of an impact that is created as a result of a combination of the project evaluated in the EIR together with other projects causing related impacts." (CEQA Guidelines, § 15130(a)(1).) Such impacts may be relatively minor and incremental, yet still be significant because of the existing environmental background, particularly when one considers other closely related past, present, and reasonably foreseeable future projects.

This analysis is concerned with criteria air pollutants. Such pollutants have impacts that are usually (though not always) cumulative by nature. Rarely would a project cause a violation of a federal or state criteria pollutant standard. However, a new source of pollution may contribute to violations of criteria pollutant standards because of the existing background sources or foreseeable future projects. Air districts attempt to attain the criteria pollutant standards by adopting attainment plans, which comprise a multi-faceted programmatic approach to such attainment. Depending on the air district, these plans typically include requirements for air offsets and the use of Best Available Control Technology (BACT) for new sources of emissions, and restrictions of emissions from existing sources of air pollution.

Much of the preceding discussion is concerned with cumulative impacts. The "Existing Ambient Air Quality" subsection describes the air quality background in the Kern County portion of the Mojave Desert Air Basin, including a discussion of historical ambient levels for each of the significant criteria pollutants. The "Construction Impacts and Mitigation" subsection discusses the project's contribution to the local existing background caused by project construction. The "Operation Impacts and Mitigation" subsection discusses the project's contribution to the local existing background caused by project operation. The following subsection includes two additional analyses:

- a summary of projections for criteria pollutants by the air district and the air district's programmatic efforts to abate such pollution;
- an analysis of the project's *localized cumulative impacts*, the project's direct operating emissions combined with other local major emission sources;

Summary of Projections

The eastern Kern County portion of the MDAB is designated as non-attainment for both federal (8-hour) and State (1-hour) ozone and state PM10 standards. All other criteria pollutants (NO_2, and SO_2, and PM2.5) are considered to be in attainment by the State, and in attainment and/or unclassified under federal standards.

The KCAPCD developed an ozone redesignation request and maintenance plan for the federal 1-hour ozone standard in 2003 (KCAPCD 2003). The eastern portion of Kern County was determined to be in attainment of the 1-hour ozone standard by the USEPA in 2004 and deemed a maintenance area (FR 2004). The District is in the process for being reclassified for the 8-hour ozone standard, so any initial 8-hour ozone standard attainment plan is not due to USEPA until sometime in 2009; however, the 1-hour ozone maintenance plan remains in force until such time as the 8-hour attainment plan is approved. The 1-hour ozone maintenance plan requires no new control measures for maintaining attainment of the 1-hour standard.

The KCAPCD California Clean Air Act Ozone Air Quality Attainment Plan was approved by the California Air Resources Board (CARB) on February 18, 1993. KCAPCD's most recent Annual Implementation Progress Report for this attainment plan was completed in 2005 (KCAPCD 2005), and will likely be updated at the same time as the initial federal 8-hour ozone attainment plan is due in 2009. The implementation progress report notes that the area is overwhelmingly impacted by upwind transport, with the majority of the ambient ozone pollution in the area being due to pollutants that are transported by the wind from the San Joaquin Valley and South Coast Air Basins. The implementation progress report indicates that no additional control measures are required for attainment of the ozone CAAQS, attainment will occur by reducing the pollution in these adjacent air basins.

Therefore, both the federal and State ozone management plans require no new control measures that would affect the proposed Project and compliance with existing KCAPCD rules and regulations during construction and operation would ensure conformance with the approved KCAPCD air quality management plans.

Summary of Conformance with Applicable Air Quality Plans

The applicable air quality plans do not outline any new control measures applicable to the proposed project's operating emission sources. Therefore, compliance with existing District rules and regulations would ensure compliance with those air quality plans.

Localized Cumulative Impacts

Since the power plant air quality impacts can be reasonably estimated through air dispersion modeling (see the "Operational Modeling Analysis" subsection) the project contributions to localized cumulative impacts can be estimated. To represent *past* and, to an extent, *present projects* that contribute to ambient air quality conditions, the Energy Commission staff recommends the use of ambient air quality monitoring data (see the "Environmental Setting" subsection), referred to as the *background*. The staff

takes the following steps to estimate what are additional appropriate “present projects” that are not represented in the background and “reasonably foreseeable projects”:

- First, the Energy Commission staff (or the applicant) works with the air district to identify all projects that have submitted, within the last year of monitoring data, new applications for an authority to construct (ATC) or permit to operate (PTO) and applications to modify an existing PTO within six miles of the project site. Based on staff’s modeling experience, beyond six miles there is no statistically significant concentration overlap for non-reactive pollutant concentrations between two stationary emission sources.
- Second, the Energy Commission staff (or the applicant) works with the air district and local counties to identify any new area sources within six miles of the project site. As opposed to point sources, area sources include sources like agricultural fields, residential developments or other such sources that do not have a distinct point of emission. New area sources are typically identified through draft or final Environmental Impact Reports (EIRs) that are prepared for those sources. The initiation of the EIR process is a reasonable basis on which to determine what is “reasonably foreseeable” for new area sources.
- The data submitted, or generated from the applications with the air district for point sources or initiating the EIR process for area sources, provides enough information to include these new emission sources in air dispersion modeling. Thus, the next step is to review the available EIR(s) and permit application(s), determine what sources must be modeled and how they must be modeled.
- Sources that are not new, but may not be represented in ambient air quality monitoring are also identified and included in the analysis. These sources include existing sources that are co-located with or adjacent to the proposed source (such as an existing power plant). In most cases, the ambient air quality measurements are not recorded close to the proposed project, thus a local major source might not be well represented by the background air monitoring. When these sources are included, it is typically a result of there being an existing source on the project site and the ambient air quality monitoring station being more than two miles away.
- The modeling results must be carefully interpreted so that they are not skewed towards a single source, in high impact areas near that source’s fence line. It is not truly a cumulative impact of the BSEP if the high impact area is the result of high fence line concentrations from another stationary source and BSEP is not providing a substantial contribution to the determined high impact area.

Once the modeling results are interpreted, they are added to the background ambient air quality monitoring data and thus the modeling portion of the cumulative assessment is complete. Due to the use of air dispersion modeling programs in staff’s cumulative impacts analysis, the applicant must submit a modeling protocol, based on information requirements for an application, prior to beginning the investigation of the sources to be modeled in the cumulative analysis. The modeling protocol is typically reviewed, commented on, and eventually approved in the Data Adequacy phase of the licensing procedure. Staff typically assists the applicant in finding sources (as described above), characterizing those sources, and interpreting the results of the modeling. However, the actual modeling runs are usually left to the applicant to complete. There are several

reasons for this: modeling analyses take time to perform and require significant expertise, the applicant has already performed a modeling analysis of the project alone (see the "Operational Modeling Analysis" subsection), and the applicant can act on its own to reduce stipulated emission rates and/or increase emission control requirements as the results warrant. Once the cumulative project emission impacts are determined, the necessity to mitigate the project emissions can be evaluated, and the mitigation itself can be proposed by staff and/or the applicant (see the "Mitigation" subsection).

The applicant, in consultation with Kern County Planning Department and the District, has conducted a survey of new development projects and stationary sources that have potential for emissions of criteria air contaminants within six miles of the project site that are either under construction, or have received permits to be built or operate in the foreseeable future. The survey results indicate that no such stationary sources exist within the six miles radius[8] of the proposed project site. Two non-stationary projects, the Los Angeles Department of Water and Power (LADWP) Pine Tree Wind Development Project and the LADWP Barren Ridge-Castaic Transmission Project, are located within six miles of the project site. These two projects would have temporary construction emissions and limited operating emissions consisting of inspection and maintenance operations.

The Pine Tree Wind Development Project, which is located approximately six miles west of the site in rugged topography, is currently under construction and scheduled to be in service in July 2009. Therefore, its construction would not significantly overlap the construction of the BSEP. Additionally, the maintenance emissions are not considered to be of a magnitude, given they would occur six miles from the BSEP site, to affect the modeling analysis on a cumulative basis.

The Barren Ridge-Castaic project, which has not yet completed its environmental review and licensing/permitting process, may or may not have construction activities that overlap the BSEP construction. However, those construction activities as a long linear project will be limited in duration and scope near the project site, and the operating inspection/maintenance emissions near the project site would be minimal. Therefore, this project's emissions are not considered to be of a magnitude or duration to affect the modeling analysis on a cumulative basis.

Staff has considered the minority population surrounding the site (see **Socioeconomics Figure 1**). Since the project's cumulative air quality impacts have been mitigated to less than significant, there is no environmental justice issue for air quality.

COMPLIANCE WITH LORS

The Kern County Air Pollution Control District issued a Preliminary Determination of Compliance (PDOC) for the BSEP on December 23, 2008 (KCAPCD 2008), a Final Determination of Compliance (FDOC) on March 5, 2009 (KCAPCD 2009a), and a revised FDOC incorporating the applicant's project refinements that was issued on

[8] Staff assumes that impacts from projects beyond six miles would not affect the modeling analysis on a cumulative basis.

August 6, 2009 (DB 2009dd). Compliance with all District rules and regulations was demonstrated to the District's satisfaction in the DOC. The District's FDOC conditions are presented in the Conditions of Certification (**AQ-1** to **AQ-79**).

Energy Commission staff provided comments on the PDOC to the District on January 20, 2009 (CEC 2009u). Staff has found that the revisions made to the FDOC adequately address staff's comments.

FEDERAL

The District is responsible for issuing the federal New Source Review (NSR) permit and has been delegated enforcement of the applicable New Source Performance Standard (Subpart IIII). Additionally, this project would not require a PSD permit from U.S. EPA prior to initiating construction.

STATE

The applicant would demonstrate that the project would comply with Section 41700 of the California State Health and Safety Code, which restricts emissions that would cause nuisance or injury, with the issuance of the District's Final Determination of Compliance and the Energy Commission's affirmative finding for the project. In the FDOC, the District concluded that the project should comply with this requirement as the screening health risk assessment they performed found risks to be below a Prioritization Score of 1.0, or below the need for any additional analysis or action.

The fire pump engine is also subject to the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines. This measure limits the types of fuels allowed, established maximum emission rates, establishes recordkeeping requirements. The proposed Tier 3 engine meets the emission limit requirements of this rule. This measure would also limit the engine's testing and maintenance operation to 50 hours per year.

LOCAL

The District rules and regulations specify the emissions control and offset requirements for new sources such as the BSEP. Best Available Control Technology would be implemented, and emission reduction credits (ERCs) are not required to offset the project's emissions by District rules and regulations based on the permitted stationary source emission levels for this project. Compliance with the District's new source requirements would ensure that the project would be consistent with the strategies and future emissions anticipated under the District's air quality attainment and maintenance plans.

The applicant provided an air quality permit application to the KCAPCD in April 2008 and the District issued a PDOC (KCAPCD 2008) on December 23, 2008, a FDOC (KCAPCD 2009a) on March 5, 2009, and a revised FDOC (DB 2009dd) issued on August 6, 2009. The FDOC states that the proposed project is expected to comply with all applicable District rules and regulations. The DOC evaluates whether and under what conditions the proposed project would comply with the District's applicable rules and regulations, as described below.

Regulation II – Permits

Rule 210.1 – New and Modified Stationary Source Review

This rule establishes the stationary source[9] requirements that must be met to obtain a PTO, including the requirement to comply with best available control technology (BACT), provide emission offsets for emission increase above specified thresholds; and provide a dispersion modeling analysis, an alternatives analysis, and a compliance certification (if applicable). In the FDOC, the District has determined that the proposed controls for the boilers, cooling tower, tank vent system, and firewater pump engine meet BACT requirements. The District has also determined that an inspection and maintenance program limiting VOC leaks on the HTF Piping Network component to less than 100 ppm would be BACT.

The BSEP, as a minor stationary source, does not require offsets, require a dispersion modeling, analysis, or require a compliance certification per District Rule 210.1.

Regulation IV – Prohibitions

Rule 401 - Visible Emissions

This rule limits visible emissions from emissions sources, including stationary source exhausts and fugitive dust emission sources. In the FDOC, the District has determined that the facility is expected to comply with this rule.

Rule 402 - Fugitive Dust

This rule limits fugitive emissions from certain bulk storage, earthmoving, construction and demolition, and manmade conditions resulting in wind erosion. With the implementation of recommended staff condition **AQ-SC7** the facility is expected to comply with this rule.

Rule 404.1 - Particulate Matter Concentration

The rule limits particulate matter (PM) emissions to less than 0.1 grains per standard cubic foot of gas at standard conditions. In the FDOC, the District has determined that the applicable equipment's (boiler, fire pump engine, cooling tower) PM emission concentration are less than 0.001 gr/scf and so will be well below the limits established by this rule.

Rule 407 - Sulfur Compounds

This rule limits discharge into the atmosphere of sulfur compounds exceeding 0.2% by volume concentration calculated as SO_2. In the FDOC, the District has determined that the use of California standard liquefied petroleum gas (including liquefied propane) and California diesel fuel in the boilers and fire pump engine, respectively, will ensure compliance with this rule.

[9] The maintenance vehicles are not stationary sources and are not subject to District rules.

Rule 409 - Fuel Burning Equipment - Combustion Contaminants

This rule limits discharge into the atmosphere from fuel burning equipment combustion contaminants exceeding in concentration at the point of discharge, 0.1 grain per cubic foot of gas calculated to 12% of carbon dioxide (CO_2) at standard conditions. In the FDOC, the District has determined that the applicable equipment's (boiler and fire pump engine) PM emission concentration are less than 0.001 gr/scf and so will be well below the limits established by this rule.

Rule 411 – Storage of Organic Liquids

This rule sets standards for storage of organic liquids with a true vapor pressure of 1.5 pounds per square inch or greater. The HTF storage/expansion tanks will be equipped with a vapor control system; therefore, the requirements of this rule do not apply.

Rule 414.2 – Soil Decontamination

This rule sets requirements for the VOC emissions from the handling and decontamination activities of VOC contaminated soils. In the FDOC, the District has determined that the on-site bio-remediation area will comply with "Maximum Allowable Addition Rates of Contaminated Soil" (Section V.B) and "Treatment System" (Section V.C) requirements of this rule, and that the applicant is proposing a "Land Farming" operation using bio-remediation to comply with BACT and the requirements of this rule.

Rule 419 – Nuisance

This rule restricts emissions that would cause nuisance or injury to people or property (identical to California Health and Safety Code 41700). In the FDOC, the District has determined that, due to control devices and inspection and maintenance requirements contained in the District conditions, compliance with this rule was expected.

Rule 422 - New Source Performance Standards

This rule incorporates the Federal NSPS (40 CFR 60) rules by reference. The proposed Tier 3 engine meets the emission limit requirements of the only NSPS ((Subpart IIII) that applies to the proposed BSEP equipment.

Rule 425.2 - Boilers, Steam Generators and Process Boilers (Oxides of Nitrogen)

This rule limits NOx emissions from boilers, steam generators, and process heaters to levels consistent with Reasonably Available Control Technology (RACT). The projects proposed boiler BACT emission controls provide emission levels in compliance with this Rule's RACT requirements.

Rule 429.1 - Cooling Towers (Hexavalent Chromium)

This rule prohibits the use of hexavalent chromium-bearing compounds in cooling towers. Enforcement of District Condition **AQ-14** will ensure compliance with this regulation.

NOTEWORTHY PUBLIC BENEFITS

Renewable energy facilities, such as the BSEP, are needed to meet California's mandated renewable energy goals.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency comments were received on the PSA Air Quality analysis. The intervenor, California Unions for Reliable Energy (CURE), did provide comments (ABJC 2009f). The applicant also provided comments and those comments have been addressed as considered appropriate within this Final Staff Assessment (FSA). Responses to the CURE PSA Air Quality analysis comments are provided below.

California Unions for Reliable Energy (CURE)

Comment 1 (p. 14)
CURE contends that the PSA was insufficient for many reasons, including the following staff discussion in the Air Quality Section of the PSA.

"Staff's review of the applicant's emission estimate indicates that there is a potential that the fugitive dust emissions have been underestimated due to a low silt content estimate used to determine the unpaved road dust and dozing/scraping/grading emission factors. . . . One aspect of the quantification of the construction emissions that were inadvertently not analyzed were the emissions associated with the delivery of the considerable amounts of material….to the site. An accurate accounting of those emissions within Kern County needs to be considered and will be presented in the Final Staff Assessment."

Response: These two construction emission calculation issues did not impact staff's assessment, as staff recommended feasible mitigation to control construction emissions in the PSA and continues to recommend feasible mitigation to control construction emissions. The FSA has been updated to note that the significance findings and mitigation measures are not impacted by the noted potential errors in the construction emission calculations, and has been updated to provide the full emission accounting of the estimated offsite construction traffic.

Comment 2 (p. 65)
CURE contends that air quality mitigation is improperly deferred without specifying performance measures, specifically citing mitigation measures **AQ-SC2** through **AQ-SC7**, and requests that the Air Quality Construction Mitigation Plan and site dust control plan (operations) be incorporated now rather than developed prior to construction and operation, respectively.

Response: These two conditions refer to fourteen specific fugitive dust control requirements that must be implemented where applicable. Therefore, staff does not believe that this mitigation is deferred. However, the mitigation plans are allowed to be submitted at times that are reasonable for the applicant, in order to incorporate necessary input from the prime construction and operations contractors.

Comment 3 (p. 65, 66)
CURE contends that several of the air quality mitigation measures are worded ambiguously, specifically citing AQ-SC3(H) and AQ-SC5(F).

Response: Staff has reviewed the mitigation measures and has made revisions to address CURE's issue and clarify the mitigation measures including revising the two specifically cited measures.

Comment 4 (p. 66, 67)
CURE contends that additional construction mitigation measures should be required, including the several measures identified in the CEQA handbook or related emission mitigation measure documents developed by San Luis Obispo County Air Pollution Control District, San Joaquin Valley Air Pollution Control District, Santa Barbara County Air Pollution Control District, and Sacramento Metropolitan Air Quality Management District. These measures would include: installation of tailpipe controls on diesel engines, requiring electrification where feasible, scheduling truck trips outside of peak hours, use alternatively fueled vehicles, curtailing construction during periods of high ambient concentrations, requiring minimum practical engine size, and demonstrating that the heavy-duty off-road vehicles will achieve average 20 percent reduction in NOx and 45 percent reduction in PM emissions in comparison with CARB fleet averages. This comment relates primarily to proposed staff condition **AQ-SC5**.

Response: Staff's believes that the proposed mitigation measure (**AQ-SC5**) represents feasible emission control levels for the offroad engines by requiring newer cleaner engines be used, rather than older engines that require tailpipe emission controls, and that this mitigation measure can be reasonably implemented and enforced. Staff believes that this recommended mitigation measure would control the offroad diesel engine emissions as effectively as the Sacramento Metropolitan Air Quality Management District quoted project fleet wide reduction of in comparison with ARB fleet averages (20 percent reduction in NOx and 45 percent reduction in PM emissions). Additionally, this measure requires the use of electric vehicles where feasible and would allow, when they can meet required EPA Tier emission standards, the use of alternatively fueled vehicles. Staff does not believe that restrictions on truck trip scheduling would be an effective mitigation measure considering that the highest ambient impacts in the area of the project site are primarily from pollutant transport or wind events that do not follow a set daily schedule.

CONCLUSIONS

Staff has made the following conclusions about the BSEP:

- The project would comply with applicable District Rules and Regulations, including New Source Review requirements, and staff recommends the inclusion of the Districts FDOC conditions as Conditions of Certification **AQ-1** through **AQ-79**.
- The project's construction activities, if unmitigated, would likely contribute to significant adverse PM10 and ozone impacts. Staff recommends **AQ-SC1** to **AQ-SC5** to mitigate the potential impacts.

- The project's operation would not cause new violations of any NO_2, SO_2, PM2.5 or CO ambient air quality standards, and therefore, the project's direct operational NOx, SOx, PM2.5 and CO emission impacts are not significant.
- The project's direct and indirect, or secondary emissions contribution to existing violations of the ozone and PM10 ambient air quality standards are likely significant if unmitigated. Therefore, staff recommends **AQ-SC6** to mitigate the onsite maintenance vehicle emissions, **AQ-SC7** to mitigate the operating fugitive dust emissions, and **AQ-SC9** to mitigate emissions from heavy duty haul trips for supplies and wastes that require more than 40 trips per year to ensure that the potential ozone and PM10 impacts are mitigated to less than significant over the life of the project.
- The water source alternatives would have adverse criteria pollutant impacts in comparison with the proposed project but, with staff's recommended mitigation measures for the proposed project, would have less than significant impacts to air quality.
- The project would be consistent with the requirements of SB 1368 and the Emission Performance Standard for greenhouse gases (see **Appendix Air-1**).

PROPOSED CONDITIONS OF CERTIFICATION

STAFF CONDITIONS OF CERTIFICATION

AQ-SC1 Air Quality Construction Mitigation Manager (AQCMM): The project owner shall designate and retain an on-site AQCMM who shall be responsible for directing and documenting compliance with Conditions of Certification **AQ-SC3**, **AQ-SC4** and **AQ-SC5** for the entire project site and linear facility construction. The on-site AQCMM may delegate responsibilities to one or more AQCMM Delegates. The AQCMM and AQCMM Delegates shall have full access to all areas of construction on the project site and linear facilities, and shall have the authority to stop any or all construction activities as warranted by applicable construction mitigation conditions. The AQCMM and AQCMM Delegates may have other responsibilities in addition to those described in this condition. The AQCMM shall not be terminated without written consent of the Compliance Project Manager (CPM).

Verification: At least 60 days prior to the start of ground disturbance, the project owner shall submit to the CPM for approval, the name, resume, qualifications, and contact information for the on-site AQCMM and all AQCMM Delegates.

AQ-SC2 Air Quality Construction Mitigation Plan (AQCMP): The project owner shall provide an AQCMP, for approval, which details the steps that will be taken and the reporting requirements necessary to ensure compliance with Conditions of Certification **AQ-SC3**, **AQ-SC4, AQ-SC5** and **AQ-SC6**.

Verification: At least 60 days prior to the start of any ground disturbance, the project owner shall submit the AQCMP to the CPM for approval. The CPM~~District~~ will notify the project owner of any necessary modifications to the plan within 30 days from the date of receipt.

AQ-SC3 Construction Fugitive Dust Control: The AQCMM shall submit documentation to the CPM in each Monthly Compliance Report that demonstrates compliance with the following mitigation measures for the purposes of minimizing fugitive dust emissions due to construction activities. Any deviation from the following mitigation measures shall require prior CPM notification and approval.

A. The main access road through the facility to the power block area will be paved prior to initiating construction in the main power block area, and the LPG/propane and chemical delivery areas will be paved prior to taking initial deliveries.

B. All unpaved construction roads and unpaved operational site roads, as they are being constructed, shall be stabilized with the CARB certified Soil-Sement® product, or another non-toxic soil stabilizer that can be determined to be both as efficient for fugitive dust control and that would not increase any other environmental impacts. All other disturbed areas in the project and linear construction sites shall be watered as frequently as necessary to comply with the dust mitigation objectives of Condition of Certification **AQ-SC4**. The frequency of watering can be reduced or eliminated during periods of precipitation.

C. No vehicle shall exceed 10 miles per hour within the construction site.

D. Visible speed limit signs shall be posted at the construction site entrances.

E. All construction equipment vehicle tires shall be inspected and washed as necessary to be cleaned free of dirt prior to entering paved roadways.

F. Gravel ramps of at least 20 feet in length must be provided at the tire washing/cleaning station.

G. All unpaved exits from the construction site shall be graveled or treated to prevent track-out to public roadways.

H. All construction vehicles shall enter the construction site through the treated entrance roadways, unless an alternative route has been submitted to and approved by the CPM~~District~~.

I. Construction areas adjacent to any paved roadway shall be provided with sandbags or other equivalently effective measures to prevent run-off to roadways, or other similar run-off control measures as specified in the Storm Water Pollution Prevention Plan (SWPPP), only when such SWPPP measures are necessary so that this condition does not conflict with the requirements of the SWPPP.

J. All paved roads within the construction site shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs to prevent the accumulation of dirt and debris.

K. At least the first 500 feet of any paved public roadway exiting the construction site or exiting other unpaved roads en route from the construction site or construction staging areas shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs or on any other day when dirt or runoff resulting from the construction site activities is visible on the public paved roadways.

L. All soil storage piles and disturbed areas that remain inactive for longer than 10 days shall be covered, or shall be treated with appropriate dust suppressant compounds.

M. All vehicles that are used to transport solid bulk material on public roadways and that have potential to cause visible emissions shall be provided with a cover, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to provide at least one foot of freeboard.

N. Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) shall be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition shall remain in place until the soil is stabilized or permanently covered with vegetation.

Verification: The AQCMM shall provide the CPM a monthly compliance report to include:

1. a summary of all actions taken to maintain compliance with this condition;

2. copies of any complaints filed with the District in relation to project construction; and

3. any other documentation deemed necessary by the CPM~~District~~ and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

AQ-SC4 Dust Plume Response Requirement: The AQCMM or an AQCMM Delegate shall monitor all construction activities for visible dust plumes. Observations of visible dust plumes that have the potential to be transported (A) off the project site and within 400 feet upwind of any regularly occupied structures not owned by the project owner or (B) 200 feet beyond the centerline of the construction of linear facilities indicate that existing mitigation measures are not resulting in effective mitigation. The AQCMP shall include a section detailing how the additional mitigation measures will be accomplished within the time limits specified. The AQCMM or Delegate shall implement the following procedures for additional mitigation measures in the event that such visible dust plumes are observed:

Step 1: The AQCMM or Delegate shall direct more intensive application of the existing mitigation methods within 15 minutes of making such a determination.

Step 2: The AQCMM or Delegate shall direct implementation of additional methods of dust suppression if Step 1, specified above, fails to result in adequate mitigation within 30 minutes of the original determination.

Step 3: The AQCMM or Delegate shall direct a temporary shutdown of the construction activity causing the emissions if Step 2, specified above, fails to result in effective mitigation within one hour of the original determination. The activity shall not restart until the AQCMM or Delegate is satisfied that appropriate additional mitigation or other site conditions have changed so that visual dust plumes as described in (A) and (B) above will not result upon restarting the shutdown source. The owner/operator may appeal to the CPM~~District~~ any directive from the AQCMM or Delegate to shut down an activity, if the shutdown shall go into effect within one hour of the original determination, unless overruled by the CPM~~District~~ before that time.

Verification: The AQCMM shall provide the CPM a monthly compliance report to include:

A. a summary of all actions taken to maintain compliance with this condition;

B. copies of any complaints filed with the District in relation to project construction; and

C. any other documentation deemed necessary by the CPM and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

AQ-SC5 Diesel-Fueled Engines Control: The AQCMM shall submit to the CPM, in the MCR, a construction mitigation report that demonstrates compliance with the following mitigation measures for the purposes of controlling diesel construction-related emissions. Any deviation from the following mitigation measures shall require prior CPM notification and approval.

A. All diesel-fueled engines used in the construction of the facility shall be fueled only with ultra-low sulfur diesel, which contains no more than 15 ppm sulfur.

B. All diesel-fueled engines used in the construction of the facility shall have clearly visible tags issued by the on-site AQCMM showing that the engine meets the conditions set forth herein.

C. A good faith effort shall be made to find and use off-road construction diesel equipment that has a rating of 100 hp to 750 hp and that meets the Tier 3 California Emission Standards for Off-Road Compression-Ignition Engines as specified in Title 13, California Code of Regulations section 2423(b)(1). This good faith effort shall be documented with signed written correspondence by the appropriate construction contractors along with documented correspondence with at least two construction equipment rental firms.

D. All construction diesel engines, which have a rating of 50 hp or more, shall meet, at a minimum, the Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in Title 13, California Code of Regulations section 2423(b)(1). The following exceptions for specific construction equipment items may be made on a case-by-case basis.

1. Equipment with non-Tier 2 engines that have tailpipe retrofit controls that reduce exhaust emissions of NOx and PM to no more than Tier 2 levels.

2. Tier 1 equipment will be allowed on a case-by-case basis only when the project owner has documented that no Tier 2 equipment or emissions equivalent retrofit equipment is available for a particular equipment type that must be used to complete the project's construction. This shall be documented with signed written correspondence by the appropriate construction contractors along with documented correspondence with at least two construction equipment rental firms.

3. The construction equipment item is intended to be on site for five days or less.

4. Equipment owned by specialty subcontractors may be granted an exemption, for single equipment items on a case-by-case basis, if it can be demonstrated that extreme financial hardship would occur if the specialty subcontractor had to rent replacement equipment, or if it can be demonstrated that a specialized equipment item is not available by rental.

E. All heavy earthmoving equipment and heavy duty construction-related trucks with engines meeting the requirements of (c) above shall be properly maintained and the engines tuned to the engine manufacturer's specifications.

F. All diesel heavy construction equipment shall not remain running at idle for more than five minutes, except for vehicles that need to idle as part of their normal operation (such as concrete trucks).

G. Construction equipment will employ electric motors when feasible.

Verification: The AQCMM shall include in the Monthly Compliance Report:

A. A summary of all actions taken to maintain compliance with this condition;

B. A list of all heavy equipment used on site during that month, including the owner of that equipment and a letter from each owner indicating that equipment has been properly maintained; and

C. Any other documentation deemed necessary by the CPM and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

AQ-SC6 The project owner shall use 2011 model year or newer vehicles, meeting California model year on-road vehicle emission standards, for onsite parabolic mirror washing activities and all other facility maintenance activities.

Other vehicle/fuel types may be allowed assuming that the emission profile for those vehicles, including fugitive dust generation emissions, is comparable to the vehicles types identified above.

Verification: At least 60 days prior to the start commercial production, the project owner shall submit to the CPM a copy of the plan that identifies the size and type of the on-site electric and fossil-fueled vehicle and equipment fleet and the vehicle and equipment purchase orders and contracts and/or purchase schedule. The plan shall be updated every other year and submitted in the Annual Compliance Report

AQ-SC7 The project owner shall provide a Site Operations Dust Control Plan, including all applicable fugitive dust control measures identified in AQ-SC3 that would be applicable to reducing fugitive dust from ongoing operations; that:

A. describes the active operations and wind erosion control techniques such as windbreaks and chemical dust suppressants, including their ongoing maintenance procedures, that shall be used on areas that could be disturbed by vehicles or wind; and

B. identifies the location of signs throughout the facility that will limit traveling on unpaved portion of roadways to solar equipment maintenance vehicles only. In addition, vehicle speed shall be limited to no more than 10 miles per hour on these unpaved roadways.

The Site Operations Fugitive Dust Control Plan shall include the use of durable non-toxic soil stabilizers on all regularly used unpaved roads, and shall include the inspection and maintenance procedures that will be undertaken to ensure that the unpaved roads remain stabilized. The soil stabilizer used shall be the CARB certified Soil-Sement® product, or another non-toxic soil stabilizer that can be determined to be both as efficient for fugitive dust control and that would not increase any other environmental impacts.

Verification: At least 60 days prior to start of commercial operation, the project owner shall submit to the CPM for review and approval a copy of the Site Operations Fugitive Dust Control Plan that identifies the dust and erosion control procedures that will be used during operation of the project and that identifies all locations of the speed limit signs. At least 60 days after commercial operation, the project owner shall provide to the CPM a report identifying the locations of all speed limit signs, and a copy of the

project employee and contractor training manual that clearly identifies that project employees and contractors are required to comply with the dust and erosion control procedures and on-site speed limits.

AQ-SC8 The project owner shall provide the CPM copies of all District issued Authority-to-Construct (ATC) and Permit-to-Operate (PTO) for the facility.

The project owner shall submit to the CPM for review and approval any modification proposed by the project owner to any project air permit. The project owner shall submit to the CPM any modification to any permit proposed by the District or U.S. Environmental Protection Agency (U.S. EPA), and any revised permit issued by the District or U.S. EPA, for the project.

Verification: The project owner shall submit any ATC, PTO, and proposed air permit modification to the CPM within five working days of its submittal either by 1) the project owner to an agency, or 2) receipt of proposed modifications from an agency. The project owner shall submit all modified air permits to the CPM within 15 days of receipt.

AQ-SC9 During site operation the project owner shall only contract with material suppliers (LPG/propane, chemicals, etc.) and waste haulers that will transport materials to and from the site using trucks that meet or exceed CARB model year 2007 emission standards, all trucks will meet CARB emission standards for their model year, and no trucks more than six years old shall be used throughout the life of the project. This requirement applies to all specific materials and wastes that require more than 40 haul trips per year. Alternatively, the project owner can buy and operate new material and waste haul trucks that meet at the time of purchase, throughout the operating life of the facility, the current model year CARB emission criteria.

Verification: The project owner shall submit documentation to the CPM at least fifteen days prior to signing material supply or waste hauling contracts, or buying haul trucks, that confirms that the contracted hauler or purchased truck will meet the requirements of this condition.

DISTRICT CONDITIONS

District Final Determination of Compliance Conditions (KCAPCD 2009a, DB 2009dd)

ATC Nos. 0369001A and '002A (30.0-MMBtu/hr Natural Gas or Liquefied Petroleum Gas (LPG) Fueled Boilers No. 1 and No. 2)

Equipment Description

30.0-MMBtu/hr (900-hp) natural gas or LPG fueled boiler with low-NOx burner system.

Design Conditions

AQ-1 Boiler shall be fueled with natural gas or LPG. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-2 Boiler described above shall be equipped with low NOx burner and be in accordance with manufacturer's specifications. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-3 Boiler exhaust stack shall be equipped with provisions for collection of pollutant samples in manner consistent with U. S. EPA test methods. (Rule 210.1)

Verification: The project owner shall provide facilities, utilities, and safety equipment for source testing and inspections upon request of the District, ARB, and the Energy Commission.

Operational Conditions

AQ-4 Visible emissions from boiler exhaust stack shall not exceed 5% opacity or Ringelmann No. 1/4. (Rule 210.1 BACT Requirement)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-5 Boiler operation shall not exceed 1000-hours/year without prior District approval. (Rule 210.1)

Verification: The project owner shall submit to the CPM the boiler operating data demonstrating compliance with this condition as part of the Annual Operation Report.

AQ-6 Boiler exhaust concentration of sulfur oxides (calculated as SO_2) shall not exceed 2000 parts per million on a volume basis (ppmv). (Rule 407)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-7 If natural gas is use as fuel, volume of natural gas used as fuel for boiler shall not exceed 28.6 million standard cubic feet per year (MMscf/yr); if LPG is used as fuel, volume of LPG used as fuel for boiler shall not exceed 11.9 MMscf/yr. (Rule 210.1)

Verification: The project owner shall submit to the CPM the boiler fuel use data demonstrating compliance with this condition as part of the Annual Operation Report.

AQ-8 Operator shall comply with applicable monitoring, testing, and recordkeeping requirements of Rule 425.2. (Rule 425.2)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-9 Operator shall maintain annual records of fuel use. (Rule 425.2)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-10 Equipment shall be maintained according to manufacturer's specifications to ensure compliance with emissions limitations. (Rules 209 and 210.1)

Verification: The project owner shall submit maintenance reports for all equipment to the CPM as part of Annual Compliance Report. As part of the Annual Compliance Report, the project owner shall include information on any maintenance performed on the boiler.

AQ-11 No emission resulting from use of this equipment shall cause injury, detriment, nuisance, annoyance to or endanger comfort, repose, health or safety of any considerable number of persons or public. (Rule 419 and CH & SC 41700)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

Compliance Testing Requirements

AQ-12 Boiler stack shall be equipped with sampling ports (in accordance with California Air Resources Board Standards), sampling platform, access to sampling platforms, and utilities for sampling equipment to perform source-sampling operations. (Rule 108.1)

Initial compliance with NOx emission limits shall be verified by compliance test utilizing test methods listed in Subsection VI.B of Rule 425.2 within 60-days of District initial start-up inspection. (Rule 210.1)

Initial testing for Rule 425.2 shall commence within 60-days after annual boiler heat attains or exceeds 90,000 therms (9,000-MMBtu). Boiler shall be tested in accordance with test methods listed in Subsection VI.B and in accordance to schedule in Subsection VI.C of Rule 425.2. (Rule 425.2)

Should inspection reveal conditions indicative of non-compliance, compliance with any emission limitations shall be verified, within 60 days of District request. Test results shall be submitted to KCAPCD within 30 days after test completion. (Rule 108.1 and 210.1)

Verification: The project owner shall notify the District and the CPM within fifteen working days before the execution of the compliance test required in this condition. The test results shall be submitted to the District and to the CPM within 30 days after test completion.

Emission Limits

AQ-13 Emissions rate of each air contaminant from this unit shall not exceed following limits:

Particulate Matter (PM10):	0.22	lb/hr
	3.04	lb/day
	0.11	ton/yr
Sulfur Oxides (SOx as SO_2):	0.51	lb/hr
	7.14	lb/day
	0.25	ton/yr
Oxides of Nitrogen (NO_2):	9	ppmv @ 3% O_2 (Rule 210.1 BACT Rqmt.)
	0.33	lb/hr
	4.62	lb/day
	0.17	ton/yr
Volatile Organic Compounds (VOC): (as defined in Rule 210.1)	0.16	lb/hr
	2.20	lb/day
	0.08	ton/yr
Carbon Monoxide:	50	ppmv
	1.11	lb/hr
	15.54	lb/day
	0.56	ton/yr

(Emissions limits established pursuant to Rule 210.1, unless otherwise noted.)

Compliance with maximum daily emission limits shall be verified by source operator (with appropriate operational data and recordkeeping to document maximum daily emission rate) each day source is operated and such documentation of compliance shall be retained and made readily available to District for period of three years. (Rules 209 and 210.1)

Verification: As part of the Annual Compliance Report, the project owner shall include information on operating emission rates. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

ATC No. 0369003 (Forced Draft Cooling Tower with 11 Cells and High Efficiency Drift Eliminator)

Equipment Description

A. Eleven 140-MMBtu (13,600-gpm) Cooling Tower Cells

B. Eleven 250-hp Cooling Tower Fans

C. Two 2,000-hp (79,000-gpm) Cooling Water Pumps

D. Make-Up Water Tank

E. 50-hp Make-Up Water Pump

AQ-14 No hexavalent chromium containing compounds shall be added to cooling tower circulating water. (Rule 429.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-15 Drift eliminator drift rate shall not exceed 0.0005%. (Rule 210.1)

Verification: The manufacturer guarantee data for the drift eliminator, showing compliance with this condition, shall be provided to the CPM and the District 30 days prior to cooling tower operation.

AQ-16 Cooling tower total dissolved solids (TDS) shall not exceed 1600 mg/liter (0.01335 lb/gal). (Rule 210.1)

Verification: The cooling tower recirculating water TDS content shall be tested as required in Condition **AQ-22** and those tests shall be provided in the Annual Compliance Report. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-17 Cooling water volumetric flow rate shall not exceed 149,000-gal/minute. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-18 Compliance with daily PM10 emission rate shall be determined by the product of the following factors: circulating water rate (gallons per day, total dissolved solids in blowdown water (lb/gal), and design drift rate (%). (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-19 Operator shall comply with applicable monitoring, testing, and recordkeeping requirements of Rule 429.1. (Rule 429.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-20 Equipment shall be maintained according to manufacturer's specifications to ensure compliance with emissions limitations. (Rules 209 and 210.1)

Verification: The project owner shall submit maintenance reports for all equipment to the CPM as part of Annual Compliance Report. As part of the Annual Compliance Report, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-21 No emission resulting from use of this equipment shall cause injury, detriment, nuisance, annoyance to or endanger comfort, repose, health or safety of any considerable number of persons or public. (Rule 419 and CH & SC 41700)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-22 Compliance with PM10 emission limits shall be determined by continuous conductivity monitoring of blowdown water with results available to District staff available to District staff upon request, and annual calibration verification available to District staff upon request. In-lieu of continuous conductivity monitoring, tests of total solids in blowdown water sample analysis shall be completed at a minimum of once per week by independent laboratory. (Rule 210.1)

Verification: The cooling tower recirculating water TDS content test results and resulting emission estimates shall be shall be provided in the Annual Compliance Report. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Compliance Testing Requirements

AQ-23 Should inspection reveal conditions indicative of non-compliance, compliance with any emission limitations shall be verified, within 60 days of District request. Test results (i.e. conductivity calibration or laboratory water sample testing) shall be submitted to KCAPCD within 30 days after test completion. (Rule 108.1, 210.1, and 429.1)

Verification: The project owner shall provide an emissions calculation and water sample testing protocol to the District for approval and CPM for review at least 30 days prior to initial operation of the cooling tower. The project owner shall notify the District and the CPM within fifteen working days before the execution of any compliance tests required under this condition. The test results shall be submitted to the District and to the CPM within 30 days of the completion of the tests.

Emission Limits

AQ-24 Emissions rate of each air contaminant from this unit shall not exceed following limits:

Particulate Matter (PM_{10}):	0.60 lb/hr
	9.55 lb/day
	1.74 ton/yr

(Emissions limits established pursuant to Rule 210.1, unless otherwise noted.)

Compliance with maximum daily emission limits shall be verified by source operator (with appropriate operational data and recordkeeping to document

maximum daily emission rate) each day source is operated and such documentation of compliance shall be retained and made readily available to District for period of three years. (Rules 209 and 210.1)

Verification: As part of the Annual Compliance Report the project owner shall include information on operating emission rates to demonstrate compliance with this condition. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

ATC No. 0369004A (Twenty-Two 75,000-Gallon Heat Transfer Fluid (HTF) Expansion Tank Vented To Vapor Control System, Including HTF Piping Network)

Equipment Description

A. Twenty-Two 75,000 Gallon HTF Expansion Tanks (No. 1 through No. 22) each with PV vent valve,

B. 25-hp Expansion tank pump,

C. HTF Fluid pumps (400-hp),

D. Nitrogen blanket system,

E. HTF piping header,

F. HTF ullage system,

G. Solar field piping,

H. Solar generating system piping, and

I. Piping from expansion tank to vapor control system.

Design Conditions

AQ-25 Each HTF tank shall be connected to a volatile organic compound (VOC) vapor control system (Permit No. 0369005). (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-26 Volume of each tank shall not exceed 75,000-gallons without prior District approval. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

Operational Conditions

AQ-27 HTF expansion vessel shall be gas tight and vent to vapor control system (Permit No. 0369005). (Rule 210.1 BACT Requirement)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-28 The project owner shall establish an inspection and maintenance program to determine, repair, and long leaks in HTF piping network and expansion tanks. Inspection and maintenance program and documentation shall be available to District staff upon request. (Rule 210.1 BACT Requirement)

A. All pumps, compressors and pressure relief devices (pressure relief valves or rupture disks) shall be electronically, audio, or visually inspected once every operating period.

B. All accessible valves, fittings, pressure relief devices (PRDs), hatches, pumps, compressors, etc. shall be inspected quarterly using a leak detection device such as a Foxboro OVA 108 calibrated for methane.

C. VOC leaks greater than 100-ppmv shall be tagged (with date and concentration) and repaired within seven calendar days of detection.

D. VOC leaks greater than 10,000-ppmv shall be tagged and repaired within 24-hours of detection.

E. The project owner shall maintain a log of all VOC leaks exceeding 10,000-ppmv, including location, component type, and repair made.

F. The project owner shall maintain record of the amount of HTF replaced on a monthly basis for a period of five years.

G. Any detected leak exceeding 100-ppmv and not repaired in 7-days and 10,000-ppmv not repaired within 24-hours shall constitute a violation of the District's Authority to Construct (ATC)/Permit to Operate (PTO).

H. Pressure sensing equipment shall be installed that will be capable of sensing a major rupture or spill within the HTF network.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-29 The following component count shall be utilized to determine fugitive emissions.

Equipment	Service	Count
Valves	Light Liquid	3050
Pump Seals	Light Liquid	4
Connectors*	Light Liquid	7646
Pressure Relief Valve	Gas	22
Open-ended Lines	Light Liquid	44

Verification: The project owner shall provide the District for approval and the CPM for review any requested revisions to the component count listed in this condition 30 days prior to utilizing such component counts for fugitive emission calculations, and shall keep a record of approved changes in the component count in the inspection and maintenance program documentation kept at the site.

AQ-30 Each expansion tank shall have fixed roof without holes, tears, or other such openings, except pressure/vacuum (PV) valves, in the cover which allow the emission of VOC. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-31 All expansion tank hatches shall be kept closed and gap-free, except during maintenance, inspection, or repair. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-32 Tank roof appurtenances shall not exhibit emissions exceeding 10,000-ppmv as methane measured with an instrument calibrated with methane and conducted in accordance with U.S. Method 21. (Rule 411)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-33 Each tank shall be maintained leak-free. A "leak" is defined as the dripping of liquid volatile organic compounds at a rate of three or more drops per minute, or vapor volatile organic compounds in excess of 10,000-ppm as equivalent methane as determined by EPA Test Method 21. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-34 Project owner shall provide District with total volume require for solar power plant and annual volume of HTF used at the facility. (Rule 210.1)

Verification: As part of the Annual Compliance Report the project owner shall include information on HTF total volume and annual usage rates to demonstrate compliance with this condition.

AQ-35 Equipment shall be maintained according to manufacturer's specifications to ensure compliance with emissions limitations. (Rules 210.1 and 209)

Verification: The project owner shall submit maintenance reports for all equipment to the CPM as part of Annual Compliance Report.

AQ-36 Compliance with all operational conditions shall be verified by appropriate recordkeeping, including records of operational data needed to demonstrate compliance. Such records shall be kept on site in readily available format. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-37 No emission resulting from use of this equipment shall cause injury, detriment, nuisance, annoyance to or endanger comfort, repose, health, or safety of any considerable number of persons or public. (Rule 419 and CH&SC Sec 41700)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-38 The District shall be notified of any breakdown conditions in accordance with Rule 111 (Equipment Breakdown). (Rule 111)

Verification: The project owner shall provide equipment breakdown notification as required by District Rule 111 and shall provide such data to the CPM within five days of District notification and shall provide equipment breakdown records in the Annual Compliance Report.

Compliance Testing Requirements

AQ-39 Should inspection reveal conditions indicative of non-compliance, compliance with hourly and concentration emission limits for VOC shall be verified pursuant to Rule 108.1 and KCAPCD Guidelines for Compliance Testing, within 60 days of District request.

Verification: The project owner shall provide a test protocol to District for approval and CPM for review of any compliance tests proposed to be conducted as required under this condition at least 30 days prior to conducting such tests. The project owner shall notify the District and the CPM within fifteen working days before the execution of any compliance tests required under this condition. The test results shall be submitted to the District and to the CPM within 30 days of the completion of the tests.

Emission Limits

AQ-40 Emissions rate of each air contaminant from this unit shall not exceed following limits:

Fugitive Emissions (Connectors, Pumps, etc.)

Volatile Organic Compounds (VOC):	34.34 lb/day 6.27 ton/yr

(Emissions limits established pursuant to Rule 210.1, unless otherwise noted.)

Compliance with maximum daily emission limits shall be verified by source operator (with appropriate operational data and recordkeeping to document maximum daily emission rate) each day source is operated and such documentation of compliance shall be retained and made readily available to District for period of three years. (Rules 209 and 210.1)

Verification: As part of the Annual Compliance Report the project owner shall include information on operating emission rates to demonstrate compliance with this condition. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

ATC No. 0369005 (Vapor Control System)

Equipment Description

A. Piping from expansion tanks (Permit Nos. 0369004) to vapor control system, and

B. Two Granular Activated Carbon (GAC) adsorption units in series each with 1,000-lb GAC vessel, and sampling ports at entrance and exhaust.

Design Conditions

AQ-41 Vapor control system shall serve HTF expansion tanks and HTF piping system listed on Permit No. 0369004. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-42 Carbon adsorption system shall have provisions for monitoring between carbon beds and exhaust of carbon adsorption system. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Operational Conditions

AQ-43 Carbon adsorption system shall be operated during heat transfer fluid (HTF) expansion system operation and during operation of HTF Ullage system. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-44 Control efficiency of carbon adsorption vessels shall be at least 95%. (Rule 210.1)

Verification: The project owner shall provide the District and CPM carbon adsorption manufacturer guarantee data showing compliance with this condition at least 30 days prior to the installation of the carbon adsorption vessels.

AQ-45 Vapor samples shall be taken monthly between carbon beds and at the exhaust carbon adsorption system and tested for carbon breakthrough. (Rule 210.1)

Verification: The project owner shall keep the monthly vapor sample data at the site and shall provide a summary of the vapor sample data as part of the Annual Compliance Report. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-46 Carbon breakthrough shall be defined as VOC concentration of 10-ppmv as hexane measured after primary carbon bed measured with a flame ionization detector (FID) or photo ionization detector (PID). (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-47 Primary carbon bed shall be replaced upon indication of carbon breakthrough. (Rule 210.1)

Verification: The project owner shall keep primary carbon bed replacement records on site and shall provide such records as part of the Annual Compliance Report. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-48 Operation of this equipment shall be conducted in compliance with all data and specifications submitted with application under which this permit is issued. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-49 Equipment shall be maintained according to manufacturer's specifications to ensure compliance with emissions limitations. (Rules 209 and 210.1)

Verification: The project owner shall submit maintenance reports for all equipment to the CPM as part of Annual Compliance Report.

AQ-50 No emission resulting from use of this equipment shall cause injury, detriment, nuisance, annoyance to or endanger comfort, repose, health, or safety of any considerable number of persons or public. (Rule 419 and CH&SC, Sec 41700)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Compliance Testing Requirements

AQ-51 Should inspection reveal conditions indicative of non-compliance, compliance with any emission limits for VOC shall be verified pursuant to Rule 108.1 and KCAPCD Guidelines for Compliance Testing, within 60 days of District request.

Verification: The project owner shall provide a test protocol to District for approval and CPM for review of any compliance tests proposed to be conducted as required under this condition at least 30 days prior to conducting such tests. The project owner shall notify the District and the CPM within fifteen working days before the execution of any compliance tests required under this condition. The test results shall be submitted to the District and to the CPM within 30 days of the completion of the tests.

Emission Limits

AQ-52 Emissions rate of each air contaminant from this unit shall not exceed the following emissions limits

Controlled Vapor Emissions:

Volatile Organic Compounds (VOC):	3.13 lb/hr 6.26 lb/day 1.14 ton/yr

(Emissions limits established pursuant to Rule 210.1 unless otherwise noted)

Compliance with maximum daily emission limits shall be verified by source operator (with appropriate operational data and record keeping to document maximum daily emission rate) each day the source is operated and such documentation of compliance shall be retained and made readily available to District for period of three years. (Rules 210.1 and 209)

Verification: As part of the Annual Compliance Report the project owner shall include information on operating emission rates to demonstrate compliance with this condition. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

ATC No. 0369006 (Emergency Firewater Pump Driven By 300-BHP Diesel Piston Engine)

Equipment Description

3000-gallon per minute (gpm) Clarke firewater pump driven by 300-bhp John Deere Tier 3 diesel fueled piston engine

Design Conditions

AQ-53 Engine shall be equipped with turbocharger and aftercooler. (Rule 210.1 BACT Requirement)

Verification: The project owner shall submit the final engine specifications documenting compliance with this condition at least 30 days prior to installation of the engine.

AQ-54 Elapsed time meter shall be installed and maintained indicating cumulative hours of engine operating time. (Rule 210.1)

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission.

Operational Conditions

AQ-55 Visible emissions from engine exhaust after engine has reached normal operating temperature shall not equal or exceed 5% opacity or Ringelmann No. ¼ for more than three minutes in any one hour. (Rule 210.1 BACT Requirement)

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission.

AQ-56 Exhaust gas particulate matter concentration shall not exceed 0.1 grains/ft3 of gas at standard conditions. (Rule 404.1)

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission.

AQ-57 Fuel for diesel piston engine shall conform to California Air Resources Board standards for reformulated diesel fuel (low sulfur, 0.0015% by weight and low aromatic hydrocarbon, 20% by weight). (Rule 210.1 BACT Requirement)

Verification: The project owner shall make the site available for inspection of equipment and fuel purchase records by representatives of the District, ARB, and the Energy Commission.

AQ-58 Equipment shall be maintained according to manufacturer's specifications to ensure compliance with emissions limitations. (Rule 210.1 and Rule 209)

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission.

AQ-59 Compliance with all operational conditions shall be verified by appropriate recordkeeping, including records of operational data needed to demonstrate compliance. Such records shall be kept on site in readily available format. (Rule 209)

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission.

AQ-60 Operating record of this equipment shall be maintained in format approved in writing by District, kept for minimum of two years, and made available upon request of District personnel. Record shall include, at minimum, days and hours of operation, location of operation, amount of fuel oil supplied to this engine, and date(s), check(s) and certification(s) of injection timing. (Rules 209 and 210.1)

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission.

AQ-61 No emission resulting from use of this equipment shall cause injury, detriment, nuisance, annoyance to or endanger comfort, repose, health or safety of any considerable number of persons or public. (Rule 419 and CH&SC 41700)

Verification: The project owner shall make the site available for inspection of equipment and records by representatives of the District, ARB, and the Energy Commission.

AQ-62 Engine operation shall not exceed 200 hours per year without prior District approval. (Rule 210.1)

Verification: As part of the Annual Compliance Report the project owner shall include information on annual engine operating hours to demonstrate compliance with this condition. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-63 Diesel engine driving emergency fire water pump shall comply with Tier 3 emissions standards and Air Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines. (California Code of Regulations 93115, Title 17)

Verification: The project owner shall submit the final engine specifications documenting compliance with this condition at least 30 days prior to installation of the engine.

AQ-64 Engine operation for maintenance and testing shall not exceed 50 hours per year without prior District approval. (Rule 210.1)

Verification: As part of the Annual Compliance Report the project owner shall include information on annual engine operating hours to demonstrate compliance with this condition. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Compliance Testing Requirements

AQ-65 Should inspection reveal conditions indicative of non-compliance, compliance with any emission limitations shall be verified, within 60 days of District request. Test results shall be submitted to KCAPCD within 30 days after test completion. (Rule 108.1 and 210.1)

Verification: The project owner shall provide a test protocol to District for approval and CPM for review of any compliance tests proposed to be conducted as required under this condition at least 30 days prior to conducting such tests. The project owner shall notify the District and the CPM within fifteen working days before the execution of any compliance tests required under this condition. The test results shall be submitted to the District and to the CPM within 30 days of the completion of the tests.

Emission Limits

AQ-66 Emissions rate of each air contaminant from this unit shall not exceed following limits:

Particulate Matter (PM10):	0.15 gm/bhp-hr 0.10 lb/hr 2.38 lb/day 0.01 ton/yr
Sulfur Oxides (SOx as SO_2):	0.0030 lb/hr 0.0800 lb/day 0.0003 ton/yr
Oxides of Nitrogen (NOx as NO_2):	2.80 gm/bhp-hr 1.85 lb/hr 44.45 lb/day 0.19 ton/yr
Volatile Organic Compounds (VOC): (as defined in Rule 210.1)	0.20 gm/bhp-hr 0.13 lb/hr 3.18 lb/day 0.01 ton/yr
Carbon Monoxide:	1.72 lb/hr 41.28 lb/day 0.17 ton/yr

(Emissions limits established pursuant to Rule 210.1, unless otherwise noted.)

Compliance with maximum daily emission limits shall be verified by source operator (with appropriate operational data and recordkeeping to document maximum daily emission rate) each day source is operated and such documentation of compliance shall be retained and made readily available to District for period of three years. (Rules 209 and 210.1)

Verification: As part of the Annual Compliance Report the project owner shall include information on operating emission rates to demonstrate compliance with this condition. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

ATC No. 0369007 (Bio-Remediation of Hydrocarbon Contaminated Soil)

Equipment Description

A. 400-ft. by 800-ft. bio-remediation/land-farm facility,

B. Irrigation system for bio-remediation/land-farm facility, and

C. Bio-remediation fertilizer for enhanced bio-remediation.

Design Conditions

AQ-67 Bio-remediation area shall be lined with minimum 60-mil high density polyethylene (HDPE) or alternate lining approved by Lahontan Regional Water Quality Board (LRWQB). (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-68 The project owner shall provide District with depth of bio-remediation operation area. (Rule 210.1)

Verification: The project owner shall submit the depth of the bio-remediation operation area to the District and CPM prior to use of the bio-remediation operation area.

Operational Conditions

AQ-69 Visible emissions from bio-remediation/land-farm facility when soil is not actively being added or removed shall not equal or exceed 0% opacity for more than five minutes in any two hour period. (Rule 210.1 BACT Requirement)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-70 The project owner shall have flame ionization detector (FID) or photo ionization detector (PID) on site to measure soil VOC emissions (measured as hexane). (Rule 210.1)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-71 The project owner shall maintain VOC readings of bio-remediation area during any period it is operated as required by an approved protocol. The project owner shall provide protocol for VOC readings, soil acidity (pH), soil moisture content (% weight), soil temperature (°F), and Nutrient Ratio (C:N:P) to be approved by District staff. (Rule 210.1)

Verification: The project owner shall provide a protocol for measuring bio-remediation soil VOC content to the District for approval and the CPM for review prior to

use of the bio-remediation operation area. The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-72 If soil in bio-remediation area registers a VOC reading of less than 50-ppm by volume, measured three inches above soil surface, with FID or PID compliance with Condition AQ-73 is not required. (Rule 210.1)

Verification: Logs of the bio-remediation soil VOC content measurements shall be kept with specific notation regarding whether VOC readings are above or below 50 ppm by volume. The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-73 If soil in bio-remediation area registers a VOC reading greater than or equal to 50-ppm (calibrated to methane) by volume, measured three inches above soil surface, with FID or PID bio-remediation operation shall comply with the following conditions. (Rule 210.1)

A. Affected soil stockpile shall be covered with minimum 10-mile plastic sheeting within 24-hours of detection to control emissions during treatment until VOC readings 3-inches above the uncovered soil stockpile are less than 50-ppmv. (Rule 210.1)

B. Covered soil stockpile shall be treated by enhanced bio-remediation using accepted environmental engineering practices to maintain conditions suitable for bio-remediation. Soil in stockpiles shall be conditioned as necessary through addition of nutrients, moisture and air as needed.

C. The following parameters in treatment area shall be monitored according to approval protocol: VOC readings over treatment area in use, soil acidity (pH), soil moisture content (% weight), soil temperature (°F), and Nutrient Ratio (C:N:P).

D. Records of soil treatment and monitoring results shall be maintained at the site for a period of at least 5-years, and

E. If bio-remediation operation is not effective after two months (i.e. VOC readings show no reduction in VOC content), the project owner shall propose alternate method of soil remediation for District approval.

Verification: Logs of the bio-remediation soil VOC content measurements shall be kept with specific notation regarding whether VOC readings are above or below 50 ppm by volume with other records required by this condition. A summary of the bio-remediation operation area records to demonstrate ongoing compliance with this condition shall be provided in the Annual Compliance Report.

AQ-74 Soil moisture content shall be maintained according to District approved protocol. (Rule 210.1)

Verification: A summary of the bio-remediation operation area records to demonstrate ongoing compliance with this condition shall be provided in the Annual Compliance Report.

AQ-75 Compliance with all operational conditions shall be verified by appropriate recordkeeping, including records of operational data needed to demonstrate compliance. Such records shall be kept on site in readily available format. (Rule 209)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-76 No emission resulting from use of this equipment shall cause injury, detriment, nuisance, annoyance to or endanger comfort, repose, health or safety of any considerable number of persons or public. (Rule 419 and CH&SC 41700)

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

Compliance Testing Requirements

AQ-77 Should inspection reveal conditions indicative of non-compliance, compliance with any emission limitations shall be verified, within 60 days of District request. Test results shall be submitted to KCAPCD within 30 days after test completion. (Rule 108.1 and 210.1)

Verification: The project owner shall provide a test protocol to District for approval and CPM for review of any compliance tests proposed to be conducted as required under this condition at least 30 days prior to conducting such tests. The project owner shall notify the District and the CPM within fifteen working days before the execution of any compliance tests required under this condition. The test results shall be submitted to the District and to the CPM within 30 days of the completion of the tests.

Emission Limits

AQ-78 Emissions rate of each air contaminant from this unit shall not exceed the following emissions limits:

Volatile Organic Compounds (VOC):	0.10 lb/day
(as defined in Rule 210.1)	0.02 ton/yr

(Emissions limits established pursuant to Rule 210.1 unless otherwise noted)

Compliance with maximum daily emission limits shall be verified by source operator (with appropriate operational data and recordkeeping to document maximum daily emission rate) each day source is operated and such documentation of compliance shall be retained and made readily available to District for period of three years. (Rules 209 and 210.1)

Verification: As part of the Annual Compliance Report the project owner shall include information that demonstrates that the bio-remediation area has been operated using good engineering practices. Such operation shall be deemed to demonstrate compliance with this condition. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Facility Wide Conditions

Construction Activity

AQ-79 All construction phase emissions shall be controlled utilizing reasonably available control provisions, e.g. construction site and unsurfaced roadway dust control, conscientious maintenance of mobile and piston engine-powered equipment, etc.

Verification: The project owner shall comply with the requirements of Conditions AQ-SC1 through AQ-SC5.

Air Toxics

AQ-80 Facility shall comply with California Health and Safety Code Sections 44300 through 44384. (Rule 208.1)

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

ACRONYMS

AAQS	Ambient Air Quality Standard
AERMOD	ARMS/EPA Regulatory Model
AFC	Application for Certification
amsl	above mean sea level
APCD	Air Pollution Control District (KCAPCD)
AQCMM	Air Quality Construction Mitigation Manager
AQCMP	Air Quality Construction Mitigation Plan
AQMP	Air Quality Management Plan
ARB	California Air Resources Board
ATC	Authority to Construct
ATCM	Airborne Toxic Control Measure
BACT	Best Available Control Technology
bhp	brake horsepower
BSEP	Beacon Solar Energy Project
Btu	British thermal unit
CAAQS	California Ambient Air Quality Standard
CEC	California Energy Commission (or Energy Commission)
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPM	(CEC) Compliance Project Manager
EIR	Environmental Impact Report
ERC	Emission Reduction Credit
FDOC	Final Determination Of Compliance
HTF	Heat Transfer Fluid (Therminol)
GHG	Greenhouse Gas
gr	Grains (1 gr $\cong$ 0.0648 grams, 7000 gr = 1 pound)
hp	horsepower
H_2S	Hydrogen Sulfide
KCAPCD	Kern County Air Pollution Control District
lbs	Pounds
LORS	Laws, Ordinances, Regulations and Standards
LPG	Liquefied Petroleum Gas
MCR	Monthly Compliance Report
MDAB	Mojave Desert Air Basin

mg/m^3	milligrams per cubic meter
MMBtu	Million British thermal units
MW	Megawatts (1,000,000 Watts)
NAAQS	National Ambient Air Quality Standard
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_3	Nitrates
NOx	Oxides of Nitrogen *or* Nitrogen Oxides
NSPS	New Source Performance Standard
NSR	New Source Review
O_2	Oxygen
O_3	Ozone
OLM	Ozone Limiting Method
PDOC	Preliminary Determination Of Compliance
PM	Particulate Matter
PM10	Particulate Matter less than 10 microns in diameter
PM2.5	Particulate Matter less than 2.5 microns in diameter
ppm	Parts Per Million
ppmv	Parts Per Million by Volume
ppmvd	Parts Per Million by Volume, Dry
ppmw	Parts Per Million by Weight
PSA	Preliminary Staff Assessment (this document)
PSD	Prevention of Significant Deterioration
PTO	Permit to Operate
scf	Standard Cubic Feet
SO_2	Sulfur Dioxide
SO_3	Sulfate
SOx	Oxides of Sulfur
SR	State Route
tpy	tons per year
U.S. EPA	United States Environmental Protection Agency
$\mu g/m^3$	Microgram per cubic meter
VOC	Volatile Organic Compounds

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APPENDIX AIR-1 - GREENHOUSE GAS EMISSIONS

Testimony of William Walters, P.E. and Matthew Layton, P.E.

SUMMARY OF CONCLUSIONS

The Beacon Solar Energy Project (BSEP) is a proposed addition to the state's electricity system that would produce greenhouse gas (GHG) emissions while generating electricity for California consumers. As a solar project it would emit considerably less greenhouse gases (GHG) than existing power plants and most other generation technologies, and thus would contribute to continued improvement of the overall western United States, and specifically California, electricity system GHG emission rate average.

BSEP, as a solar energy generation project, is exempt from the mandatory GHG emission reporting requirements for electricity generating facilities as currently required by the California Air Resources Board (ARB) for compliance with the California Global Warming Solutions Act of 2006 (AB 32 Núñez, Statutes of 2006, Chapter 488, Health and Safety Code sections 38500 et seq.) (ARB 2008a). However, the project may be subject to future reporting requirements and GHG reductions or trading requirements as these regulations become more fully developed and implemented.

On October 8, 2008, the Energy Commission adopted an order initiating an informational (OII) proceeding (08-GHG OII-1) to solicit comments on how to assess the greenhouse gas impacts of proposed new power plants in accordance with the California Environmental Quality Act (CEQA). This analysis provides the staff's conclusions concerning greenhouse gas emissions for this siting case. Future power plant siting and amendment cases are likely to be reviewed with the benefit of new information and policy direction from the Energy Commission in response to the OII. (CEC 2009a).

While BSEP would emit some GHG emissions, BSEP's contribution to the system build-out of renewable resources in California would result in a net cumulative reduction of energy and GHG emission from new and existing fossil resources. Electricity is produced by operation of inter-connected generation resources. Operation of one power plant, like BSEP, affects all other power plants in the interconnected system. The operation of the BSEP would affect the overall electricity system operation and GHG emissions in several ways:

- BSEP would provide low-GHG, renewable generation.
- BSEP would facilitate to some degree the replacement out-of-state high-GHG-emitting (e.g., coal) electricity generation that must be phased out in conformance with the State's new Emissions Performance Standard.
- BSEP 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, staff believes that

the project 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.

Staff concludes that the short-term minor emissions of greenhouse gases during construction that are necessary to create this new low GHG-emitting renewable energy resource, would be sufficiently reduced by “best practices” and would, therefore, not be significant.

The Beacon Solar Energy Project, as a solar project with a nightly shutdown would operate less than 60% of capacity and is therefore not subject to the requirements of SB 1368 (Chapter 11, Greenhouse Gases Emission Performance Standard, Article 1, Section 2900 et. seq.). However, the Beacon Solar Energy Project would easily comply with the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard.

INTRODUCTION

Greenhouse gas (GHG) emissions are not criteria pollutants, but they are discussed in the context of cumulative impacts. The state has demonstrated a clear willingness to address global climate change through research, adaptation and inventory reductions. In that context, staff evaluates the GHG emissions from the proposed project, presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following federal, state, and local laws and policies in **Greenhouse Gas Table** 1 pertain to the control and mitigation of greenhouse gas emissions. Staff’s analysis examines the project’s compliance with these requirements.

Greenhouse Gas Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
State	
California Global Warming Solutions Act of 2006, AB 32 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500 et seq.)	This act requires the California Air Resource Board (ARB) to enact standards that will reduce GHG emission to 1990 levels. Electricity production facilities will be regulated by the ARB.
California Code of Regulations, tit. 17, Subchapter 10, Article 2, sections 95100 et. seq.	These ARB regulations implement mandatory GHG emissions reporting as part of the California Global Warming Solutions Act of 2006 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500 et seq.)
Title 20, California Code of Regulations, section 2900 et seq.; CPUC Decision D0701039 in proceeding R0604009	The regulations prohibit utilities from entering into long-term contracts with any base load facility that does not meet a greenhouse gas emission standard of 0.5 metric tonnes carbon dioxide per megawatt-hour (0.5 $MTCO_2$/MWh) or 1,100 pounds carbon dioxide per megawatt-hour (1,100 lbs CO_2/MWh).

GLOBAL CLIMATE CHANGE AND ELECTRICITY PRODUCTION

There is general scientific consensus that climate change is occurring and that human activity contributes in some measure (perhaps significantly) to that change. Man-made emissions of greenhouse gases, if not sufficiently curtailed, are likely to contribute further to continued increases in global temperatures. Indeed, the California Legislature finds that "[g]lobal warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California" (Cal. Health & Safety Code, sec. 38500, division 25.5, part 1).

In 1998, the Energy Commission identified a range of strategies to prepare for an uncertain climate future, including a need to account for the environmental impacts associated with energy production, planning, and procurement (CEC 1998, p.5). In 2003, the Energy Commission recommended that the state require reporting of greenhouse gases (GHG) or global climate change[10] emissions as a condition of state licensing of new electric generating facilities (CEC 2003, IEPR p. 42). In 2006, California enacted the California Global Warming Solutions Act of 2006 (AB 32). It requires the California Air Resources Board (ARB) to adopt standards that will reduce statewide GHG emissions to statewide GHG emissions levels in 1990, with such reductions to be achieved by 2020.[11] To achieve this, ARB has a mandate to define the 1990 emissions level and achieve the maximum technologically feasible and cost-effective GHG emission reductions.

The ARB adopted early action GHG reduction measures in October 2007, adopted mandatory reporting requirements and the 2020 statewide target in December 2007, and adopted a statewide scoping plan in December 2008 to identify how emission reductions will be achieved from significant sources of GHG via regulations, market mechanisms, and other actions. ARB staff is developing regulatory language to implement its plan and holds ongoing public workshops on key elements of the recommended GHG reduction measures, including market mechanisms (ARB 2006). The regulations must be effective by January 1, 2011 and mandatory compliance commences on January 1, 2012. The mandatory reporting requirements are effective for electric generating facilities over 1 megawatt (MW) capacity, and the due date for initial reports by existing facilities this first year was June 1, 2009.

Examples of strategies that the state might pursue for managing GHG emissions in California, in addition to those recommended by the Energy Commission and the Public Utilities Commission, were identified in the California Climate Action Team's Report to the Governor (CalEPA 2006). The scoping plan approved by ARB in December 2008 builds upon the overall climate policies of the Climate Action Team report and show the recommended strategies to achieve the goals for 2020 and beyond. Some strategies focus on reducing consumption of petroleum across all areas of the California economy. Improvements in transportation energy efficiency (fuel economy), land use planning,

[10] Global climate change is the result of greenhouse gases, or air emissions with global warming potentials, affecting the global energy balance, and thereby, climate of the planet. The term greenhouse gases (GHG) and global climate change (GCC) gases are used interchangeably.

[11] Governor Schwarzenegger has also issued Executive Order S-3-05 establishing a goal of 80% below 1990 levels by 2050.

and alternatives to petroleum-based fuels are slated to provide substantial reductions by 2020 (CalEPA 2006). The scoping plan includes a 33 percent Renewables Portfolio Standard (RPS), aggressive energy efficiency targets, and a cap-and-trade system that includes the electricity sector (ARB 2008b).

It is possible that GHG reductions mandated by ARB will be non-uniform or disproportional across emitting sectors, in that most reductions will be based on cost-effectiveness (i.e., the greatest effect for the least cost). For example, the ARB proposes a 40 percent reduction in GHG from the electricity sector, even though that sector currently only produces about 25 percent of the state GHG emissions. In response, in September 2008 the Energy Commission and the Public Utilities Commission provided recommendations (CPUC 2008) to ARB on how to achieve such reductions through both programmatic and regulatory approaches, and identified regulation points should ARB decide that a multi-sector cap and trade system is warranted.

The Energy Commission's *2007 Integrated Energy Policy Report* (IEPR) also addresses climate change within the electricity, natural gas, and transportation sectors (CEC 2007). For the electricity sector, it recommends such approaches as pursuing all cost-effective energy efficiency measures and meeting the Governor's stated goal of a 33 percent renewable portfolio standard.

SB 1368[12], enacted in 2006, and regulations adopted by the Energy Commission and the Public Utilities Commission pursuant to the bill, prohibits California utilities from entering into long-term commitments with any base load facilities that exceed the Emission Performance Standard of 0.500 metric tonnes CO_2 per megawatt-hour[13] (1,100 pounds CO_2/MWh). Specifically, the SB 1368 Emission Performance Standard applies (EPS) applies to base load power from new power plants, new investments in existing power plants, and new or renewed contracts with terms of five years or more, including contracts with power plants located outside of California.[14] If a project, instate or out of state, plans to sell base load electricity to California utilities, the utilities will have to demonstrate that the project meets the EPS. *Base load* units are defined as units that operate at a capacity factor higher than 60 percent. As a project with a permit operating restriction of less than 60 percent of the year, electricity from CPP would not have to meet the SB 1368 EPS.

In addition to these programs, California is involved in the Western Climate Initiative, a multi-state and international effort to establish a cap and trade market to reduce greenhouse gas emissions in the Western United States and the Western Electricity Coordinating Council (WECC). The timelines for the implementation of this program are similar to those of AB 32, with full roll-out beginning in 2012. And as with AB 32, the electricity sector has been a major focus of attention.

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[12] Public Utilities Code § 8340 et seq.

[13] The Emission Performance Standard only applies to carbon dioxide, and does not include emissions of other greenhouse gases converted to carbon dioxide equivalent.

[14] See Rule at http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/64072.htm

ELECTRICITY PROJECT GREENHOUSE GAS EMISSIONS

Electricity use can be as simple as turning on a switch to operate a light or fan. The system to deliver the adequate and reliable electricity supply is complex and variable. But it operates as an integrated whole to meet demand, such that the dispatch of a new source of generation generally curtails or displaces one or more less efficient or less competitive existing sources. Within the system, generation resources provide electricity, or energy, generating capacity, and ancillary services to stabilize the system and facilitate electricity delivery, or movement, over the grid. *Capacity* is the instantaneous output of a resource, in megawatts. *Energy* is the capacity output over a unit of time, for example an hour or year, generally reported as megawatt-hours or gigawatt-hours (GWh). Ancillary services[15] include regulation, spinning reserve, non-spinning reserve, voltage support, and black start capability. Individual generation resources can be built and operated to provide only one specific service. Alternatively, a resource may be able to provide one or all of these services, depending on its design and constantly changing system needs and operations. California is actively pursuing policies to reduce GHG emissions that include adding non-GHG emitting renewable generation resources to the system mix.

The generation of electricity using fossil fuels, even in a back-up generator at a thermal solar plant, produces air emissions known as greenhouse gases in addition to the criteria air pollutants that have been traditionally regulated under the federal and state Clean Air Acts. Greenhouse gas emissions contribute to the warming of the earth's atmosphere, leading to climate change. For fossil fuel-fired power plants and equipment, these include primarily carbon dioxide, with much smaller amounts of nitrous oxide (N_2O, not NO or NO_2, which are commonly known as NOx or oxides of nitrogen), and methane (CH_4 – often from unburned natural gas). Also included are sulfur hexafluoride (SF_6) from high voltage equipment, and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/chiller equipment. GHG emissions from the electricity sector are dominated by CO_2 emissions from the carbon-based fuels; other sources of GHG emissions are small and also are more likely to be easily controlled or reused/recycled, but are nevertheless documented here as some of the compounds have very large relative global warming potentials. Global warming potential is a relative measure, compared to carbon dioxide, of a compound's residence time in the atmosphere and ability to warm the planet. Mass emissions of GHG are converted into carbon dioxide equivalent (CO_2-equivalnet) metric tonnes for ease of comparison.

PROJECT CONSTRUCTION

Construction of industrial facilities such as power plants requires coordination of numerous equipment and personnel. The concentrated on-site activities result in short-term, unavoidable increases in vehicle and equipment emissions that include greenhouse gases. The construction would last over 25 months. The applicant provided a greenhouse gas emission estimate for the entirety of the main solar facility site, gas line, and transmission line construction activities. The greenhouse gas emissions estimate, presented below in **Greenhouse Gas Table 2,** were converted by the applicant into CO_2-equivalent and totaled.

[15] See page CEC 2009b, page 95.

Greenhouse Gas Table 2
Beacon Estimated Potential Construction Greenhouse Gas Emissions

Construction Element	CO_2-equivalent (MTCO2E) [a]
Solar Facility Construction	15,047
Transmission Line Construction	176
Offsite Access Road Construction	265
Heavy Delivery Trucks	1,282
Construction Total	16,770

Source: DB 2009b and staff estimates for the offsite access road construction and heavy delivery trucks.
[a] One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms

PROJECT OPERATIONS

Operations GHG emissions are shown in **Greenhouse Gas Table 3**. The proposed BSEP project would cause GHG emissions from the facility maintenance fleet and employee trips, two propane fueled boilers, emergency fire pump internal combustion engine, and sulfur hexafluoride emissions from new electrical component equipment.

Greenhouse Gas Table 3
Estimated BSEP Potential Operating Greenhouse Gas Emissions

	CO_2-equivalent (MTCO2E[a] per year)
Boilers	3,787
Fire Pump Engine	7.8
Maintenance Vehicles	72.6
Worker Vehicles [b]	419.9
Delivery and Waste Haul Vehicles	519.5
Equipment Leakage (SF_6)	26.0
Total Project GHG Emissions – MTCO2E	**4,832.8**
Facility MWh per year [c]	600,000
Facility GHG Performance (MTCO2E/MWh)	0.008

Sources: BS 2008a, BS 2008g, DB 2009r, DB 2009t, DB 2009z and staff estimate for worker and delivery vehicles.
[a] One metric tonne (mt) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms.
[b] Assume 66 full time equivalent workers commuting 60 miles round trip five times a week with 10 percent rideshare.
[c] BS 2008a, page 2-6.

Greenhouse Gas Table 3 shows what the proposed project, as permitted, could potentially emit in greenhouse gases on an annual basis. All emissions are converted to CO_2-equivalent and totaled. Electricity generation GHG emissions are generally dominated by CO_2 emissions from the carbon-based fuels; other sources of GHG are typically small and also are more likely to be easily controlled or reused/recycled. For this solar project the primary fuel, solar energy, is greenhouse gas free, but there is propane fuel use in the boilers used to shorten startup times and keep the heat transfer fluid from freezing. Other comparatively large GHG emission sources for this project are the maintenance and worker vehicles and the SF_6 equipment leakage.

The proposed project would be permitted, on an annual basis, to emit over 4,800 metric tonnes of CO_2-equivalent per year if operated at its maximum permitted level. BSEP is a solar project with a nightly shutdown so it will operate less than 60% of capacity;

therefore, the project is not subject to the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard. However, the BSEP, at 0.008 mt CO_2-equivalent/MWh, would easily meet the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard of 0.500 mt CO_2/MWh.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Staff assesses three kinds of impacts: construction, operation, and cumulative effects. As the name implies, construction impacts result from the emissions occurring during the construction of the project. The operation impacts result from the emissions of the proposed project during operation. Cumulative impacts analysis assesses the impacts that result from the proposed project's incremental effect viewed over time. The impact of GHG emissions caused by this solar facility is characterized by considering how the power plant would affect the overall electricity system. The integrated electricity system depends on non-fossil and fossil-fueled generation resources to provide energy and satisfy local capacity needs. As directed by the OII (CEC 2009a), staff is refining and implementing the concept of a "blueprint" that describes the long-term roles (i.e., retirements and displacement) of fossil-fueled power plants in California's electricity system as we move to a high-renewable, low-GHG electricity system, which will include projects like BSEP.

CONSTRUCTION IMPACTS

Staff does not believe that the small GHG emission increases from construction activities would be significant for several reasons. First, the period of construction will be short-term and the emissions intermittent during that period, not ongoing during the life of the project. Additionally, best practices control measures that staff recommends, such as limiting idling times and requiring, as appropriate, equipment that meet the latest emissions standards would further minimize greenhouse gas emissions since staff believes that the use of newer equipment will increase efficiency and reduce GHG emissions and be compatible with low-carbon fuel (e.g., bio-diesel and ethanol) mandates that will likely be part of the ARB regulations to reduce GHG from construction vehicles and equipment.

DIRECT/INDIRECT OPERATION IMPACTS AND MITIGATION

The proposed BSEP promotes the state's efforts to move towards a high-renewable, electricity system, and, therefore, reduce the amount of natural gas used by electricity generation and greenhouse gas emissions. As the *2007 Integrated Energy Policy* Report (CEC 2007, p. 184) noted:

> New natural gas-fueled electricity generation technologies offer efficiency, environmental, and other benefits to California, specifically by reducing the amount of natural gas used—and with less natural gas burned, fewer greenhouse gas emissions. Older combustion and steam turbines use outdated technology that makes them less fuel- and cost-efficient than newer, cleaner plants.… The 2003 and 2005 IEPRs noted that the state could help reduce natural gas consumption for electric generation by taking steps to retire older, less efficient natural gas power plants and replace or repower them with new, more efficient power plants.

Thus, in the context of the Energy Commission's *Integrated Energy Policy Report*, the BSEP - solar-powered, limited propane use, limited GHG emissions and likely replacement of older existing plant capacity, furthers the state's strategy to promote generation system efficiency and reduce fossil fuel use and GHG emissions. As stated in the 2009 *Framework for Evaluating Greenhouse Gas Implications of Natural Gas-Fired Power Plants in California* (CEC 2009b, p.20):

> When one resource is added to the system, all else being held equal, another resource will generate less power. If the new resource has a lower cost or fewer emissions than the existing resource mix, the aggregate system characteristics will change to reflect the cheaper power and lower GHG emissions rate.

Net GHG emissions for the integrated electric system will decline when new renewable power plants are added to: 1) move renewable generation towards the 33 percent target; 2) improve the overall efficiency, or GHG emission rate, of the electric system; or 3) serve load growth or capacity needs more efficiently, or with fewer GHG emissions.

The Role of BSEP in Renewables Goals/Load Growth

As California moves towards an increased reliance on renewable energy, non-renewable energy resources maybe curtailed or displaced. These potential reduction in non-renewable, shown in **Greenhouse Gas Table 4**, could be as much as 36,000 GWh. These assumptions are conservative in that the forecasted growth in retail sales assumes that the impacts of planned increases in expenditures on (uncommitted) energy efficiency are already embodied in the current retail sales forecast[16]. If, for example, forecasted retail sales in 2020 were lowered by 10,000 GWh due to the success of increased energy efficiency expenditures, non-renewable energy needs fall by an additional 6,700 to 8,000 GWh/year, totaling as much as 45,000 GWh per year of reduced non-renewable energy, depending on the RPS assumed.

[16] The extent to which uncommitted energy efficiency savings are already represented in the current Energy Commission demand forecast is a subject of study for the 2009 IEPR.

Greenhouse Gas Table 4
Estimated Changes in Non-Renewable Energy Potentially Needed to Meet California Loads, 2008-2020

California Electricity Supply	**Annual GWh**	
Statewide Retail Sales, 2008, estimated [a]	265,185	
Statewide Retail Sales, 2020, forecast [a]	308,070	
Growth in Retail Sales, 2008-20	42,885	
Growth in Net Energy for Load [b]	46,316	
California Renewable Electricity	**GWh @ 20% RPS**	**GWh @ 33% RPS**
Renewable Energy Requirements, 2020 [c]	61,614	101,663
Current Renewable Energy, 2008	29,174	
Change in Renewable Energy-2008 to 2020 [c]	32,440	72,489
Resulting Change in Non-Renewable Energy [d]	13,876	(-36,173)

Source: Energy Commission staff 2009.
Notes:
a. Not including 8 percent transmission and distribution losses.
b. Based on 8 percent transmission and distribution losses, or 42,885 GWh x 0.08 = 46,316 GWh.
c. Renewable standards are calculated on retail sales and not on total generation, which accounts for 8 percent transmission and distribution losses.
d. Based on net energy (including 8 percent transmission and distribution losses), not based on retail sales

The Role of BSEP in Retirements/Replacements

BSEP would be capable of annually providing 600 GWh of renewable energy generation to replace resources, such as those estimated in **Greenhouse Gas Table 4** above, that are or will likely be precluded from serving California loads. State policies, including GHG goals, are discouraging or prohibiting new contracts and new investments in high GHG-emitting, such as coal-fired, generation, generation that relies on water for once-through cooling, and aging power plants (CEC 2007). Some of the existing plants that are likely to require significant capital investments to continue operation in light of these policies may be unlikely to undertake the investments and will retire or be replaced.

Replacement of High GHG-Emitting Generation

High GHG -emitting resources, such as coal, are effectively prohibited from entering into new contracts for California electricity deliveries as a result of the Emissions Performance Standard adopted in 2007 pursuant to SB 1368. Between now and 2020, more than 18,000 GWh of energy procured by California utilities under these contracts will have to reduce GHG emissions or be replaced; these contracts are presented in **Greenhouse Gas Table 5**.

This represents almost half of the energy associated with California utility contracts with coal-fired resources that will expire by 2030. If the State enacts a carbon adder[17], all the

[17] A carbon adder or carbon tax is a specific value added to the cost of a project for per ton of associated carbon or carbon dioxide emissions. Because it is based on, but not limited to, actual operations and

coal contracts (including those in **Greenhouse Gas Table 5**, which expire by 2020 and, other contracts that expire beyond 2020 and are not shown in the table) may be retired at an accelerated rate as coal-fired energy becomes uncompetitive due to the carbon adder or the capital needed to capture and sequester the carbon emissions. Also shown are the approximate 500 MW of in-state coal and petroleum coke-fired capacity that may be unlikely to contract with California utilities for baseload energy due to SB1368 Emission Performance Standard. As these contracts expire, new and existing generation resources will replace the lost energy and capacity. Some will come from renewable generation; some will come from new and existing natural gas fired generation. All will emit significantly less GHG than the coal and petroleum coke-fired generation, which average about 1.0 $MTCO_2$/MWh without carbon capture and sequestration, resulting in a significant net reduction in GHG emissions from the California electricity sector.

Greenhouse Gas Table 5
Expiring Long-term Contracts with Coal-fired Generation 2009 – 2020

Utility	Facility [a]	Contract Expiration	Annual GWh Delivered to CA
PG&E, SCE	Misc In-state Qual. Facilities [a]	2009-2019	4,086
LADWP	Intermountain	2009-2013	3,163 [b]
City of Riverside	Bonanza, Hunter	2010	385
Department of Water Resources	Reid Gardner	2013 [c]	1,211
SDG&E	Boardman	2013	555
SCE	Four Corners	2016	4,920
Turlock Irrigation District	Boardman	2018	370
LADWP	Navajo	2019	3,832
		TOTAL	18,522

Source: Energy Commission staff based on Quarterly Fuel and Energy Report (QFER) filings.
Notes:
a. All facilities are located out-of-state except for the Miscellaneous In-state Qualifying Facilities.
b. Estimated annual reduction in energy provided to LADWP by Utah utilities from their entitlement by 2013.
c. Contract not subject to Emission Performance Standard, but the Department of Water Resources has stated its intention not to renew or extend.

Retirement of Generation Using Once-Through Cooling

The State Water Resource Control Board (SWRCB) has proposed significant changes to OTC units, shown in **Greenhouse Gas Table 6**, which would likely require retrofit, retirement, or significant curtailment of dozens of generating units. In 2008, these units collectively produced about 58,000 GWh. While those OTC facilities owned and operated by utilities and recently-built combined cycles may well install dry or wet cooling towers, it is unlikely that the aging, merchant plants will do so. Most of these units operate at low capacity factors, suggesting a limited ability to compete in the current electricity market. Although the timing would be uncertain, new resources would out-compete aging plants and would displace the energy provided by OTC facilities and likely accelerate the retirements.

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emission and can be trued up at year end, it is considered a simple mechanism to assign environmental costs to a project.

Greenhouse Gas Table 6
Units Utilizing Once-Through Cooling: Capacity and 2008 Energy Output [a]

Plant, Unit Name	Owner	Local Reliability Area	Aging Plant?	Capacity (MW)	2008 Energy Output (GWh)	GHG Performance (MTCO2/MWh)
Diablo Canyon 1, 2	Utility	None	No	2,232	17,091	Nuclear
San Onofre 2, 3	Utility	L.A. Basin	No	2,246	15,392	Nuclear
Broadway 3 [b]	Utility	L.A. Basin	Yes	75	90	0.648
El Centro 3, 4 [b]	Utility	None	Yes	132	238	0.814
Grayson 3-5 [b]	Utility	LADWP	Yes	108	150	0.799
Grayson CC [b]	Utility	LADWP	Yes	130	27	0.896
Harbor CC	Utility	LADWP	No	227	203	0.509
Haynes 1, 2, 5, 6	Utility	LADWP	Yes	1,046	1,529	0.578
Haynes CC [c]	Utility	LADWP	No	560	3,423	0.376
Humboldt Bay 1, 2 [a]	Utility	Humboldt	Yes	107	507	0.683
Olive 1, 2 [b]	Utility	LADWP	Yes	110	11	1.008
Scattergood 1-3	Utility	LADWP	Yes	803	1,327	0.618
Utility-Owned				7,776	39,988	0.693
Alamitos 1-6	Merchant	L.A. Basin	Yes	1,970	2,533	0.661
Contra Costa 6, 7	Merchant	S.F. Bay	Yes	680	160	0.615
Coolwater 1-4 [b]	Merchant	None	Yes	727	576	0.633
El Segundo 3, 4	Merchant	L.A. Basin	Yes	670	508	0.576
Encina 1-5	Merchant	San Diego	Yes	951	997	0.674
Etiwanda 3, 4 [b]	Merchant	L.A. Basin	Yes	666	848	0.631
Huntington Beach 1, 2	Merchant	L.A. Basin	Yes	430	916	0.591
Huntington Beach 3, 4	Merchant	L.A. Basin	No	450	620	0.563
Mandalay 1, 2	Merchant	Ventura	Yes	436	597	0.528
Morro Bay 3, 4	Merchant	None	Yes	600	83	0.524
Moss Landing 6, 7	Merchant	None	Yes	1,404	1,375	0.661
Moss Landing 1, 2	Merchant	None	No	1,080	5,791	0.378
Ormond Beach 1, 2	Merchant	Ventura	Yes	1,612	783	0.573
Pittsburg 5-7	Merchant	S.F. Bay	Yes	1,332	180	0.673
Potrero 3	Merchant	S.F. Bay	Yes	207	530	0.587
Redondo Beach 5-8	Merchant	L.A. Basin	Yes	1,343	317	0.810
South Bay 1-4	Merchant	San Diego	Yes	696	1,015	0.611
Merchant-Owned				15,254	17,828	0.605
Total In-State OTC				23,030	57,817	

Source: Energy Commission staff based on Quarterly Fuel and Energy Report (QFER) filings.
a. OTC Humboldt Bay Units 1 and 2 are included in this list. They must retire in 2010 when the new Humboldt Bay Generating Station (not ocean-cooled), currently under construction, enters commercial operation.
b. Units are aging but are not OTC.

Any additional costs associated with complying with the SWRCB regulation would be amortized over a limited revenue stream today and into the foreseeable future. Their energy and much of their dispatchable, load-following capability will have to be replaced. These units constitute over 15,000 MW of merchant capacity and 17,800 GWh of merchant energy. Of this, much but not all of the capacity and energy are in local reliability areas, requiring a large share of replacement capacity – absent transmission upgrades – to locations in the same local reliability area. **Greenhouse Gas Table 6** provides a summary of the utility and merchant energy supplies affected by the OTC regulations.

New generation resources that can either provide local support or energy will emit significantly less GHGs. Existing aging and OTC natural gas generation average 0.6 to 0.7 MTCO2/MWh, which is much higher than a renewable project like BSEP. When a project can provide energy and capacity, given its location, it can provide a significant net reduction in GHG emissions from the California electricity sector. A project like BSEP located far from the coastal load pockets like the Greater Los Angeles Local Capacity Area, would more likely provide energy support to facilitate the retirement of some aging and/or OTC power plants, but would not likely provide any local capacity support at or near the coastal OTC units.

CUMULATIVE IMPACTS

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or . . . compound or increase other environmental impacts" (CEQA Guidelines § 15355). "A cumulative impact consists of an impact that is created as a result of a combination of the project evaluated in the EIR together with other projects causing related impacts" (CEQA Guidelines § 15130[a][1]). Such impacts may be relatively minor and incremental, yet still be significant because of the existing environmental background, particularly when one considers other closely related past, present, and reasonably foreseeable future projects.

This entire assessment is a cumulative impact assessment. The project alone would not be sufficient to change global climate, but would emit greenhouse gases and therefore has been analyzed as a potential cumulative impact in the context of existing GHG regulatory requirements and GHG energy policies.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

BSEP, as a solar energy generation project, is exempt from the mandatory GHG emission reporting requirements for electricity generating facilities as currently required by the California Air Resources Board (ARB) for compliance with the California Global Warming Solutions Act of 2006 (AB 32 Núñez, Statutes of 2006, Chapter 488, Health and Safety Code sections 38500 et seq.) (ARB 2008a).

Since this power project would be permitted for less than a 60% annual capacity factor, the project is not subject to the requirements of SB 1368 and the Emission Performance Standard.

NOTEWORTHY PUBLIC BENEFITS

Greenhouse gas related noteworthy public benefits include the construction of renewables and low-GHG emitting generation technologies and the potential for successful integration into the California and greater WECC systems.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency comments were received on the PSA GHG analysis. An intervenor, California Unions for Reliable Energy (CURE), did provide a comment regarding a staff note regarding construction GHG emissions emission estimates not being complete. However, this note was a continuity error as the construction GHG emission estimate information was completed just prior to publication of the PSA, so this erroneous note has been deleted within this Final Staff Assessment (FSA).

CONCLUSIONS

The Beacon Solar Energy Project would emit considerably less greenhouse gases (GHG) than existing power plants and most other generation technologies, and thus would contribute to continued improvement of the overall western United States, and specifically California, electricity system GHG emission rate average. The project would lead to a net reduction in GHG emissions across the electricity system that provides energy and capacity to California. Thus, staff believes that the project would result in a cumulative overall reduction in GHG emissions from the state's power plants, would not worsen current conditions, and would thus not result in impacts that are cumulatively significant.

Staff does not believe that the GHG emission increases typical from construction activities would be significant for several reasons. First, the period of construction would be short-term and not ongoing during the life of the project. Additionally, the best practices control measures that staff recommends, such as limiting idling times and requiring, as appropriate, equipment that meets the latest emissions standards, would further minimize greenhouse gas emissions since staff believes that the use of newer equipment will increase efficiency and reduce GHG emissions and be compatible with low-carbon fuel (e.g., bio-diesel and ethanol) mandates that will likely be part of the ARB regulations to reduce GHG from construction vehicles and equipment. For all these reasons, staff would likely conclude that the short-term emission of greenhouse gases during construction would be sufficiently reduced and would, therefore, not be significant.

The Beacon Solar Energy Project, as a solar project with a nightly shutdown will operate less than 60% of capacity and is therefore not subject to the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard. However, the Beacon Solar Energy Project would easily comply with the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard.

PROPOSED CONDITIONS OF CERTIFICATION

No Conditions of Certification related to Greenhouse Gas emissions are proposed. The project owner would comply with any future applicable GHG regulations formulated by the ARB, such as GHG reporting or emissions cap and trade markets.

REFERENCES

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CPUC 2008 – California Public Utilities Commission. Final Opinion on Greenhouse Gas Regulatory Strategies, Joint Agency proposed final opinion, publication # CEC-100-2008-007-D. Posted: September 12, 2008.

DB 2009z – Downey Brand/S. Prentiss (tn 52500). Responses to Air Quality Questions from Workshop. Submitted to CEC/Docket Unit on 7/20/09.

BIOLOGICAL RESOURCES

Testimony of Susan D. Sanders

SUMMARY OF CONCLUSIONS

Much of the 2,012-acre Beacon Solar Energy Project (BSEP) plant site is barren or sparsely vegetated due to past agricultural disturbances, but the site nevertheless supports a diversity of mammals, birds, and reptiles, including some special-status wildlife species. Grading on the plant site would not directly or indirectly impact sensitive plant communities, rare plants, or wetlands, but would result in direct impacts to some wildlife species and removal of approximately 430 acres of vegetation that provides cover, foraging, and breeding habitat. Construction of linear facilities also has potential for impacts to listed species; transmission line construction west of State Route 14 would permanently impact approximately five acres of Mojave creosote bush scrub habitat for desert tortoise (federal- and state-listed as threatened) and Mohave ground squirrel (state-listed as threatened). Construction of a 40-mile water pipeline from the Rosamond Water Treatment Plant would impact 11.2 acres of desert tortoise and Mohave ground squirrel habitat. These potential direct and indirect construction impacts to vegetation and wildlife at the plant site and along linear facilities can be reduced to less-than-significant levels with impact avoidance and minimization measures described in staff's proposed Conditions of Certification **BIO-1** through **BIO-8** and **BIO-21**.

Potential take of desert tortoise and Mohave ground squirrel and loss of habitat for these species would be fully mitigated with implementation of staff's proposed Conditions of Certification **BIO-9** through **BIO-12**. The measures described in staff's proposed Condition of Certification **BIO-11** were proposed by the applicant and require acquisition and enhancement of 115 acres of habitat suitable for these listed species. The other two conditions specify impact avoidance and minimization measures, as required by the U. S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG). Implementation of these conditions would reduce impacts to desert tortoise and Mohave ground squirrel to less-than-significant levels and would also satisfy the CDFG's requirements under section 2081 of California's Fish and Game Code.

One of the most significant biological impacts of the BSEP is the re-routing of Pine Tree Creek and another ephemeral desert wash on the plant site, resulting in loss of approximately 60 acres of desert wash scrub habitat and 16.0 acres of jurisdictional waters of the state. The vegetation in the desert wash is highly degraded by past agricultural activities, but these washes are nevertheless characterized by natural processes that support recruitment of native desert wash vegetation and provide wildlife habitat. The applicant proposes to replace the desert washes with an engineered channel to the south and east of the project site and to replicate in part the hydrological and biological functions and processes in this new drainage.

California Energy Commission staff concurs with the applicant's overall goal of replacing the biological functions and values of the impacted desert wash with the re-routed drainage. Staff agrees with the applicant's recommendations on how this goal would be achieved, with some modifications, as described in staff's Condition of Certification **BIO-**

18. However, the design for the re-routed wash has not been finalized and several significant issues remain unresolved, including final grade control structure design, extent of needed bank protection and soil cement channel lining, and how the re-routed channel would intercept and divert flood flows from the natural drainage into the engineered channel. **Soil & Water Appendix C** provides a detailed discussion of these remaining uncertainties.

Staff anticipates satisfactory resolution of these issues by the applicant and expects that the refined channel design would provide suitable conditions for revegetation of the wash, as described in staff's proposed Condition of Certification **BIO-18**. With implementation of this condition impacts to the 16.0 acres of state waters and loss of the hydrological and biological functions of desert washes at the BSEP site would be mitigated to less-than-significant levels. This condition would also fulfill requirements of California Department of Fish and Game's Lake and Streambed Alteration Agreement program pursuant to Section 1600 et seq. of California's Fish and Game Code.

The BSEP would include evaporation ponds that would collect blowdown water from the cooling towers. Open ponds are a source of significant concern to CDFG, USFWS, and staff because they could attract ravens, which in turn prey on desert tortoise, and could also harm waterfowl, shorebirds, and other resident or migratory birds due to elevated levels of metals or hyper-saline conditions. Staff has addressed these concerns with proposed Condition of Certification **BIO-14**, which requires the evaporation ponds to be covered with netting to exclude birds and other wildlife. This condition of certification would avoid take of migratory birds and would reduce the potential adverse effects of the evaporation ponds to wildlife to less-than-significant levels.

With implementation of staff's proposed conditions of certification, construction, operation, decommissioning of the BSEP would comply with all federal, state, and local laws, ordinances, regulations, and standards relating to biological resources and would mitigate potential impacts to biological resources to less-than-significant levels.

INTRODUCTION

This section of the Final Staff Assessment provides the California Energy Commission (Energy Commission) staff's final analysis of potential impacts to biological resources from the construction and operation of the proposed Beacon Solar Energy Project (BSEP). Information provided in this document addresses potential impacts to special-status species and areas of critical biological concern. This analysis also describes the biological resources at the project site and at the locations of ancillary facilities. This document explains the need for mitigation, evaluates the adequacy of mitigation proposed by the applicant, and specifies additional mitigation measures to reduce impacts to less-than-significant levels. It also describes compliance with applicable laws, ordinances, regulations, and standards (LORS) and recommends conditions of certification.

This analysis is based, in part, upon information provided in the BSEP Application for Certification (BS 2008a, BS 2008c) and other submittals, responses to staff data requests (BE 2008i, DB 2008d, DB 2008n, DB 2008o, AECOM 2009e), and staff

workshops (DB 2008r); site visits by Energy Commission staff on April 17, 2008; April 13, June 30, July 19-21, 2009, and communications with representatives from the California Department of Fish and Game (CDFG), United States Fish and Wildlife Service (USFWS), and California Regional Water Quality Control Boards, Lahontan Region (RWQCB) and independent research.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The applicant will need to abide by the laws, ordinances, regulations, and standards (LORS) during project construction and operation, as listed in **Biological Resources Table 1**.

Biological Resources Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	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 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.
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).
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.
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 is prohibited without an Incidental Take Permit.
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.
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.

Significant Natural Areas (Fish and Game Code section 1930 et seq.)	Designates certain areas such as refuges, natural sloughs, riparian areas, and vernal pools as significant wildlife habitat.
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 Agreement (Fish and Game Code sections 1600 et seq.)	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.
Water Quality Control Plan for the Lahontan Region (Basin Plan)	The Basin Plan establishes water quality objectives that protect the beneficial uses of surface water and groundwater in the Region. The Basin Plan describes implementation plans and other control measures designed to ensure compliance with statewide plans and policies and provide comprehensive water quality planning. Beneficial uses for minor surface water bodies of the Koehn Hydrologic Area include wildlife habitat.
California Native Plant Protection Act of 1977 (Fish and Game Code section 1900 et seq.)	Designates state rare, threatened, and endangered plants.
California Desert Native Plants Act of 1981 (Food and Agricultural Code section 80001 et seq. and California Fish and Game Code sections 1925-1926)	Protects non-listed California desert native plants from unlawful harvesting on both public and private lands in Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego counties. Unless issued a valid permit, wood receipt, tag, and seal by the commissioner or sheriff, harvesting, transporting, selling, or possessing specific desert plants is prohibited.
Local	
Kern County General Plan Land Use, Open Space, and Conservation Element (Kern County 2007)	Directs the county to work closely with state and federal agencies to assure that discretionary projects avoid or minimize impacts to fish, wildlife, and botanical resources.

SETTING

PROJECT SITE AND DESCRIPTION

Beacon Solar, LLC, (Beacon) proposes to develop and operate a 250-megawatt solar energy facility called Beacon Solar Energy Project (BSEP) in Kern County east of State Route (SR) 14. The facility would be located approximately four miles north-northwest of the northern boundary of California City, approximately 15 miles north of the Town of Mojave. The site is situated in the Fremont Valley, just east of the southernmost portion of the Sierra Nevada, in the northwestern Mojave Desert. The Fremont Valley is typified by creosote bush scrub vegetation, with patches of desert saltbush scrub, desert wash scrub, and agriculture (mostly abandoned).

The project includes the plant site (solar array, power generating equipment, support facilities, evaporation ponds, and access roads) and the project's linear facilities (transmission line and switchyard). The power block and solar arrays would occupy approximately 1,266 acres of the 2,012-acre plant site. The total area that would be fenced and subject to disturbance is 2,012 acres and includes an engineered channel, evaporation ponds, access road, administration buildings and other support facilities, and bioremediation areas. The major components of the project are described below.

Plant Site

The layout of the project's plant site includes the solar array, power block and on-site support facilities such as an administration building and warehouse. An existing dirt road off SR-14 would be paved to provide access to the solar array, power block, and support facilities on the plant site. The entire property would be fenced with low maintenance fencing (e.g. single or double strand barbed-wire fence) to prevent human access; in addition, desert tortoise exclusion fencing would be erected around the plant site to exclude desert tortoise and deter other wildlife from entering the site (BS 2008i).

Evaporation Ponds

On-site facilities also would include three, 2-acre evaporation ponds to dewater the waste stream from the project's water treatment and cooling water. The ponds would be designed with an average depth of eight feet which allows for two feet of freeboard, three feet of wastewater and three feet of accumulated solids. The ponds would be cleaned when three feet of precipitated solids accumulate in the base of the ponds, which depending on the water quality of the cooling water is estimated to be 3.5 - 4.5 years (DB 2009r). The pond solids would likely be transported off-site and disposed at the McKittrick Waste Treatment Site, a Class II facility (DB 2009r).

Re-Routed Desert Wash

The plant site is traversed diagonally from southwest to northeast by Pine Tree Creek, an ephemeral desert wash approximately 10,900 feet in length. The plant site would be mass graded at the beginning of construction, so the applicant proposes to re-route Pine Tree Creek and a smaller (2,150-foot) unnamed dry wash inside the eastern property boundary (BS 2008a). The re-routed wash would be outside the desert tortoise exclusion fencing but within a low maintenance security fence (DB 2008e).

The applicant's original design proposed for the engineered channel featured a trapezoidal channel approximately 14,000 feet long with 3:1 gradient slopes (BS 2008a). In response to Staff's hydrological/hydraulic analyses indicating that this proposed channel design was too steep to adequately manage flood flows, the applicant developed a new design that incorporated eleven, 10-foot high drop structures within the 14,000-foot channel (DB 2009r, Attachment 1a, *Draft Memorandum for Hydrologic and Hydraulic Analysis of Rerouted Channel for Beacon Solar Energy - Mojave, CA*). The revised design for the engineered drainage would route up to approximately 28,000 cubic feet/second (cfs) of flood waters along the southern and eastern boundaries of the plant site. The channel would be offset 50 feet to the west of the eastern project boundary and 55 feet north of the southern project boundary, in order to accommodate any future roads. The new channel would be approximately 250 feet wide at the base and maintain 4-feet horizontal to 1-foot vertical side slopes except along the east-west reach, where the north side slope would be 3-feet horizontal to 1-foot vertical. The channel would be approximately 12 feet deep with a diffuser at its downstream end (DB 2009r).

The drop structures would need heavy armoring with concrete as well as energy dissipaters because water velocities would be high at these structures (DB 2009r, Technical Memorandum from Serkan Mahmutoglu, P.E., AECOM, *Preliminary Sediment Transport Analysis Pine Tree Wash, Fremont Valley, California*, June 19, 2009.). A transition zone reinforced with riprap would likely be needed approximately 50 feet upstream and downstream of the energy dissipaters. Specific details on the extent and required materials for armoring (for example, heavy armor versus riprap, and riprap stone diameter) cannot be finalized until further modeling and analysis is completed (DB 2009r, *Preliminary Sediment Transport Analysis*).

Between the drop structures the channel would be straight with relatively flat slopes of 0.2 percent. Within these reaches the incoming sediment supply would likely be sufficient to prevent significant long-term erosion of the side slopes, and heavy armoring would not be necessary (DB 2009r, *Preliminary Sediment Transport Analysis*). However, some form of soil stabilization, most likely soil cement, would be needed to protect against erosion on these side slopes (DB 2009r, *Preliminary Sediment Transport Analysis*).

Model refinement and design verification are needed before settling on a final design for the armoring requirements, and also to establish channel maintenance requirements. Preliminary hydraulic calculations indicate that the applicant's proposed design can handle the currently projected 100-year storm, and that some maintenance would be needed such as removal of sediment and bank protection repair (DB 2009r, *Preliminary Sediment Transport Analysis*). **Soil & Water, Appendix C** provides a detailed discussion of the remaining design issues that need to be refined so that the engineered channel would provide adequate flood conveyance and other hydrological functions of the existing drainages on the BSEP site.

Initial site preparation such as grading waters of the state is anticipated to take approximately 90 days at the onset of project construction (DB 2008e). Once initial work

is complete, construction of the facility is anticipated to last an additional 22 months. The operation lifetime of the project is anticipated to be up to approximately 30 years (DB 2008e).

Transmission Line and Towers

The BSEP would require construction of a transmission line to interconnect the project to the existing Barren Ridge facility, Los Angeles Department of Water and Power's (LADWP's) 230-kilovolt (kV) Barren Ridge Substation, located across SR-14 southwest of the BSEP plant site. The transmission line would involve constructing a 230-kV transmission line approximately 3.5 miles long that would run west and southwest from the power block, cross SR-14 and extend south along an expanded LADWP right-of-way, where it would tie into the existing Inyo-Rinaldi 230-kV transmission line at the existing Barren Ridge Substation. Approximately 1.6 miles of the 3.5-mile line would be within the 2,012-acre plant site boundary. The transmission line would be installed on 36 new steel/concrete monopoles. Potential new access roads (14 feet by 1.9 miles), in addition to spur roads (averaging 12 feet by 110 feet) to 10 pole sites, also would be built.

Emergency Access Road

The applicant recently identified a second emergency access road in addition to the primary access off of SR-14 on the western side of the BSEP plant site. The second emergency access road, described in more detail in recent submittals from the applicant (AECOM 2009), occurs at the northern edge of the facility on the eastern side of the plant site connecting to Neuralia Road.

Alternative Water Sources

Since publication of the Preliminary Staff Assessment staff has been evaluating the feasibility of BSEP using an alternative source of water other than onsite potable groundwater. Staff has identified several such sources, including recycled water from California City (CofC 2009c), groundwater from near Koehn Lake (DB 2009r), and tertiary treated waste water from the Rosamond Community Services District (RCSD 2009a).

The Rosamond Community Services District has expressed their willingness to provide 1,456 acre-feet per year of Title 22 tertiary treated waste water, generated from its customers, to the BSEP for a period of 30 years (Rosamond 2009). Delivery of this water would require construction of a 40-mile underground pipeline extending from the community of Rosamond to the BSEP site. **Biological Resources Appendix A** describes the vegetation and wildlife resources occurring along the southern 23 miles of the 39.61-mile Rosamond water pipeline alignment. The northern 17.6 miles of the Rosamont water pipeline alignment is identical to that analyzed for the BSEP gas pipeline (BS 2008a). The gas pipeline is no longer a part of the BSEP because the applicant has proposed using propane in place of natural gas as fuel for the boilers (DB 2009r), but the impact analysis for construction of the gas pipeline is applicable to the assessment of the water pipeline impacts for this 17.6-mile portion of the alignment.

Vegetation and Wildlife

Plant Communities

Seven vegetation communities were mapped within the plant site and along linear facilities (BSE 2008a). **Biological Resources Table 2** (from BS 2008i, Table 1, p. 12) summarizes the acreage of vegetation communities within each project feature.

Biological Resources Table 2
BSEP Vegetation Communities/Cover Types

Vegetation Communities/Cover Type	Acreage
Plant Site	
Mojave Desert Wash Scrub	60.3
Developed	2.7
Fallow Agricultural-Ruderal	1,579.7
Fallow Agricultural-Disturbed Atriplex Scrub	369.2
Subtotal Plant Site	2,011.9
Transmission Line	
Mojave Creosote Bush Scrub	5.0
Fallow Agricultural Ruderal	0.9
Rosamond Recycled Water Pipeline Study Area	
Disturbed (Developed, road, road shoulder, unvegetated)	81.2
Mojave Creosote Bush Scrub	4.3
Saltbush Scrub	6.9

The fallow agricultural-ruderal vegetation community covers the majority of the plant site and a portion of the transmission line alignments. This relatively barren plant community reflects the disturbance from past agricultural activities and is dominated by non-native plants such as Russian thistle (*Salsola tragus*), Sahara mustard (*Brassica tournefortii*), and Mediterranean schismus (*Schismus arabicus*). Vegetative cover is very sparse, ranging from 0 to 2 percent (BS 2008a).

Fallow agricultural-disturbed atriplex scrub is the second most common plant community at the plant site. It occupies areas previously used for agriculture but which have now been recolonized by several native atriplex shrub species. The dominant species is the allscale (*Atriplex polycarpa*), a species particularly effective at reoccupying abandoned agricultural lands. Other plants found within this vegetation community are shadscale (*Atriplex confertifolia*), Russian thistle, and salt heliotrope (*Heliotropium curassavicum*). Shrub cover in this vegetation community is approximately 22 to 25 percent (BS 2008a).

Mojave Desert wash scrub is an open shrubby community with scattered microphyllous trees and shrubs on well-drained sandy soils. This vegetation community is found in washes, arroyos, and canyons of intermittent streams throughout the Mojave Desert, and in the project area occurs within Pine Creek Tree Wash. The dominant plant in this community is the scale broom (*Lepidospartum squamatum*). Other shrubs occurring in this community are box thorn (*Lycium cooperi*), bladderpod (*Isomeris arborea*),

rabbitbush (*Chrysothamnus nauseosus*), bladder sage (*Salazaria mexicana*), and Mormon tea (*Ephedra nevadensis* and *E. californica*). The smaller of the two dry washes within the plant site is unvegetated (BS 2008a).

Mojave creosote bush scrub occurs along portions of the transmission line alignment west of the plant site. This is an open shrub, native plant community dominated mainly by creosote bush. Other shrubs commonly found in this vegetation community include white bursage (*Ambrosia dumosa*), box thorn, silver cholla (*Cylindropuntia echinocarpa*), and occasional Joshua trees (*Yucca brevifolia*). While dominated by shrubs (approximately 18 percent shrub cover), this vegetation community also has an herbaceous layer, which during 2008 surveys included species such as Mojave sun cups (*Camissonia campestris*), Mojave pincushion (*Chaenactis xantiana*), brittle spineflower (*Chorizanthe brevicornu*), pygmy poppy (*Eschscholzia minutiflora* ssp. *minutiflora*), California goldfields (*Lasthenia californica*), and desert dandelion (*Malacothrix glabrata*) (BS 2008i).

The areas mapped as “developed” include unpaved and paved roads and road shoulders, the rail line, canals, and areas cleared for residential uses within the plant site.

Sensitive Vegetation Communities

Sensitive vegetation communities are those that are considered rare in the region, support special status plant or animal species, or receive regulatory protection. No sensitive vegetation communities occur in the survey area or within one mile of project boundaries (BS 2008a, EDAW 2008d).

Ephemeral Drainages/Waters of the State

The project site is located on the alluvial sediments of the Fremont Valley, due east of the alluvial fans emanating from the east side of the Sierra Nevada. The valley is a closed basin that contains one playa, Koehn Lake. The project area slopes gently northeast toward the lake, which is approximately six miles from the plant site. During infrequent large precipitation events, runoff from the site may reach Koehn Lake (DB 2008i). Koehn Lake is within the North Mojave Dry Lake complex, an area designated by the National Audubon Society as a California Important Bird Area (Jones et al 2008). The North Mojave Dry Lakes Important Bird Area includes Koehn Lake and three other large dry lakes and their associated seasonal wetlands between Ridgecrest and Barstow in the northern Mojave Desert. Seasonal flooding within these lakebeds provides foraging and breeding grounds for a variety of waterfowl and other birds (Jones et al. 2008).

Pine Tree Creek, a dry desert wash, traverses the site diagonally from southwest to northeast for approximately 10,900 linear feet (DB 2008i). A smaller, unnamed wash crosses the southwestern portion of the plant site from west to east and is approximately 2,150 linear feet (DB 2008i). The smaller wash is unvegetated, but Pine Tree Creek is characterized by approximately 15 percent cover of Mojave Desert wash scrub, totaling 60.3 acres (DB 2008i). Flow within the wash is from southwest to northeast across the project site, and then continues in a more dispersed fashion to Koehn Lake (DB 2008i, Appendix F).

According to the applicant's hydrological analysis (DB 2009r, Attachment 1a) much of the project site is part of Pine Tree Creek's floodplain for large storm events (100-year storm of 28,000 cfs). Pine Tree Creek has a well-defined natural earthen channel at its upstream end, but that channel is truncated by an escarpment, the Cantil Valley Fault scarp, which bisects the plant site. Uplift of the terrain to the southeast of the Cantil Valley Fault has resulted in differing fluvial conditions. In the uplifted region of the site (southeast), the Pine Tree wash tends to follow a channelized flow with generally high velocities (DB 2009r, Technical Memorandum from Serkan Mahmutoglu, P.E., AECOM, to Sara Head, Beacon Solar Energy Project, Preliminary Sediment Transport Analysis Pine Tree Wash, Fremont Valley, California, June 19, 2009). Once the stormwater passes over the Cantil Valley Fault scarp flood waters spill out of the existing wash and inundate much of the project area (DB 2009r, Attachment 1a).

Pine Tree Creek and the unnamed wash on the plant site have been disturbed by past agricultural activities and are occupied primarily by monotypic stands of scale broom with a limited understory composed primarily of patchy red-stem stork's bill (*Erodium cicutarium*) and Mediterranean grass (*Schismus barbatus*). Windblown dead Russian thistle has collected in large portions of the washes. The vegetation community type of the wash, classified as southern alluvial fan scrub, is primarily restricted to floodplain habitats containing riverine cobbles, boulders, and sand. These areas flood infrequently (approximately every 5 to 10 years), so that many upland species become established in the wash (DB 2008i). The occasional flooding and sediment reworking, however, is the driving force that maintains this vegetation type (DB 2008i).

The extent and distribution of the collective area of state waters occurring within the plant site, based upon the presence of bed and bank, for Pine Tree Creek is 14.96 acres and 1.04 acres for the unnamed wash (DB 2008i). Of the total 16.00 acres of state waters, the extent and distribution of scale-broom occurring within Pine Tree Creek is 2.4 acres. The remaining 13.60 acres of state waters are riverine unconsolidated bottom (i.e., unvegetated waters of the state). No wetlands occur within or near the project area (BSE 2008a).

The U.S. Army Corps of Engineers issued an approved jurisdictional determination for the BSEP on February 5, 2008, concluding that drainages on the plant site are not jurisdictional waters of the U.S. because they were tributaries to a non-navigable waterway, Koehn Lake (BSE 2008a, Appendix F.2).

Functions and Values of Project Area Washes

Pine Tree Creek and the unnamed wash on the project site are typical of the drainages that characterize most of the arid southwest in that they are ephemeral streams rather than perennial (an ephemeral stream is defined as one that flows briefly in direct response to precipitation). Dry desert washes like Pine Tree Creek support many of the same hydrological and ecological processes as perennial streams, and provide the following functions and values: landscape hydrologic connections; stream energy dissipation during high-water flows that reduces erosion and improves water quality; water supply and water-quality filtering; surface and subsurface water storage; groundwater recharge; sediment transport, storage, and deposition aiding in floodplain maintenance and development; nutrient cycling; wildlife habitat and

movement/migration; and support for vegetation communities that help stabilize stream banks and provide wildlife habitat (Levick et al. 2008).

Vegetation within the Pine Tree Creek wash reflects the high levels of disturbance from the alfalfa farming that occurred at the site until the late 1980s, as well as the more recent sheep grazing. The past and current agricultural activities on the site have eliminated much of the vegetation that once occurred there, replacing it with a sparse shrub cover dominated by scale broom (*Lepidospartum squamatum*). Scale broom is an early-successional native shrub characteristic of Mojave Desert washes that have been subject to soil disruption. Prior to the disturbance from farming and grazing the vegetation within Pine Tree Creek, the project site probably resembled the upstream reaches of this wash, with a denser and more diverse shrub cover and understory. However, even with diminished plant diversity and cover, Pine Tree Creek continues to provide the functions and values as described above, such as foraging, cover, and breeding habitat for a variety of birds, mammals, and reptiles. During field surveys conducted in April of 2008 and 2009 staff observed numerous small mammal burrows in the wash and bird species such as sage sparrow (*Amphispiza belli*), horned lark (*Eremophila alpestris*), and loggerhead shrike (*Lanius ludovicianus*).

The patchiness of the shrub cover reduces the wash's value as a corridor for wildlife movement, but does not eliminate it. No features of the wash currently impede movement of desert tortoise or other wildlife, although the applicant notes that with respect to desert tortoise, "Poor habitat in the wash limits the wash's usefulness as occupiable habitat or a movement corridor…" (BS 2008a Appendix F, Attachment E, Letter from Alice Karl to Arrie Bachrach re: Summary of August 10, 2007 site visit, January 3, 3008, p. 4). Based on staff's observations at the site of vegetation and wildlife, and review of information provided by the applicant (BS 2008a), staff has concluded that the existing desert washes on the project site still provide some value to wildlife as a corridor for movement, although staff agrees with the applicant's assessment that these values have been substantially impaired by the recent changes in vegetation within the wash. Staff also notes that, while impacts are determined based on the current functions and values, the vegetation in the channel is in a state of recovery from the agricultural operations that ended approximately 30 years ago, and that if left undisturbed the shrub layers and understory would eventually become more dense, diverse, and hospitable to wildlife movement.

The agricultural activities that altered the plant communities within Pine Tree Creek wash did not substantially alter the hydrologic connections or topography of the channel. In their sediment transport studies the applicant provided an analysis of historical aerial photographs from 1952 and 1983, comparing it with 2007 imagery of the project site to determine the extent of lateral migration of Pine Tree Creek wash (DB 2009r, Technical Memorandum from Serkan Mahmutoglu, P.E., AECOM, *Preliminary Sediment Transport Analysis Pine Tree Wash, Fremont Valley, California,* June 19, 2009). The current desert landscape is similar to that observed in the 1952 image, with the 1983 image indicating that a large portion of the project site was altered to agricultural use. Over the 55 year period (1952 to 2007) slight variations in the stream channel location have occurred, but the main channel remains in the same vicinity (DB 2009r, *Preliminary Sediment Transport Analysis*). The limits of the depositional wash area to the north of the Cantil Valley Fault also appear to be relatively stable over this

time period (DB 2009r, *Preliminary Sediment Transport Analysis*). The analysis is consistent with staff's observations and analysis of the washes on project site, which indicate that despite past agricultural disturbances the washes continue to support natural processes of soil deposition, channel formation, and development of microtopography and soil crusts.

Staff concludes that Pine Tree Creek wash within the project site provides significant hydrological and biological values and functions, including: hydrological connections with Koehn Lake, a seasonally important wildlife resource; stream energy dissipation during high-water flows that reduces erosion and improves water quality; surface and subsurface water storage; groundwater recharge; sediment transport, storage, and deposition aiding in floodplain maintenance and development; nutrient cycling; support for vegetation communities that help stabilize stream banks and provide wildlife habitat and a movement corridor. These latter functions relating to wildlife habitat and connectivity have been impaired, but not eliminated, by the recent disturbances to vegetation from agricultural activities. All other functions remain intact.

Rosamond Alternative Water Pipeline

The Rosamond Alternative would involve construction of a 40-mile pipeline extending from the community of Rosamond's new tertiary treated water plant to the BSEP. The biological resources encountered along the northern 17.6 miles of this alignment, from California City Boulevard to the BSEP, have already been described (BS 2008a, BS 2008c, EDAW 2008d). **Biological Resources** Appendix A provides a detailed description of the vegetation and wildlife resources along the southern 23 miles of the Rosamond Alternative pipeline alignment.

The southern 23 mile portion of the Rosamond Alternative water pipeline alignment would be constructed almost entirely within the existing road bed and shoulder. The alignment is along mostly along improved gravel and dirt roads in rural-residential and undeveloped areas, on the disturbed road shoulder of Sierra Highway, and on the paved road bed of Rosamond Boulevard. Habitat types mapped along the alignment include Mojave creosote bush scrub, saltbush scrub (xerophytic phase), saltbush scrub (halophytic phase), disturbed-ruderal saltbush scrub, and unvegetated or other disturbed-urban areas. The pipeline alignment crosses two forks of Cache Creek, an ephemeral drainage, and 12 smaller unnamed ephemeral drainages. All features, including Cache Creek, are isolated waters with no direct connection to a perennial stream or other navigable waters or permanent water source such as a lake or spring, and are unlikely to qualify as jurisdictional features subject to regulation under the federal Clean Water Act. Only Cache Creek would be considered a waters of the state because the other ephemeral drainages are not characterized by a defined bed and bank within the pipeline alignment right-of-way (ROW). Surveyors mapped 11 Joshua trees in or near the ROW. The ROW was also searched for native cactus, creosote bush rings, and Mojave yucca; however, none were found within or adjacent to the ROW.

No federal-listed plant species occur within the vicinity of the project area. Two state-listed species, Red Rock tarplant and Mojave tarplant, occur within the general vicinity of the pipeline but are not expected to occur in the project area; these two species occur

approximately 15 miles away in gravelly volcanic tuffs and riparian scrubs (respectively) in the Piute Mountains, and the creosote bush scrubs in the valley soils and elevations found in the project area are not likely to support these two state-listed species. However, the alignment crosses plant communities that provide moderate to high quality habitat for desert tortoise, Mohave ground squirrel and western burrowing owl. Other special status species that could occur near the pipeline alignment include loggerhead shrike, LeConte's thrasher, horned larks, desert kit fox and American badger.

Wildlife

The plant site and most of the proposed linear facility alignments are disturbed and sparsely vegetated, but nevertheless support a diversity of wildlife species. Reptiles detected during the 2007/2008 surveys include desert tortoise (*Gopherus agassizii*), side-blotched lizard (*Uta stansburiana*), long-nosed leopard lizard (Gambelia wislizenii), western whiptail (*Cnemidophorus tigris*), zebra-tailed lizard (*Callisaurus draconoides*) red coachwhip (*Masticophis flagellum piceus*), pacific gopher snake (*Pituophis catenifer*), and Mohave green rattlesnake (*Crotalus scutulatus scutulatus*). Mammals recorded during the surveys include desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), whitetail antelope squirrel (*Ammospermophilus leucurus*), and coyote (*Canis latrans*). Desert kit fox sign (*Vulpes macrotis macrotis*) was also detected during the surveys (BSE 2008a, EDAW 2008d).

The project area provides forage, cover, roosting, and nesting habitat for a variety of bird species, despite the relatively low vegetative cover and a history of agricultural disturbance. Some of the resident and migratory birds detected in and near the BSEP site in 2007 and/or 2008 surveys include common poorwill (*Phalaenoptilus nuttallii*), lesser nighthawk (*Chordeiles acutipennis*), greater roadrunner (*Geococcyx californianus*), long-billed curlew (*Numenius americanus*), black-crowned night heron (*Nycticorax nycticorax*), mourning dove (*Zenaida macroura*), black-throated sparrow (*Amphispiza bilineata*), white-crowned sparrow (*Zonotrichia leucophrys*), sage sparrow (*Amphispiza belli*), horned lark (*Eremophila alpestris*), verdin (*Auriparus flaviceps*), California thrasher (*Toxostoma redivivum*), Le Conte's thrasher (*Toxostoma lecontei*), and loggerhead shrike (*Lanius ludovicianus*). Resident raptors detected at the site include burrowing owl (*Athene cunicularia*) and American kestrel (*Falco sparverius*). Red-tailed hawk (*Buteo jamaicensis*) and peregrine falcon (*Falco peregrinus*) were also detected (BSE 2008a, EDAW 2008d).

Special-Status Species

Biological Resources Table 3 lists special-status species that are known to occur or could potentially occur in the project area and vicinity. None of the rare plant species listed below was detected during the 2007 and 2008 surveys (BSE 2008a, EDAW 2008d). Floristic surveys were repeated in 2008 because 2007 surveys occurred during a dry year when many of the target plant species might not be blooming. Conditions during the 2008 surveys were adequate for determining the presence/absence of the rare plant species listed below (EDAW 2008d). Seven special status wildlife species were detected during the surveys and are discussed in more detail below. Species observed during the 2007/2008 surveys are indicated by **bold-face type.**

Biological Resources Table 3
Special-Status Species Known or Potentially Occurring in the BSEP Area

PLANTS		
Common Name	***Scientific Name***	**Status State/Fed/CNPS**
Alkali mariposa lily	*Calochortus striatus*	__/__/1B.2
Red Rock tarplant	*Deinandra arida*	R/__/1B.2
Mojave tarplant	*Deinandra mohavensis*	E/__/1B.3
Red Rock poppy	*Eschscholzia minutiflora ssp.twisselmannii*	__/__/ 1B.2
Creamy blazing star	*Mentzelia tridentata*	__/__/ 1B.3
Charlotte's phacelia	*Phacelia nashiana*	__/__/ 1B.2

WILDLIFE		
Common Name	***Scientific Name***	**Status State/Federal**
Reptiles		
Desert tortoise	***Gopherus agassizii***	**ST/FT**
Birds		
Burrowing owl	***Athene cunicularia***	**CSC/BCC**
American peregrine falcon	***Falco peregrinus anatum***	**SFP/__**
Northern harrier	**Circus cyaneus**	**CSC/__**
California horned lark	***Eremophila alpestris actia***	**WL/__**
Loggerhead shrike	***Lanius ludovicianus***	**CSC/BCC**
Le Conte's thrasher	***Toxostoma lecontei***	**WL/BCC**
Mammals		
Pallid bat	*Antrozous pallidus*	CSC/__
Spotted bat	*Euderma maculatum*	CSC/__
Mohave ground squirrel	*Spermophilus mohavensis*	ST/__
American badger	*Taxidea taxus*	CSC/__

Sources: CDFG 2008; CDFG 2008a

Status Codes:

Federal: FE - Federally listed, endangered: species in danger of extinction throughout a significant portion of its range
FT - Federally listed, threatened: species likely to become endangered within the foreseeable future
BCC: Fish and Wildlife Service: Birds of Conservation Concern: Identifies migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent highest conservation priorities <www.fws.gov/migratorybirds/reports/BCC2002.pdf>

State CSC = California Species of Special Concern. Species of concern to CDFG because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.
SE = State listed as endangered
ST = State listed as threatened
R = State listed as rare.
SFP = Fully protected
WL = Watch List: includes species formerly on California Species of Special Concern List (Remsen 1978) but which did not meet the criteria for the current list of special concern bird species (Shuford and Gardali 2008).

California Native Plant Society
List 1B - Rare, threatened, or endangered in California and elsewhere
List 2 - Rare, threatened, or endangered in California but more common elsewhere
List 3 - Plants which need more information
List 4 - Limited distribution – a watch list
0.1 - Seriously threatened in California (high degree/immediacy of threat)
0.2 - Fairly threatened in California (moderate degree/immediacy of threat)
0.3 - Not very threatened in California (low degree/immediacy of threats or no current threats known)

Desert Tortoise

The desert tortoise's range includes the Mojave Desert region of Nevada, southern California, and the southwest corner of Utah and the Sonoran Desert region of Arizona and northern Mexico. The desert tortoise range is divided into Mojave and Sonoran populations. The desert tortoise in the vicinity of the BSEP is part of the Mojave population, which is primarily found in creosote bush-dominated valleys with adequate annual forbs for forage.

Desert tortoise activity is seasonally variable, and in California, peak adult and juvenile activity typically coincides with the greatest annual forage availability during the early spring and summer. However, tortoises will emerge from their burrows at any time of year when the weather is suitable. Hatchling desert tortoises typically become active earlier than adults do, and their greatest activity period can be expected between late winter and spring. During active periods, tortoises feed on a wide variety of herbaceous plants, including cactus, grasses, and annual flowers (USFWS 1994).

Annual home ranges have been estimated between 10 and 450 acres and are age, sex, seasonal, and resource density dependent, with some overlap between individuals (USFWS 1994). More than 1.5 square miles of habitat may be required to meet the life history needs of a tortoise, and individuals have been known to travel as much or more than 7 miles at a time (BLM 2001). In drought years, tortoises can be expected to wander farther in search of forage. During their active period, desert tortoises retreat to shallow burrows and aboveground shade to escape the heat of the day and will also retire to burrows at nighttime. Desert tortoises are primarily dormant in winter in underground burrows and sometimes congregate in communal dens.

Desert tortoise populations have declined throughout their range because of loss and degradation of habitat caused by urbanization, agricultural development, military training, recreational use, mining, and livestock grazing. The loss of individual desert tortoises to increased predation by common ravens, collection by humans for pets or consumption, collisions with vehicles on paved and unpaved roads, and mortality resulting from diseases also contributed to declines (USFWS 2004).

Survey Results for Desert Tortoise

Protocol level surveys conducted in 2007 and 2008 provided 100 percent survey coverage of the plant site and linear facilities and surrounding buffer area (BS 2008a, EDAW 2008d). A total of seven desert tortoises were observed during the biological surveys in 2008, all outside the plant site boundary (BS 2008i). Four of the seven tortoises were observed west of SR-14. Two were north of the plant site and east of the railroad tracks, and one was observed in the 1,000-foot Zone of Influence transect north of California City Boulevard. In addition, two carcasses were observed, one along Neuralia Road, approximately 4 miles north of California City, and the other carcass was observed on the west side of SR-14 (BS 2008i).

No live desert tortoises were found within the plant site boundary during the 2007 and 2008 surveys. Desert tortoise sign detected within these boundaries include an intact juvenile carcass that had been depredated by a raven and a deteriorated adult burrow (BS 2008i). In addition, two other sets of old (greater than four years since death) bone

and carapace fragments were found near the southern edge of the plant site boundary. The 2008 survey documented two live desert tortoises north of the plant site and east of the railroad tracks, one associated with a burrow. Following the 2007 surveys, another juvenile desert tortoise carcass, also preyed upon by a raven, was observed during subsequent work at the site. In addition, one live adult desert tortoise was also detected on the northwestern edge of the plant site boundary, along the main access road, and was likely a transient from adjacent habitat (EDAW 2008d, 2008a).

Desert Tortoise Habitat in the Project Area

The 2,012-acre plant site provides little or no habitat to support resident desert tortoise because these former agricultural lands are either barren or shrub cover is less than 2 percent (BS 2008i). This assessment is based on a detailed field evaluation by Dr. Alice Karl, a recognized expert on the species, and is supported by the survey findings. Approximately 369 acres of the plant site is occupied by fallow agricultural-disturbed atriplex scrub, where shrubs are regrowing in a monotypic stand of allscale with patchy shrub cover interspersed with broad barren swathes, and another 60 acres is vegetated by Mojave Desert wash scrub. In the disturbed atriplex scrub the soils are fine and slightly hard, with poor friability, making them unsuitable for desert tortoise to dig burrows. The scattered patches of vegetation are separated by barren areas up to 0.5 miles in extent. Dispersal across these barren areas is highly unlikely, and such large barren areas would not be included within a desert tortoise's home range.

Transient desert tortoise might occasionally occur in these atriplex shrub patches or in the 60.3 acres of vegetated desert wash that crosses the plant site. However, the presence of transient desert tortoises in this poor habitat would likely be attributable to the proximity of the adjoining native habitat outside of the plant site rather than reflecting use by resident individuals (BS 2008i). The Mojave creosote bush scrub north of the plant site is poor-to-fair quality desert tortoise habitat because it has also been disrupted by past farming activities (BS 2008i); therefore, desert tortoise densities are expected to be low in this area. Furthermore, desert tortoises have been excluded for decades from much of the plant site by a chicken wire perimeter fence originally built to exclude rabbits from the agricultural fields (BS 2008i). Long segments of this fence are intact, blocking desert tortoise from entering the site.

Desert washes often provide movement corridors for desert tortoise and other wildlife, but the desert wash on this site is unlikely to provide a connection between suitable desert tortoise habitats. The portion of Pine Tree Creek wash that is revegetating consists of a patch on the northwest side of the plant site, bounded on the east and south by large barren areas, and therefore does not lead to suitable habitat. The wash is characterized by low shrub diversity and discontinuous vegetative cover (EDAW 2008b). This wash is mostly bordered by barren land, and its northern terminus is dominated by stands of the non-native Russian thistle. The wash also transitions from moderately suitable habitat south of the project to non-habitat in the northeast within and adjacent to the plant site. These factors strongly suggest that desert tortoises are not using the wash as a movement corridor.

Desert Tortoise Critical Habitat/Desert Tortoise Natural Areas

The plant site is located approximately 3 miles west of the Desert Tortoise Natural Area (DTNA), approximately 1 mile south of the Jawbone/Butterbredt Area of Critical Environmental Concern (ACEC), and approximately 7 miles west of federally designated desert tortoise critical habitat (BS 2008a).

Mohave Ground Squirrel

The Mohave ground squirrel is rare throughout its range and is restricted to the Mojave Desert in San Bernardino, Los Angeles, Kern, and Inyo counties. This species inhabits desert areas, including alluvial fans, basins, and plains with deep sandy or gravelly friable soils with an abundance of native herbaceous vegetation. Mohave ground squirrels can be found in Mojave creosote bush scrub, shadscale desert scrub, alkali scrub, and Joshua tree woodland. This species feeds on green vegetation and seeds but may also eat carrion (BS 2008a).

This diurnal ground squirrel is active above ground in the spring and early summer. Emergence dates vary from March to June, depending on elevation. Squirrels begin aestivation in July or August. Stored body fat is the principal source of energy for aestivation, although food is also stored in the burrows. Home range size averages approximately 0.91 acres and varies from 0.25 to 2 acres.

Populations of Mohave ground squirrel have been diminished by urban development, off-road vehicle use, and agriculture. The Mohave ground squirrel is threatened by loss of habitat and degradation of habitat due to urban, suburban, and rural development; agriculture; military activities; energy development; livestock grazing; and off-highway vehicle use.

Mohave Ground Squirrel Habitat/Presence in the Project Area

Protocol surveys were not conducted for Mohave ground squirrel, and instead the evaluation of potential presence of this species was based on two habitat assessments conducted in 2007 by Dr. Phil Leitner, a recognized expert on Mohave ground squirrel. Dr. Leitner also evaluated relevant published and unpublished data.

Dr. Leitner notes that an extensive area of Mojave creosote bush scrub immediately adjoins the plant site to the east and south, and this habitat provides suitable habitat for the Mohave ground squirrel (BS 2008i). However, the plant site itself provides little to no habitat for this species. Approximately 430 acres of the 2,012-acre plant site supports scattered perennial vegetation; the remaining area is essentially barren, reflecting past agricultural disturbance (BS 2008i). The 429.5 acres of the plant site with some perennial plant cover would not support a resident population of Mohave ground squirrel because essential food resources are absent. This species will eat saltbush foliage and is known to consume small amounts of the two non-native herbs present on the site, red-stemmed filaree and Mediterranean grass, but individuals cannot maintain themselves on a diet composed only of only these plants (BS 2008i). Based on Dr. Leitner's experience and those of other Mohave ground squirrel experts whom he

queried, Dr. Leitner concluded that monotypic saltbush scrub such as that found in the northwest portion of the BSEP plant site would not support a resident population of Mohave ground squirrel (BS 2008i).

Dr. Leitner also concluded that Pine Tree Creek wash is unsuitable for resident Mohave ground squirrel because the shrub vegetation is sparse (with barren stretches extending as much as 1,875 feet), plant diversity is low, and there is little cover or forage appropriate for the species (BS 2008i). He also concluded that the plant site has no value as a movement corridor for this species; dispersing juveniles might attempt to enter the plant site from adjoining creosote bush habitat to the west, south, or east, but they would not cross the wide bands of barren fallow agricultural land (BS 2008i). This conclusion is based his research in the Coso area of Inyo County showing that a small playa appeared to act as a complete barrier to the dispersal movements of radio-collared juveniles (Harris and Leitner 2005). There is no evidence indicating that this species would attempt to traverse extensive areas without cover (BS 2008i). However, even disturbed agricultural lands can support annual plant species cover and provide foraging habitat during high rainfall years.

The only vegetation community in the project area capable of supporting resident populations of Mohave ground squirrel is the Mojave creosote bush scrub west of SR-14. This area is located on a large alluvial fan deposited by outflows from Pine Tree Canyon. The dominant shrub species are creosote bush and white bursage. Desert senna (*Senna armata*) and cheesebush (*Hymenoclea salsola*) are also abundant, reflecting disturbance from periodic surface water flows. Vegetation surveys did not reveal the presence of winter fat (*Krascheninnikovia lanata*) or spiny hop sage (*Grayia spinosa*), two shrubs that provide important food resources for Mohave ground squirrel (Leitner and Leitner 1998). This relatively undisturbed habitat has moderately diverse vegetation that could provide adequate forage and cover for Mohave ground squirrel. The habitat on this portion of the survey area appears suitable for the species but is not of high quality (BS 2008a).

Based on this information the applicant has concluded that Mohave ground squirrel has little potential to occur within the plant site because suitable habitat is absent (BS 2008i). However, this species is assumed to be present west of SR-14, in the vicinity of the proposed transmission lines (BS 2008i).

American Badger

American badgers were once fairly widespread throughout open grassland habitats of California. They are now uncommon, permanent residents throughout most of the state, with the exception of the northern North Coast area. Known to occur in the Mojave Desert, they are most abundant in the drier open stages of most shrub, forest, and herbaceous habitats with friable soils. In the southwest, badgers are typically associated with Mojave creosote bush scrub and sagebrush. Mating occurs in late summer or early fall and two to three young are born 183 to 265 days later in March or April (Long 1973). Badgers are fossorial, digging large burrows in dry, friable soils and will use multiple dens/cover burrows within their home range. They typically use a different den every day, although they can 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 in depth. Natal

dens are larger and more complex than cover dens. In undisturbed, high-quality habitat, badger dens can average 0.64 dens per acre, but are much lower in highly disturbed areas (Sullivan 1996).

No American badgers were detected during project surveys in 2007 or 2008, although the California Natural Diversity Data Base (CNDDB) indicates an occurrence approximately 1 mile east of the project site (BS 2008a). The project site provides only marginal habitat for this species.

Spotted Bat

Spotted bats occur throughout western North America, and have been found from below sea level to 9,000 feet in arid, low desert habitats to high elevation conifer forests (WBWG 2005). Prominent rock features appear to be a necessary feature for roosting; roost sites are cracks, crevices, and caves, usually high in fractured rock cliffs (WBWG 2005). Spotted bats feed primarily on moths and are apparently solitary but occasionally roost or hibernate in small groups (WBWG 2005). This species is infrequently captured, although in the southwest spotted bats have been most often captured over water (WBWG 2005).

No spotted bats were observed during the surveys, but no surveys were specifically conducted for this species or any other bats. Spotted bats were recorded in 1997 in Red Rock Canyon State Park near a desert spring in canyonlands (CNDDB 2008). Staff considers it unlikely that spotted bats inhabit the BSEP because of the low vegetative cover, high levels of disturbance, and absence of water features or rocky roost sites that might attract this species.

Pallid Bat

Pallid bats range throughout western North America, inhabiting low elevation rocky arid deserts and canyonlands, shrub-steppe grasslands and higher elevation coniferous forests (WBWG 2005a). They are most abundant in xeric ecosystems, including the Great Basin, Mojave, and Sonoran deserts. This species can be a solitary rooster, or can occupy small or large roost groups; day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, hollow trees or bark, and various human structures such as bridges, barns, porches, bat boxes, and human-occupied as well as vacant buildings (WBWG 2005a). Pallid bats are opportunistic generalists that glean a variety of arthropod prey from surfaces, but also capture insects on the wing (WBWG 2008a).

No pallid bats were observed during the surveys, but no surveys were specifically conducted for this species or any other bats. Pallid bats were recorded in 1997 in Red Rock Canyon State Park near an active maternity colony in a mine shaft in the vicinity of a desert spring (CNDDB 2008). Staff considers it unlikely that pallid bats inhabit the BSEP because of the low vegetative cover, high levels of disturbance, and absence of water features and suitable roosting sites.

Western Burrowing Owl

Western burrowing owls inhabit arid lands throughout much of the western United States and southern interior of western Canada (Haug et al. 1993). In the Mojave

Desert region, and in many other areas, this species has declined because of habitat modification, poisoning of its prey, and introduced nest predators. The burrowing owl is diurnal and usually non-migratory in this portion of its range.

Burrowing owls are unique among the North American owls in that they nest and roost in abandoned burrows, especially those created by California ground squirrels, kit fox, desert tortoise, and other wildlife. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats. They often return to burrows used in previous years, especially if they were successful at reproducing there in previous years (Gervais et al. 2008). The southern California breeding season (defined as from pair bonding to fledging) generally occurs from February to August with peak breeding activity from April through July (Haug et al. 1993).

In the Mojave Desert, burrowing owls generally occur at low densities 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 (Gervais et al. 2008). Burrowing owls tend to be opportunistic feeders. Large arthropods, mainly beetles and grasshoppers, comprise a large portion of their diet. Small mammals, especially mice and voles (*Microtus*, *Peromyscus*, and *Mus* spp.), are also important food items. Other prey animals include reptiles and amphibians, young cottontail rabbits, bats, and birds, such as sparrows and horned larks. Consumption of insects increases during the breeding season (Haug et al. 1993).

Habitat within the project site and the one-mile buffer is suitable for burrowing owls, and in 2007 a total of 27 burrows with burrowing owl sign were identified within the survey area one-mile buffer (BS 2008a). Two burrowing owls were detected within the plant site boundary during the 2007 surveys, in association with four active burrowing owl burrows (ENSR 2008). It is likely that the owls observed in 2007 represent two pairs of owls occupying areas within the plant site boundary.

Two burrowing owls were observed outside the plant site boundary during the 2008 surveys, one within the 1,000-foot buffer at the southwest end of the natural gas pipeline corridor, next to a burrow (DB 2008d). The other burrowing owl was incidentally observed southeast of the plant site, off of an access road used by the survey team. Although one active burrowing owl burrow was documented within the 80-acre addition to the plant site, the majority of the other 7 active and 13 inactive/potential burrowing owl burrows documented during the 2008 surveys were located within the 1,000-foot buffer associated with the natural gas pipeline corridor. However, owls were not observed at any of these other burrows during the 2008 focused surveys (DB 2008d).

American peregrine falcon

Peregrine falcons are uncommon breeding residents and migrants in California, nesting near wetlands, lakes, rivers, or other water on high cliffs. They hunt for birds by swooping from flight onto flying prey. One peregrine falcon was observed perched on a utility pole at the eastern border of the survey area during May 2007 surveys. The project site provides no nesting sites for this species and limited foraging opportunities, although the proposed evaporation ponds might attract species that would be prey for peregrine falcons.

Northern harrier

Northern harriers breed in open wetlands, including marshy meadows, wet lightly grazed pastures, old fields, freshwater and brackish marshes, and dry uplands including upland prairies, mesic grasslands, drained marshlands, croplands, cold desert shrub-steppe, and riparian woodland. The densest populations of northern harriers are typically associated with large tracts of undisturbed habitat dominated by thick vegetation growth (Macwhirter and Bildstein 1996). Harrier prey includes small and medium-sized mammals (primarily rodents), birds, reptiles, and frogs.

Within eastern Kern County, the northern harrier is present year-round, but the population fluctuates due to seasonal migration and rarely breeds within the eastern portion of the county (Morlan 2008). However, annual breeding activity has been documented in the vicinity of the town of Cantil, approximately 4 miles northeast of the BSEP site (Morlan 2008). Nesting typically occurs in close proximity to marsh habitat or otherwise routinely saturated areas, including active alfalfa fields.

Two northern harriers were detected in the 1-mile survey buffer to the northeast of the plant site boundary in May 2007 (DB 2008d). This species is known to regularly nest in the vicinity of Cantil, but the absence of observations within the plant site or along any of the linear components of the project during the 2007 and 2008 surveys suggests that the project area provides only low-quality foraging habitat for the species. The project site and linear facilities do not provide suitable nesting habitat for this species, although northern harriers might rarely forage there.

Loggerhead Shrike

Loggerhead shrikes are uncommon residents throughout most of the southern portion of their range, including southern California. In southern California they are generally much more common in interior desert regions than along the coast (Humple 2008). In the Mojave Desert this species appears to be most numerous in flat or gently sloping deserts and desert/scrub edges, especially along the eastern slopes of mountainous areas (Humple 2008). Loggerhead shrikes initiate their breeding season in February and may continue with raising a second brood as late as July; they often re-nest if their first nest fails or to raise a second brood (Yosef 1996).

This species can be found within lowland, open habitat types, including creosote scrub and other desert habitats, sage scrub, non-native grasslands, chaparral, riparian, croplands, and areas characterized by open scattered trees and shrubs. Fences, posts, or other potential perches are typically present. In general, loggerhead shrikes prey upon large insects, small birds, amphibians, reptiles, and small rodents over open ground within areas of short vegetation, usually impaling prey on thorns, wire barbs, or sharp twigs to cache for later feeding (Yosef 1996).

Loggerhead shrikes are relatively common in eastern Kern County and are typically associated with open desert, Joshua tree woodland, and parks, and populations are thought to be stable or even increasing in eastern Kern County (Morlan 2008).Suitable habitat for loggerhead shrike occurs throughout the scrub habitats within the project survey area and loggerhead shrikes were observed frequently during the 2007/2008 surveys (BS 2008a, EDAW 2008d).

Le Conte's Thrasher

This species inhabits some of the hottest and driest habitats in the arid southwest, including the Mojave Desert where they occur year-round. Preferred habitats include sparse desert scrub, alkali desert scrub, and desert succulent scrub habitats with open desert washes. They seek gentle to rolling slopes bisected by dry desert washes, conditions found on alluvial fans that are found in the project area. The Le Conte's thrasher population densities are among the lowest of passerine (perching) birds, estimated at less than five birds per square kilometer in optimal habitats (Fitton 2008). This low population density decreases the probability of their detection during field surveys. This species requires areas with an accumulated leaf litter under most plants as cover for its preferred arthropod prey; it also feeds on seeds, insects, small lizards, and other small vertebrates.

Two LeConte's thrashers were observed in the eastern portion of the survey area, and one individual was observed in the 1-mile buffer southwest of the survey area during the May 2007 surveys (BS 2008). They are year-round residents at the BSEP site and use the site for nesting, foraging, and cover.

California horned lark

Horned larks prefer areas with sparse vegetation and exposed soil. In western North America, this species is associated with desert brushlands, grasslands, and similar open habitats, as well as alpine meadows (Garrett and Dunn 1981). Throughout their range, horned larks avoid all habitats dominated by dense vegetation and become scarce and locally distributed in heavily forested areas.

Multiple individuals of this species were observed frequently throughout the survey area and within the 1-mile buffer within barren areas during the 2007 and 2008 surveys (BS 2008a, EDAW 2008d).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHODS AND THRESHOLD FOR DETERMINING SIGNIFICANCE

The determination of whether a project has a significant effect on biological resources is based on the best scientific and factual data that staff could review for the project. Significance criteria are defined in the general context of the California Environmental Quality Act (CEQA) and other relevant federal and state laws, ordinances, regulations, and standards. In this analysis the following impacts to biological resources are considered significant:

- substantial adverse effects to plant species considered by the CNPS, CDFG, or USFWS to be rare, threatened, or endangered in California or with strict habitat requirements and narrow distributions; substantial impact to a sensitive natural community (i.e., community that is especially diverse; regionally uncommon; or of special concern to local, state, and federal agencies);
- substantial adverse effects to wildlife species that are federally-listed or state-listed or proposed to be listed; a substantial impact to wildlife species of special concern to CDFG, candidates for state listing, or animals fully protected in California;

- substantial adverse effects on 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; and
- substantial adverse effect on important riparian habitats or wetlands and any other "Waters of the U.S." or state jurisdictional waters.

Direct and Indirect Impacts and Mitigation

The California Environmental Quality Act Guidelines define direct impacts as those impacts that result from the project and occur at the same time and place. Indirect impacts are caused by the project, but can occur later in time or farther removed in distance while still reasonably foreseeable and related to the project. The potential impacts discussed in this analysis are those most likely to be associated with construction and operation of the project.

Impact analyses typically characterize effects to plant communities as temporary or permanent, with a permanent impact referring to areas that are paved or otherwise precluded from restoration to a pre-project state. In the Mojave Desert ecosystem, the definition of permanent impacts needs to reflect the slow recovery rates of its plant communities. Natural recovery rates from disturbance in these systems depend on the nature and severity of the impact. For example, creosote shrubs can resprout a full canopy within five years after damage from heavy vehicle traffic (Gibson et al. 2004), but more severe damage involving vegetation removal and soil disturbance can take from 50 to 300 years; complete ecosystem recovery may require more than 3,000 years (Lovich and Bainbridge 1999). In this analysis, an impact is considered temporary only if there is evidence to indicate that pre-disturbance levels of biomass, cover, density, community structure, and soil characteristics could be achieved within five years.

Biological Resources Table 4 summarizes the impacts to biological resources resulting from BSEP construction and operation.

Biological Resources Table 4
Summary of Impact/Mitigation

Biological Resource	Impact/Mitigation
Mojave Desert Plant Communities & Wildlife Habitat	**Impacts:** Permanent loss of 2,012 acres of marginal wildlife habitat, including 430 acres of disturbed vegetation; potential direct impacts to terrestrial wildlife by heavy equipment and grading; increased risk of roadkill; increased disturbance/dust to nearby vegetation and wildlife; spread of non-native invasive weeds. **Mitigation**: Avoidance and minimization measures (**BIO-1 - BIO 8**); off-site habitat acquisition and enhancement (**BIO-11**); implement Best Management Practices **(BIO-12)**
Waters of the State	**Impacts:** Impacts to 10,900 feet of Pine Tree Creek and 2,150 feet of an unnamed desert wash, resulting in permanent loss of 60.3 acres of Desert Wash Shrub and 16 acres of waters of the state; loss of associated hydrological and biological functions and values. **Mitigation**: Replace functions and values of impacted desert wash with a new channel that incorporates native desert wash vegetation (**BIO-18**).
Special-Status Wildlife	
Desert tortoise	**Impact:** Potential take of individuals during operation and construction; permanent loss of 5 acres of Mohave Creosote Scrub habitat occupied by desert tortoise; increased risk of predation from ravens and other predators; increased road kill hazard from construction and operations traffic. **Mitigation**: Avoidance and minimization measures (**BIO-9, BIO-12)**; off-site habitat acquisition of 115 acres (**BIO-11**); raven management plan (**BIO-13).**
Mohave ground squirrel	**Impact:** Potential take of individuals during construction and operation; permanent loss of 5 acres of Mohave Creosote Scrub habitat occupied by Mohave ground squirrels; increased risk of disturbance to nearby populations; increased road kill hazard from construction and operations traffic. **Mitigation**: Avoidance and minimization measures (**BIO-1** through **BIO-8, BIO-10, BIO-12**); off-site habitat acquisition, endowment, and enhancement of 115 acres (**BIO-11**).
American badger	**Impact:** Potential **l**oss and fragmentation of habitat, loss of foraging grounds, crushing or entombing of animals during construction. **Mitigation**: Conduct pre-construction surveys and implement avoidance measures (**BIO-16)**.
Western burrowing owl	**Impact**: Potential loss of nest, eggs, or young; loss of breeding and foraging habitat on the plant site; disturbance of nesting and foraging activities for populations on and near the plant site and linear facilities. **Mitigation**: Implement burrowing owl impact avoidance and mitigation measures; passive relocation and protection of 6-acre relocation area; off-site habitat acquisition and enhancement of 20 acres (**BIO 17)**.
Other Special-Status Birds • Loggerhead shrike • California horned lark • Le Conte's thrasher	**Impact**: Disturbance of nesting activities, potential loss of nest, eggs, or young; loss of breeding and foraging habitat. **Mitigation**: Conduct pre-construction nesting surveys, implement avoidance measures (**BIO-15**); off-site habitat acquisition and enhancement (**BIO-11**).

Overview of Impacts to Vegetation and Wildlife

Grading of the entire 2,012-acre BSEP plant site would not impact sensitive plant communities or rare plants, but would directly affect wildlife by removal of shrubs and herbaceous vegetation, resulting in loss and fragmentation of cover, breeding, and foraging habitat. During construction, wildlife could be crushed or entombed in dens or burrows and could collide with vehicles. Much of the plant site is barren or sparsely vegetated, but nevertheless supports a diversity of mammals, birds, and reptiles, including some special-status wildlife species. Construction on the plant site would permanently eliminate 60.3 acres of Mojave desert wash scrub, 369.2 acres of fallow agricultural-disturbed saltbush scrub, and 1,579.7 acres of fallow agricultural ruderal (BS 2008a).

Construction of a transmission line and spur access roads west of SR-14 would result in permanent impacts to 5.0 acres of Mojave creosote bush scrub. These impact calculations include permanent impacts resulting from construction of access roads, pole pads, and pull/splicing sites. All of these transmission line construction activities would occur in occupied desert tortoise and Mohave ground squirrel habitat; potential impacts to these listed species and proposed mitigation measures are discussed in detail below.

Rosamond Pipeline

Construction of the proposed 40-mile water pipeline from the community of Rosamond to the BSEP site would occur mostly within disturbed road shoulders or within the roadbed of unpaved roads, affecting approximately 81.18 acres of developed or disturbed lands. As described in more detail in **Biological Resources** Appendix A, a maximum of 4.29 acres of Mojave creosote scrub and 6.91 acres of saltbush scrub would be temporarily impacted by construction. Even in disturbed areas, construction and trenching pose some risk to wildlife, including disturbance to nesting birds and trapping wildlife in open trenches. Desert tortoise, Mohave ground squirrel, and burrowing owls could occur in the vicinity of portions of the Rosamond pipeline alignment, as could American badger and desert kit fox. All of these special status wildlife species could be directly or indirectly impacted by pipeline construction.

Direct and indirect construction impacts to vegetation and wildlife would be reduced to less than significant levels with implementation of impact avoidance and minimization measures described in staff's proposed Conditions of Certification **BIO-1** through **BIO-8** and in other conditions of certification. Implementation of Staff's proposed Conditions of Certification **BIO-15** through **BIO-17** would avoid impacts to nesting birds, including burrowing owls, and would avoid impacts to American badger and desert tortoise.

Staff's proposed Condition of Certification **BIO-21** requires the applicant to acquire and enhance at least 33.6 acres of suitable habitat for desert tortoise and Mohave ground squirrel, and would offset anticipated habitat loss associated with construction of the proposed Rosamond water pipeline.

Vegetation Impacts

Impacts to plant communities are summarized in **Biological Resources Table 5**. No rare plants or sensitive plant communities would be directly impacted by the proposed project. Indirect impacts to native plant communities are discussed below.

Biological Resources Table 5
BSEP Impacts to Vegetation Communities BSEP

Vegetation Communities/Cover Type	Impact Area (acres)
BSEP Plant Site	
Mojave Desert Wash Scrub	60.3
Developed	62.7
Fallow Agricultural-Ruderal	1,579.7
Fallow Agricultural-Disturbed Atriplex Scrub	369.2
Transmission Line	
Mojave Creosote Bush Scrub	5.0
Rosamond Recycled Water Pipeline *(from Rosamond to CA City Blvd.)*	
Developed & Disturbed Plant Communities	81.18
Mojave Creosote Bush Scrub	4.29
Saltbush Scrub	6.91

Spread of Noxious Weeds

Construction activities and soil disturbance could introduce new noxious weeds to lands adjacent to the BSEP plant site and its linear facilities and could further spread weeds already present in the project vicinity. The spread of invasive plants is a major threat to biological resources in the Mojave Desert because non-native plants can displace native plants, increase the threat of wildfire, and supplant wildlife foods that are important to desert tortoise and other herbivorous species. The applicant has proposed a variety of weed control measures such as establishing weed wash stations for construction vehicles and using only weed-free products for erosion control. Staff has incorporated these recommendations into staff's proposed Condition of Certification **BIO-8**. Implementation of this condition would reduce potential impacts to adjacent native plant communities from the introduction and spread of noxious weeds.

Dust

Disturbance of the soil's surface caused by construction traffic and other activities would result in increased 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. 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). Soil erosion from construction activities and vehicle activity, which affects vegetation and soil properties, could have an adverse effect on both tortoise and Mohave ground squirrel foraging and burrowing potential. The impacts of increased dust and other construction impacts can be minimized with implementation of staff's proposed Condition of Certification **BIO-8** and with **SOIL&WATER-3** and **-4**.

Impacts to Waters of the State

Grading and construction for the BSEP would eliminate 10,900 linear feet (14.96 acres of state waters) of Pine Tree Creek and approximately 2,150 linear feet (1.04 acres of state waters) of the unnamed wash, as well as approximately 400-650 acres of floodplain associated with the Pine Tree Creek wash (**Soil & Water** Appendix C). Mass grading of Pine Tree Creek, the unnamed wash, and the floodplain on the BSEP site would eliminate the hydrological and biological values and functions provided by these features. Specifically, construction of the BSEP would eliminate the hydrological connections of Pine Tree Creek wash with nearby Koehn Lake; eliminate the stream energy dissipation function provided by the washes and associated floodplain during large storm events; eliminate the surface and subsurface water storage and groundwater recharge functions currently provided by Pine Tree Creek and its associated floodplain; eliminate sediment transport, storage, deposition and nutrient cycling functions that currently aids in floodplain maintenance and vegetation establishment and maintenance; and eliminate the vegetation communities that help stabilize stream banks and provide wildlife habitat and a movement corridor within the wash and its associated floodplain. Eliminating the washes on the BSEP would fundamentally and permanently alter the natural geomorphic and hydrological processes that currently characterize the project site, which in turn would fundamentally alter the biological processes that support recruitment of native vegetation and creation of wildlife habitat within the wash and on the associated floodplain. For these reasons, staff has concluded that construction of the BSEP would significantly impact the biological functions and values of the desert washes on the BSEP site.

Alternatives to Impacting Waters

In their June 19, 2008 comment letter on BSEP, the CDFG recommended avoiding impacts to state waters and requested that the applicant evaluate alternative site layouts that would avoid the desert washes (CDFG 2008b). The applicant's response (CEC 2008uu) indicated that avoiding the washes would be infeasible because the plant site does not offer sufficient space to locate the project entirely on one side of the wash or the other, requiring splitting the project into two uneven portions that would straddle the wash. This split would require multiple crossings of the wash for roads and pipes (heat transfer fluid), resulting in major disruption of the wash during construction and significantly changing the nature of the wash. The applicant also pointed out that the split layout would shift the power block significantly off-center of the field, resulting in operational problems, longer plant start-ups, lower annual energy production, and overall higher cost of electricity. Furthermore, without modifications to the washes, the applicant thought this layout would expose large portions of the solar field to flooding, creating difficulties for operations and insurance liability. Staff requested in the PSA that the applicant revisit their analysis and conclusions regarding the infeasibility of avoiding the desert washes and evaluate an alternative layout as described in the **Alternatives** section, but no such analysis has been provided.

Mitigation for Impacts to Waters of the State

To mitigate for significant impacts to waters of the state the applicant has proposed replacing the hydrological and biological functions and values of the BSEP washes and floodplain with an engineered channel. The new channel would be constructed inside

the southern and eastern property boundary, outside of the desert tortoise fencing but within a low maintenance security fence (DB 2008e). The channel would be approximately 14,000 feet long, 250-feet wide at the base, with eleven, 10-foot high drop structures (DB 2009r). The drop structures and associated energy dissipaters would need heavy armoring for protection against the erosive forces of flood waters (DB 2009r). The reaches between the drop structures would consist of long, gentle slopes (approximately 0.2 percent grade) of soil/sand, and this is the area that would be suitable for revegetation. Side slopes of the channel would be armored with soil cement, with slopes established at a relatively gentle slope of 4-feet horizontal to 1-foot vertical elevation except along the east-west reach, where the north side slope would be 3-feet horizontal to 1-foot vertical. The channel would be approximately 12 feet deep with a diffuser at its downstream end (DB 2009r).

The re-routed drainage system proposed by the applicant has been engineered to replace the hydrological connections, stream energy dissipation functions, surface water conveyance, groundwater recharge and nutrient replenishment functions that are currently provided by the existing Pine Tree Creek and its associated floodplain. The **Soil & Water** section provides a more detailed discussion of how the re-routed channel would replace the existing hydrological functions of the project's existing drainage system. However, the proposed channel with armoring and drop structures bears no resemblance to any natural hydrological feature in the Mojave Desert, nor are there any examples of successful implementation of such a drop structure channel design at this scale in a desert ecosystem. Without an existing model demonstrating that an engineered channel could successfully replicate the hydrological and biological functions of the project's existing drainage system, staff has relied on conceptual models and designs provided by the applicant to make an assessment as to whether the engineered channel could replace the biological functions and values of Pine Tree Creek.

The applicant has proposed a mitigation plan (AECOM 2009e, Attachment 1b) with the goal of creating a drainage system with biological functions and values (including botanical and wildlife) equal to or greater than the existing desert wash. The applicant has indicated that the primary success standards for the mitigation area within the rerouted wash would focus on: (1) maintaining hydrological characteristics of a natural desert wash; (2) maintaining native vegetation cover, and (3) maintaining problematic nonnative species below certain thresholds (AECOM 2009e, Attachment 1b). Staff agrees with these conceptual success standards, and has additional specific recommendations for revegetation of the channel.

Staff Recommendations for Revegetation

While aspects of the applicant's proposed plans for the channel design are still conceptual (DB 2009r), with details on the extent of necessary armoring and maintenance (for example, sediment removal, riprap repair) awaiting model refinement and design verification, enough information exists for staff to develop revegetation success standards. Plans to revegetate the channel bottom should also be finalized once the channel design is complete. Staff recommends that a draft Desert Wash Revegetation Plan be prepared and submitted for approval as soon as possible upon refinement of the channel design. Staff recommends that the draft Desert Wash

Revegetation Plan closely follow the outline available in Newton and Claassen (2003), *Appendix C: Sample Outline for a Rehabilitation Plan*. Staff also recommends that the Desert Wash Revegetation Plan incorporate the hydrological success criteria described above, as well as the following success criteria and requirements:

Fifteen Percent Shrub Cover in Channel. Staff recommends that the revegetation goal for the new channel should be to establish the same percent native shrub cover as in the existing wash. The existing wash on the BSEP consists of 16.0 acres of state waters, of which 15 percent, or 2.4 acres, is vegetated by Southern Alluvial Fan Scrub (BS 2008a). Staff recommends establishing a goal of 15 percent native shrub cover within the new channel. The total area available for revegetation (the long, gradually sloping channel bottoms between drop structures) is 53.0 acres measured from the point of diversion to the location of the proposed channel fan (Channel Station 36+00) (**Soil & Water**, Appendix C). This area is measured from toe-of-slope to toe-of-slope on the opposite bank and does not include the area proposed for soil cement in the bed of the channel from Station 143+50 to 135+00. The area in the channel bottom available for revegetation is 41.5 acres, which excludes hardened elements such as grade control structures, soil cement bank protection and channel bottom, or rock riprap constructed in the bed or along the banks.

The overall requirement would therefore be establishment of at least 6.2 acres of native shrub cover within the new channel. Minor adjustments of this shrub cover acreage goal may be needed if the total area available for revegetation differs from the estimated 41.5 acres. The Desert Wash Revegetation Plan would need to include specific guidance on how shrub cover is measured, including a discussion of how sampling units are selected and methods for measuring cover.

Revegetate Each Reach. Staff recommends that each of the 11 reaches between drop structures be revegetated to avoid extensive barren gaps within the channel that would diminish its value as a wildlife corridor. Each reach should support some native shrub vegetation, but to allow for flexibility in how the overall success criteria are achieved some reaches would be allowed to drop as low as 7 percent shrub cover. The deficiencies in shrub cover on one reach would need to be compensated with greater percent cover elsewhere in the channel to achieve the 15 percent native shrub cover overall requirement.

Ten-Year Revegetation Milestone: The applicant proposed a five year period for achievement of successful revegetation (AECOM 2009e, Attachment 1b) but staff believes this time period does not adequately reflect the slow pace of revegetation in a desert environment. Furthermore, infrequent storm events are likely to control the hydrological and biological features of this re-created ecosystem, and five years falls short of an appropriate interval to evaluate the effect of such storm events on the efforts to recreate a natural desert wash in the engineered channel. Lichvar et al. (2006) describes "ordinary" events that define bed and bank limits of channels of the arid southwestern U.S. as typically corresponding to the five- to eight-year event, as opposed to the one- and two-year event in temperate climates (USACE 2007). Staff therefore recommends a 10-year revegetation period instead of 5 years, with the provision that if 15 percent native shrub cover can be achieved in a shorter time frame then the success criteria may be considered fulfilled.

Topsoil Stockpiling: Failed revegetation projects often result from the inability of sites to begin natural soil-forming processes (Haigh 1992). Soil-forming processes require nitrogen capital, nutrient exchange capacity, and an active community of soil organisms (Newton and Claassen 2003) all of which would be absent in the newly graded and disturbed soil within the channel. To increase chances for revegetation success, topsoil should be stockpiled from the project site for use within the channel, as described in Newton and Claassen (2003). Native topsoil from the least disturbed locations on the project site would contain a seedbank of native species and beneficial soil organisms. Only areas that are relatively free of noxious weeds should be used as borrow sites, and only the upper 1 inch of topsoil should be scraped and stockpiled for reuse as the top-dressing for the trench and may need to be applied by hand to ensure even coverage. An additional 6 to 8 inches of soil below the seedbank should also be scraped and temporarily stockpiled for re-use, followed by an application of the upper 1 inch of soil.

Weed Control: Weed control is a critical component of successful revegetation (Newton and Claassen 2003). Disturbed soils provide ideal conditions for the germination and growth of noxious weeds and other invasive plants; in the Mojave Desert region, these include: Russian thistle, tumble mustard, cheatgrass, halogeton, filaree, and tamarisk (Mac et al 1998). The potential introduction and/or spread of noxious weeds and other invasive non-native plants within the disturbed soils of the project area would not only compromise the short- and long-term goals for revegetation, but also threaten adjacent habitats, and their dependent wildlife, that are currently un-infested. The ability of non-indigenous species to alter community structure, fire regime, species composition, and ecosystem function is well-documented (Mac et al 1998). Staff has therefore recommended monitoring and management for non-native species that pose a "moderate" or "high" threat to California wildlands as defined by CAL-IPC (2006) and noxious weeds rated "A" or "B" by the California Department of Food and Agriculture and any federal-rated pest plants (CDFA 2009). Biological Resources Table-6 summarizes the success standards for weed control and for percent native shrub cover for the 10-year revegetation project recommended by staff. The goals for percent cover indicate thresholds for minimum cover of native shrubs and maximum cover of weeds that would trigger the implementation of remedial measures and/or a contingency plan.

Biological Resources Table 6*
Success Standards for Native Shrub Cover for BSEP Flood Control Channel

Milestone	Native Shrub Cover Success Standards for Channel *	Percent Cover of CDFA and Cal-IPC Rated Weeds Permitted
Year 2	2 percent (0.8 acres)*	Less than 6 percent
Year 4	4 percent, (1.7 acres)	Less than 5 percent
Year 6	8 percent (3.3 acres)	Less than 4 percent
Year 8	12 percent (5.0 acres)	Less than 3 percent
Year 10	15 percent (6.2 acres)	Less than 2 percent

*Applies to compensatory land within the replacement channel that mitigates in-kind for vegetated wash habitat (vs. unvegetated waterway) and assumes a total 41.5-acre area available for revegetation within the channel. "Shrub" includes native woody sub-shrubs. Percent cover to be averaged across revegetated areas.

Remedial Actions: To ensure that the applicant's mitigation goals and responsibilities are met, remedial action should be taken if all or a portion of the success criteria for each milestone year described in Table 6 are not met. These remedial actions might include seeding or planting, invasive weed control, minor grading or contouring, the addition of organic material or native soil, or the addition of natural structural components such as rocks to promote microtopographic complexity. If, at the end of the 10-year monitoring period, all feasible remedial actions for meeting success criteria have been attempted and all feasible mitigation areas have been used, the revegetation effort shall be considered unsuccessful and the applicant shall secure off-site mitigation lands that include 16.0 acres of desert washes and their immediate watershed. Ten years is the maximum allowable time for achievement of revegetation success criteria.

Staff concludes that effective protection and management of desert wash compensation lands would require protection of the immediate watershed and floodplain adjacent to the 16 acres of waters of the state. Furthermore, staff notes that purchase of a parcel or parcels that consist exclusively of waters of the state is infeasible. To ensure that sufficient funds would be available to purchase lands that include 16 acres of desert wash and the surrounding watershed and floodplain, the security in staff's proposed Condition of Certification **BIO-18** specifies funding sufficient to purchase of at least 50 acres. Acquisition of the desert wash acreage may be integrated with requirements for the desert tortoise and Mohave ground squirrel habitat compensation lands as described in **BIO-11**.

Long-Term Maintenance and Monitoring. The Desert Wash Revegetation Plan should provide specifics on the monitoring and evaluation of success criteria for achieving revegetation goals over the 10-year establishment period. In addition to 10-years of revegetation monitoring the channel would need maintenance and monitoring in perpetuity to ensure structural stability and effective flow conveyance, as described in staff's recommended Condition of Certification **SOIL&WATER–8**. This maintenance would likely consist of structural inspections, erosion control repairs, and debris removal. Long-term maintenance must also address weed management, with the goal of maintaining less than 2 percent cover of non-native species within the channel (i.e., those species that pose a "moderate" or "high" threat to California wildlands as defined by CAL-IPC (2006) and any CDFA "A" or "B"-rated or federal-rated pest plants [CDFA 2009]). As the cover of native species in the revegetated areas increases, opportunities for non-native weed establishment and growth would diminish. Methods for weed control proposed in the Desert Wash Revegetation Plan should clearly consider and avoid potential impacts to wildlife that may use the channel and revegetated areas during the 10-year maintenance period.

Upon completion of the comprehensive 10-year maintenance and monitoring period required for the revegetation, some long-term monitoring must continue to make sure the channel remains a safe corridor for desert tortoise and other wildlife. At no time shall the engineered channel pose an entrapment hazard to desert tortoise, which is defined as depression, pit or trench with a depth of one foot or greater and a slope steeper than 3:1.

Summary of Mitigation for State Waters

Staff has incorporated the basic elements of the applicant's proposed conceptual mitigation plan and hydrological/biological success criteria and objectives into staff's proposed Condition of Certification **BIO-18**, and has provided additional recommendations and guidance for a successful revegetation effort as described above. Staff's proposed Condition of Certification **BIO-18** requires that a final Desert Wash Revegetation Plan be prepared to provide adequate detail for implementation, maintenance, and monitoring of the revegetation. This condition also specifies that if the applicant is unsuccessful in meeting the goals of the Desert Wash Revegetation Plan at the end of the 10-year-revegetation period the applicant shall secure compensatory mitigation lands. These off-site mitigation lands would include 16.0 acres of desert washes as well as the immediate watershed and floodplain, as described in staff's proposed Condition of Certification **BIO-18**. .

With implementation of staff's proposed Condition of Certification **BIO-18**, impacts to 16.0 acres of state waters and loss of the hydrological and biological functions of the project site desert washes would be mitigated to less-than-significant levels. This condition also fulfills requirements of CDFG's Lake and Streambed Alteration Agreement program pursuant to California Fish and Game Code section 1600 et seq.

Impacts to Migratory/Special-Status Bird Species

Vegetation at the plant site and along linear facilities provides foraging, cover, and/or breeding habitat for migratory birds, including a number of special-status bird species confirmed to be present at the site. Loggerhead shrike, LeConte's thrasher, and California horned lark are special-status species known to breed and forage at the site. Western burrowing owls, which also occur at the BSEP plant site and linear facilities, are discussed below. Power plant construction would eliminate nesting habitat for these and other species and could result in direct and cumulative impacts to these species due to habitat loss or injury/fatality of individuals. No impacts to northern harrier or peregrine falcon are anticipated because these species occur only infrequently at the BSEP area and do not breed there.

The loss of active bird nests or young is regulated by the federal Migratory Bird Treaty Act and Fish and Game Code section 3503. The applicant has proposed mitigation measures to avoid and minimize impacts to nesting birds that have been incorporated into staff's proposed Conditions of Certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-15** (Pre-Construction Nest Surveys). Implementation of staff's proposed conditions of certification would avoid direct impacts to nests, eggs, or young of migratory birds and would minimize the impacts of construction disturbance to nesting birds.

Loss of nesting and foraging habitat for these special-status bird species would add to the cumulative, significant loss of habitat for these species within the region. Implementation of staff's proposed Condition of Certification **BIO-11**, the compensatory mitigation plan, would offset this habitat loss.

Impacts to Burrowing Owls

Burrowing owls, a state species of special concern, nest on the project site and could be directly impacted by construction of the BSEP. Without implementation of impact avoidance and minimization measures, burrowing owl adults, eggs, or young could be crushed or entombed by grading activities, and nesting and foraging activities would be directly and indirectly impacted by construction and operation of the project. The project would also result in permanent loss of 2,012 acres that are currently used by burrowing owls for nesting and foraging. Staff considers these impacts significant.

To avoid potential impacts to burrowing owls that might be nesting or residing within burrows in the project impact area, the applicant has proposed conducting pre-constructions surveys on the plant site and along all linear facilities, using methods recommended by CDFG (California Burrowing Owl Consortium 1993). To avoid direct take of owls and offset potentially significant impacts to nesting or resident owls, the applicant has proposed passive relocation.

Passive relocation involves encouraging owls to move from occupied burrows to alternate natural or artificial burrows that are at least 150 feet from the impact zone and that are within or contiguous to a minimum of 6.5 acres of foraging habitat for each pair of relocated owls (CDFG 1995). Passive relocation of owls is only implemented during the non-breeding season (CDFG 1995) in order to avoid egg and dependent chick separation from adult owls, which would likely result in death of those eggs and young.

Passive relocation for the owls occurring on the BSEP site would involve encouraging the movement of on-site burrowing owls to a 14.39-acre parcel owned by the applicant and located just outside of the plant site boundary, east of SR-14, and north of the facility access road (DB 2008n). To facilitate the passive relocation, a total of four artificial burrows would be constructed within an approximately 6-acre portion of this 14.39-acre parcel prior to clearing and grading on the BSEP plant site. The proposed relocation area is characterized by Mojave creosote scrub habitat and currently provides suitable habitat for burrowing owls (BS 2008g). The applicant proposes to monitor the translocation sites for up to five years after initiation of passive relocation.

Passive relocation, construction of artificial burrows, and surveys prior to relocation would be in accordance with CDFG-approved guidelines (California Burrowing Owl Consortium 1993). The applicant would conduct ongoing maintenance and monitoring of the conservation area for exotic weed control for a five-year period following construction of the burrows (BS 2008g). The applicant has also agreed to find a third-party beneficiary conservation organization acceptable to CDFG and the Energy Commission to establish a conservation easement for management of the approximately 6-acre portion (the portion containing the artificial burrows) of the 14.39-acre relocation parcel (BS 2008h, p. BR-5).

In addition to the potential direct impacts to nesting burrows, the BSEP would permanently eliminate a large expanse of habitat on the plant site that is currently available for foraging and breeding by burrowing owls. Habitat loss is one of the primary threats to California's burrowing owl population (Gervais et al. 2008), and the BSEP project would contribute incrementally to this significant loss. To offset this loss, the

applicant has proposed acquisition and protection of 20 acres of land suitable for burrowing owls at some off-site location yet to be determined (BS 2008g). This off-site acquisition of 20 acres would serve to compensate for loss of foraging and breeding habitat for two burrowing owl pairs, and would be in addition to the permanent protection of 6 acres within the 14.39 acre relocation parcel near the project site.

Staff concurs with the applicant's proposed impact avoidance, minimization, and mitigation measures, which include creation of nesting burrows north of the project boundary and acquiring and enhancing off-site burrowing owl habitat, and has incorporated them into staff's proposed Condition of Certification **BIO-17**. With implementation of this condition, potential impacts to burrowing owls would be reduced to less-than-significant levels.

Noise

Noise from construction activities could temporarily discourage wildlife from foraging and nesting immediately adjacent to the project area. Many bird species rely on vocalizations during the breeding season to attract a mate within their territory, and noise from construction could disturb nesting birds and other wildlife and adversely affect nesting and other activities.

As discussed in the **Noise** section of this Preliminary Staff Analysis, a maximum noise level of 75 dBA Ldn is estimated to occur at a distance of 50 feet from the acoustic center of the construction activity (most often the power block) and attenuate to 40 dBA Ldn or less at project site boundaries. Assuming that construction noise for this project would be relatively constant, the 40 dBA Ldn estimated for construction noise would therefore equate to 34 dBA Leq at site boundaries, similar to levels of ambient noise.

The loudest noise likely to occur with BSEP construction is created by steam blows, an activity needed after construction to clear out the steam system. A series of short steam blows, lasting two or three minutes each, is performed several times daily over a period of two or three weeks. Steam blows can produce noise as loud as 130 dBA at a distance of 100 feet. In order to minimize disturbance from steam blows, the steam blow piping can be equipped with a silencer that would reduce noise levels by 20 to 30 dBA. Staff's proposed Conditions of Certification **NOISE-6** and **NOISE-8** require that any high pressure steam blows be muffled with an appropriate silencer. Based on the analysis described in the **Noise** section, staff concludes that noise impacts to nesting birds and other wildlife would be less than significant.

Impacts to Special-Status Mammals

Mohave Ground Squirrel

Most of the 2,012-acre plant site is not likely to be inhabited by the Mohave ground squirrel because it is barren, lacking perennial and herbaceous vegetation that would provide appropriate forage and cover for this species. The 429.5 acres of disturbed vegetation (fallow saltbush scrub and desert wash scrub) on the plant site would also not support resident Mohave ground squirrel because it lacks the appropriate variety of native shrub and herbaceous plants needed for sustenance throughout the active season (BS 2008i). The 60.3 acres of desert wash on the site also does not provide

suitable habitat or a movement corridor for Mohave ground squirrels because shrub vegetation is sparse, plant diversity is low and little cover or forage appropriate for the species is available (BS 2008i). However, occasionally transient individuals might occupy this disturbed vegetation, accessing it from the Mojave creosote bush scrub vegetation to the west.

The applicant's Mohave ground squirrel expert, Dr. Philip Leitner, suggests that a reasonable estimate of transient use of this vegetated area might be two individuals, based on his knowledge of this species' habitats and published and unpublished studies (BS 2008i). He estimates that grading and construction within the plant site might result in the incidental take of up to two transient Mohave ground squirrels that could occasionally enter these disturbed and degraded lands. Staff has reviewed the analysis by Dr. Leitner and the studies he cites supporting his conclusions, and while acknowledging that such estimates are necessarily speculative, agrees that loss of two transient individuals is a reasonable estimate of take of Mohave ground squirrel during construction within the plant site.

Unlike the habitat on the plant site, the Mojave creosote bush scrub west of SR-14 supports relatively undisturbed habitat with moderately diverse vegetation that could provide adequate forage and cover for a resident population of Mohave ground squirrel (BS 2008i). Construction activities within this area for installation of the proposed 230-kV transmission line could result in take of Mohave ground squirrels by vehicle strikes or burial in burrows and would also result in permanent impacts to 5 acres of their habitat.

The applicant proposes to acquire and enhance 115 acres to compensate for the potential take of two individuals during construction on the plant site and for impacts to 5.0 acres of Mojave creosote bush scrub (BS 2008i). The applicant's rationale for this acreage rests on the assumption that enhancement of mitigation lands would increase carrying capacity for this species, compensating for the loss of individuals and loss of habitat (BS 2008i). Fifteen of the 115 acres of compensatory mitigation is based on impacts to good quality habitat west of I-14 associated with transmission line construction and operation. Five acres was the estimated extent of the temporary and permanent habitat impact west of I-14, and CDFG recommended 3:1 mitigation for this impact. The remaining portion of the 115-acre compensation requirement was based not on loss of habitat, but on compensation for potential construction- and operation-related impacts to desert tortoise and Mohave ground squirrel. The applicant's Incidental Take Permit application (BS 2008i) provides a detailed explanation of the analysis supporting this recommendation. Staff agrees with the applicant's analysis and proposed compensatory mitigation and has incorporated the applicant's impact avoidance, minimization, and compensation measures into staff's proposed Conditions of Certification **BIO-11** and **BIO-12**. Implementation of these conditions would reduce impacts to Mohave ground squirrel to less-than-significant levels and would also satisfy the California Department of Fish and Game's requirements under section 2081 of California's Fish and Game Code.

Impacts to American Badger and Desert Kit Fox

American badgers were not detected on the BSEP site, but the site includes marginally suitable foraging and denning habitat for this species. The American badger is protected

under Title 14, California Code of Regulations (sections 670.2 and 670.5), and potential impacts to individuals of this species must be mitigated to less-than-significant levels. Construction of the BSEP project could kill or injure American badgers by crushing with heavy equipment or could entomb them within a den. Construction activities could also result in disturbance or harassment of individuals. Staff's proposed Condition of Certification **BIO-16** requires that concurrent with the desert tortoise clearance survey, a qualified biologist perform a preconstruction survey for badger dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads.

The desert kit fox (*Vulpes macrotis*) is not a special-status species, but it is protected under Title 14, California Code of Regulations (sections 670.2 and 670.5), and potential impacts to individuals of this species must be avoided (CDFG 2008b). Desert kit fox sign were detected on the BSEP site, and the site includes marginally suitable foraging and denning habitat for this species. Construction of the BSEP project could kill or injure desert kit fox by crushing with heavy equipment, or could entomb them within a den if avoidance measures are not implemented. Construction activities could also result in disturbance or harassment of individuals. Staff's proposed Condition of Certification **BIO-16** requires that concurrent with the desert tortoise clearance survey, a qualified biologist perform a preconstruction survey for kit fox dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads.

Impacts to Desert Tortoise

Protocol level surveys conducted in 2007 and 2008 indicate that no resident population of desert tortoise inhabits the 2,012-acre plant site because it is highly disturbed by past agricultural operations and is mostly barren, lacking perennial and herbaceous vegetation that would provide appropriate forage and burrow sites for this species (BS2008i, EDAW 2008d). While shrub vegetation is sparse and plant diversity is low on much of the plant site, occasionally individuals might occur within the 429.5 acre portion of the plant site that supports disturbed fallow saltbush scrub and desert wash scrub. Desert tortoise could access this habitat from the Mojave creosote bush scrub vegetation to the west (BS 2008i).

Unlike the habitat on the plant site, the Mojave creosote bush scrub west of SR-14 supports relatively undisturbed habitat with moderately diverse vegetation that could provide adequate forage and cover for a resident population of desert tortoise (BS 2008a, BS 2008i). Construction activities within this area for installation of the proposed 230-kV transmission line could result in permanent loss of 5 acres of habitat loss (BS 2008i). During construction in this area, along the gas pipeline and in vegetated portions of the plant site, desert tortoise could be harmed during clearing, grading, and trenching activities or might become entrapped within open trenches and pipes.

Construction activities could also result in direct mortality, injury, or harassment of individuals as a result of encounters with vehicles or heavy equipment. Other direct effects could include individual tortoise being crushed or entombed in their burrows, collection or vandalism, 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 tortoise may also be attracted to the construction area by application of water to control dust, placing them at

higher risk of injury or mortality. Increased human activity and vehicle travel would occur from the construction and improvement of access roads, which could disturb, injure, or kill individual tortoises. Also, tortoise may take shelter under parked vehicles and be killed, injured, or harassed when the vehicles are moved.

After construction is complete, additional project-related impacts (increased levels of predation on young tortoise from increased raven numbers, increased levels of disturbance and incidence of vehicle strikes) could continue to adversely affect desert tortoise. These potential operations impacts are discussed in more detail later in this subsection.

The applicant has recommended impact avoidance and minimization measures to reduce construction impacts to desert tortoise, including installation of exclusion fencing to keep desert tortoise out of construction areas, reducing construction traffic and speed limits to reduce the incidence of road kills, worker training programs, and other measures. Staff has incorporated these recommendations into conditions of certification. These include staff's proposed Conditions of Certification **BIO-1** through **BIO-8**, which apply to protection of desert tortoise and other biological resources in and near the BSEP. Staff's proposed Condition of Certification **BIO-9** would involve installation of security and desert tortoise exclusionary fencing around the entire project site, and **BIO-12** requires verification that all desert tortoise avoidance, minimization, and compensation measures have been implemented.

Construction of a desert tortoise exclusion fence at the perimeter of the plant site also has potential to adversely affect desert tortoise. The CDFG expressed concerns about impacts to resident tortoises if they are segregated from their home range with a fence, or if transient individuals engage in "fence-walking" to try to pass through the fence (Vance 2008). Such behavior might result in increased exposure to predation and increased levels of stress. Staff consulted with the applicant's desert tortoise expert, Dr. Alice Karl, to assess the potential for this impact to be a potential contributor to the impacts of the BSEP (Karl 2008).

Dr. Karl said that fence-walking typically occurs when a tortoise is moved out of its home range; often, it is when a tortoise is trying to return home. It may also occur when a tortoise is fenced out of part of its typical use area. While there have not been any quantitative scientific studies of this behavior of which Dr. Karl is aware, it has been observed with captive tortoises with the Fort Irwin relocation, during the Hyundai test track translocation activities, and by other researchers (Karl 2008). Dr. Karl thought fence-walking was very unlikely at BSEP given the lack of habitat and absence of records of any live tortoises within the plant site during the 2007/2008 surveys. Furthermore, based on her experience and conversations with other researchers, even if this behavior did occur, it would be short-lived and intermittent.

The applicant has proposed acquisition of off-site habitat to compensate for possible incidental take of up to two transient desert tortoises and for habitat loss along the transmission line corridors. The applicant proposes to acquire and enhance 115 acres to compensate for the potential take of desert tortoises during construction on the plant site and for impacts to 5.0 acres of Mojave creosote bush scrub (BS 2008i). Fifteen of the 115 acres of compensatory mitigation is based CDFG's recommended 3:1

mitigation for this impact. As with the Mohave ground squirrel compensatory mitigation, the remaining portion of the 115-acre compensation requirement was based not on loss of habitat, but on compensation for potential construction- and operation-related impacts to desert tortoise and Mohave ground squirrel. The applicant's Incidental Take Permit application (BS 2008i) provides a detailed explanation of the analysis supporting this recommendation.

Staff agrees with the applicant's analysis and proposed compensatory mitigation and has incorporated the applicant's impact avoidance, minimization, and compensation measures into staff's proposed Conditions of Certification **BIO-9** through **BIO-12**. Implementation of these conditions would reduce impacts to desert tortoise to less-than-significant levels and would also satisfy the California Department of Fish and Game's requirements under section 2081 of California's Fish and Game Code.

Operation Impacts and Mitigation

Potential operation impacts to biological resources include increased risk of raven predation on desert tortoise and wildlife, impacts to birds due to hazardous conditions at the evaporation ponds, increased levels of traffic and disturbance, potential collisions with structures, and lighting. These impacts are discussed below.

Ravens

Construction and operation of the BSEP project area could provide new sources of food, water, and nesting sites that might draw unnaturally high numbers of tortoise predators such as the common raven. Ravens depend on human encroachment to expand into areas where they were previously absent or in low abundance. Ravens habituate to human activities and are subsidized by the food and water, as well as roosting and nesting resources that are introduced or augmented by human encroachment. Common raven populations in some areas of the Mojave Desert have increased 1,500 percent from 1968 to 1988 in response to expanding human use of the desert (Boarman 2003). Since ravens were scarce in this area prior to 1940, the current level of raven predation on juvenile desert tortoises is considered to be an unnatural occurrence (BLM 1990).

Construction and operation of the BSEP would provide new attractants and subsidies that might result in changes in raven population or behavior, which could subsequently affect the desert tortoise population in the region by increased predation. The applicant has identified these raven attractants and subsidies as follows:

- water from evaporation ponds;
- potential creation of new perching/roosting/nesting sites;
- water ponding from dust suppression; and
- construction/operation waste management.

The potential impacts to desert tortoise populations and other species resulting from operation of the BSEP's evaporation ponds are discussed later in this subsection. Impacts and mitigation for the remaining three factors are discussed below.

Perching, Roosting, and Nesting Sites. Most raven predation on desert tortoise is thought to take place during the spring, most likely by breeding birds that have been shown to spend most of their time foraging within 1,300 feet of their nests (Kristan and Boarman 2003). Therefore, BSEP structures such as towers, transmission poles and lines, and maintenance buildings that offer new nesting substrates may pose increased risk of predation to nearby desert tortoise populations. The applicant has proposed project design features to reduce raven nesting and includes physical deterrents to nesting such as bird spikes and nest removal and monitoring to make sure these design features work as intended. These measures are described in more detail in staff's proposed Condition of Certification **BIO-13**, the raven monitoring and management plan.

Ponding. During construction, water would be applied to the graded areas, construction right-of-way, dirt roads, trenches, spoil piles, and other areas of ground disturbance to minimize dust emissions and topsoil erosion. Ponding water resulting from these dust suppression activities has the potential to attract ravens, thereby potentially resulting in increased desert tortoise predation. As described in staff's proposed Condition of Certification **BIO-8**, this potential impact would be minimized by using the minimal amount of water needed for dust abatement, with a Biological Monitor patrolling the construction sites to ensure water does not puddle.

Food Waste. Ravens are scavengers that forage at landfills, dumpsters behind restaurants and grocery stores, open garbage drums and plastic bags placed on the curb for garbage pickup, and on roadkill. Both the construction and operation phases of the BSEP would result in increased waste generation in the project area and improper management of food waste could attract ravens. This potential impact could be avoided with implementation of measures described in staff's proposed Condition of Certification **BIO-8**, which requires that all food-related waste be placed in self-closing containers and removed daily from the site, and that food not be left unattended on the site.

Cumulative/Regional Impacts of Ravens

Construction and operation of the BSEP and subsequent increases in raven predation could contribute incrementally to the cumulative significant impacts to the Mojave Desert population of desert tortoise. The BSEP area is already subject to elevated raven predation pressure and any cumulative loss of juvenile tortoise due to the further addition of raven subsidies could have a long-term effect on the regional tortoise population by reducing the recruitment of juvenile tortoises into the adult life stages (Boarman 2003). The effects of this shortage may not be apparent for years because tortoises do not typically reach sexual maturity until approximately 15 to 20 years of age.

The applicant has been working closely with staff, USFWS, and the CDFG since May 2008 to develop measures that address potential cumulative impacts. As part of its efforts to proactively address the issue of raven monitoring and management, the applicant has submitted two draft raven monitoring and mitigation plans (DB 2008h). The first of these plans, which was submitted in July 2008, provided a detailed monitoring program to assess the contributions of the BSEP to the regional raven

cumulative impacts and take appropriate action if raven numbers exceeded a certain threshold. The applicant revised this approach with its second raven plan submittal in October 2008 (EDAW 2008c).

This second draft plan responded to a request by the USFWS that the applicant address raven monitoring and management on a more regional basis; the USFWS is currently developing a comprehensive, regional raven management plan that would implement recommendations in the USFWS *Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2008b).

To comply with the USFWS request that the BSEP be integrated into this regional approach, the applicant replaced the proposed regional monitoring with payment of an in-lieu fee to a third party account set up by the USFWS to support a regional monitoring plan (Blackford 2009). The applicant is in the process of making final revisions to its October 2008 raven management/monitoring plan to address specific comments from USFWS on impact avoidance and minimization measures, and to finalize arrangements for the in-lieu fee payment for regional management (Blackford 2009, USFWS 2009). These fees would contribute to a region-wide management and monitoring program in the California Desert Conservation Area, and would replace the offsite raven monitoring program originally proposed by the applicant (USFWS 2009). Staff's proposed Condition of Certification **BIO-13** specifies that the applicant complete a final Raven Management and Monitoring Plan in consultation with staff, CDFG, and USFWS. Staff anticipates that the applicant would be able to produce a final raven monitoring and management plan that would meet the approval of CDFG, USFWS and staff. The in-lieu fee would offset contributions of the project to cumulative impacts associated with regional increases in raven numbers, and the project-specific raven management efforts proposed by the applicant would reduce impacts to desert tortoise from raven predation to less-than-significant levels.

Other Predators

In addition to ravens, feral dogs have emerged as significant predators of the tortoise. Dogs may range several miles into the desert and have been found digging up and killing desert tortoises (USFWS 1994; Evans 2001). Dogs brought to the project site with visitors may harass, injure, or kill desert tortoises, particularly if allowed off leash to roam freely in occupied desert tortoise habitat. Implementation of staff's proposed Condition of Certification **BIO-6**, the worker environmental awareness training, and restrictions on pets being brought to the site required of all personnel (Condition of Certification **BIO-8**) would reduce the potential for these impacts.

Impacts of Evaporation Ponds

The BSEP would include three evaporation ponds that would collect blowdown water from the cooling towers. Staff, CDFG, and USFWS are concerned about the wildlife threats posed by the evaporation ponds. First, creation of a new water source to an area where water is scarce would attract ravens to the BSEP, potentially increasing predation rates on juvenile desert tortoise in adjacent habitat. Second, waterfowl, shorebirds, and other resident or migratory birds that drink or forage at the ponds might be harmed by selenium or hyper-saline conditions resulting from high total-dissolved-

solids concentrations. Monitoring results from the summer of 2007 at nearby Harper Lake Solar Electric Generating System revealed numerous waterfowl deaths at the evaporation ponds due to salt toxicosis (DB 2008r). The Harper Lake ponds, which are approximately 30 miles from the BSEP, are similar to those proposed by the applicant. Although Harper Lake is near a wetland area and therefore attracts species unlikely to occur regularly at BSEP, the evaporation ponds and associated risk to birds are a source of significant concern.

The **Soil & Water** and **Alternatives** sections discuss a dry-cooling alternative that would eliminate the need for evaporation ponds, and would therefore eliminate the significant threat to migratory birds and desert tortoise posed by the ponds. This is the alternative preferred by staff, CDFG, and USFWS because it would entirely avoid the impact. However, if this alternative is not adopted and evaporation ponds are to be part of BSEP, the applicant would need to implement staff's recommended Condition of Certification **BIO-14**. This condition requires installation of netting over the evaporation ponds to exclude birds and other wildlife. The measure would reduce evaporation pond impacts to birds to less-than-significant levels.

Increased Risk from Roads/Traffic

Vehicle traffic would increase as a result of BSEP construction and improvement of access roads, increasing the risk of injuring or killing desert tortoise and other wildlife. Construction of the BSEP would be completed over a period of approximately 25 months, with a peak at Month 15 of approximately 836 workers per day (BS 2008a, p. 5.13-11). The average would be approximately 440 workers over the course of construction (BS 2008a, p. 5.13-11). Construction is also forecast to generate an average of approximately 15 to 20 one-way truck trips per day with a peak of approximately 75 truck trips per day. During operations approximately 38 truck trips per month are expected, the estimate of vehicular traffic from 66 workers (BS 2008a, p. 5.13-15).

The potential for increased traffic-related tortoise mortality is greatest along paved roads where vehicle frequency and speed is greatest, although tortoises on dirt roads may also be affected depending on vehicle frequency and speed. Census data indicate that desert tortoise numbers decline as vehicle use increases and that tortoise sign increases with increased distance from roads (Nicholson 1978).

To minimize the risks of increased traffic fatality and other hazards associated with roads at the BSEP project site, the applicant has proposed a variety of impact minimization measures which staff has incorporated into staff's proposed Condition of Certification **BIO-8**. These measures include confining vehicular traffic to and from the project site to existing routes of travel, prohibiting cross country vehicle and equipment use outside designated work areas, and imposing a speed limit of 25 miles per hour on routes within desert tortoise habitat.

Bird Collisions and Electrocution

Birds are known to collide with communications towers, transmission lines, and other elevated structures. The tallest structures at the plant site would be the steam turbine generator, which would be 55 feet tall. The power block, cooling tower, and other

structures would be 50 feet or less in height. These structures at the BSEP site would be unlikely to pose a collision risk because they are shorter than those typically associated with bird collision events and because bird densities are already low in the project area and would be even lower after the solar fields are built and no habitat is available to attract birds.

Large raptors like golden eagles can be electrocuted by transmission lines when a bird's wings simultaneously contact two conductors of different phases, or a conductor and a ground. This happens most frequently when a bird attempts to perch on a structure with insufficient clearance between these elements. The presence of distribution lines 69-kV or less represents more of a danger to raptors than transmission lines greater than 69 kV, because the spacing between elements in distribution lines is much less than that of transmission lines (APLIC 1996). The proposed transmission lines would be 115-kV. To minimize risk of electrocution, the applicant has proposed a "raptor-friendly" construction design for the transmission line with conductor wire spacing greater than the wingspans of large birds to help prevent electrocution as described in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (APLIC 2006). With the proposed mitigation addressed in staff's proposed Condition of Certification **BIO-8**, staff concludes that the proposed transmission lines would not pose a significant threat to birds.

Lighting

Lighting plays a significant role in collision risk with tall towers because lights can attract nocturnal migrant songbirds, and major bird kill events have been reported at lighted communications towers (Manville 2001) with most kills from towers higher than 300 to 500 feet (Kerlinger 2004). BSEP operations would require on-site nighttime lighting for safety and security, which could disturb nocturnal wildlife. To reduce off-site lighting impacts, lighting at the BSEP facility would be restricted to areas required for safety, security, and operation. Exterior lights would be hooded, and lights would be directed on site so that light or glare would be minimized. Low-pressure sodium lamps and fixtures of a non-glare type would be specified. Switched lighting would be provided for areas where continuous lighting is not required for normal operation, safety, or security; this would allow these areas to remain un-illuminated (dark) most of the time, thereby minimizing the amount of lighting potentially visible off site. The measures are described in staff's proposed Condition of Certification **VIS-4**. With implementation of this measure, lighting at the BSEP would have no adverse effects on wildlife.
Lighting may also be required to facilitate nighttime construction activities, which might disrupt the activities and affect behavior of nocturnal wildlife. As discussed in the Visual Resources section, construction lighting must be consistent with worker safety codes, directed toward the center of the construction site, shielded to prevent light from straying offsite, and task-specific. Staff has proposed Condition of Certification **VIS-3** to formalize temporary lighting measures during construction activity and on the laydown area. With implementation of this measure, construction lighting at the BSEP would have no adverse effects on wildlife.

Noise

The primary noise sources associated with operation of the BSEP include the steam turbine generators, cooling tower, start-up boiler, and various pumps and fans. As discussed in the **Noise** analysis, power plant noise levels are predicted to be less than 40 dBA Ldn (34 dBA Leq) at all sensitive receptors during daytime operation and less than 22 dBA Lmax at night. The impact on operational noise on surrounding wildlife is expected to be less than significant.

CUMULATIVE IMPACTS

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "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, § 15130). Cumulative impacts must be addressed 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)).

This cumulative impact analysis makes a broad, regional evaluation of the impacts of past projects that threaten plant and animal communities within California's southern deserts and also discusses in a general fashion future foreseeable threats. This overview of regional impacts is followed by a more detailed discussion of the effects of past, present, and future projects to biological resources of the western Mojave Desert.

Proposed Projects

The Pine Tree Wind Development Project is a wind development project under construction located approximately 6 miles west from the BSEP. The project consists of 80 1.5-MW wind turbine generators plus eight miles of transmission line. Although this project spans an 8,000-acre area, ground disturbance would total approximately 238 acres with permanent disturbance totaling approximately 132 acres (BS 2008a). In addition to the Pine Tree Wind Development Project, the LADWP is also proposing to upgrade and build new transmission capacity from the new Barren Ridge Substation approximately 1.5 miles southwest of the BSEP site in unincorporated Kern County to the Castaic Power Plant near Lake Castaic/Santa Clarita in unincorporated Los Angeles County. A Notice of Intent was filed for the Barren Ridge project in April 2008 (*Federal Register*, April 7, 2008, Volume 73, Number 67, pp. 18734–18737), and the environmental review process for this project is in the early stages. The Barren Ridge-Castaic Transmission Project is designed to tie into LADWP's Pine Tree Wind Development Project and to other proposed wind and solar developments (BS 2008a).

Numerous solar power project applications have been submitted to the U.S. Bureau of Land Management (BLM) in Kern County or just to the east of the Kern County line in San Bernardino County (BS 2008a, p. 5.1-3). These include several large (between 5,000 – 6,000 acres) solar thermal or photovoltaic projects within 30 miles of the BSEP (www.blm.gov/pgdata/content/ca/en/fo/cdd/alternative_energy/SolarEnergy.html).

Regional Overview

Over the past 200 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; Avery 1997; Jennings 1997). The introduction of non-native plant species and increases in predators such as ravens has also contributed to population declines and range contractions for many special-status plant and animal species (Boarman 2002). Against this backdrop of past projects within California's deserts, proposed wind and solar energy projects have the potential to further reduce, degrade, and fragment native plant and animal populations, in particular sensitive species such as desert tortoise and Mohave ground squirrel. BLM has received solar and wind applications for use of BLM land for approximately one million acres of the California Desert Conservation Area.

In the context of this large-scale habitat loss and currently proposed projects in the region, staff assessed the potential of the BSEP project to contribute to cumulative significant loss and degradation of habitat for desert plants and wildlife, including desert tortoise, Mohave ground squirrel, and other special-status species such as burrowing owl. The BSEP plant site is highly disturbed by past agricultural activities and currently supports marginal wildlife habitat, with little potential to support resident populations of sensitive species such as desert tortoise and Mohave ground squirrel. However, transient individuals could occur in the vegetated portions of the site, and resident populations inhabit the area west of SR-14 where transmission line construction would occur. Furthermore, over the years the disturbed vegetation on the site would have continued to recover from historical disturbances and would eventually provide improved habitat for these species. The BSEP would prevent recovery of these disturbed agricultural lands and would contribute to fragmentation of native plant communities in the project area. BSEP would also contribute to the cumulative increase in ravens in the area, increasing predation pressures on desert tortoise.

Staff believes that implementation of the conditions of certification described below will minimize and offset the contributions of the BSEP to the cumulative loss of habitat for native plant communities and wildlife, including special-status species. Staff's proposed Condition of Certification **BIO-11** requires the applicant to acquire and enhance at least 115 acres of suitable habitat for desert tortoise and Mohave ground squirrel. This habitat would be connected to other suitable habitat for these species and would offset any habitat loss associated with the BSEP. Staff's proposed Condition of Certification **BIO-17** requires 20 acres of off-site habitat acquisition to be protected and managed for burrowing owls, and staff's proposed Condition of Certification **BIO-13**, the Raven Management and Monitoring Plan, specifically includes measures that would address the cumulative regional increases in raven predation on desert tortoise. Finally, Staff's proposed Condition of Certification **BIO-18** requires that the impacts to the desert washes be mitigated by re-creating natural hydrological and biological conditions in the

new diversion channel, offsetting cumulative losses to waters of the state. With implementation of these conditions of certification, the BSEP project would not result in significant cumulative impacts to biological resources.

COMPLIANCE WITH LORS

The proposed project must comply with state and federal laws, ordinances, regulations, and standards (LORS) that address state and federally listed species, as well as other sensitive species and habitats, and must secure the appropriate permits to satisfy these LORS. The Energy Commission has a one-stop permitting process for all thermal power plants rated 50 MW or more under the Warren-Alquist Act (Pub. Resources Code § 25500). Under the act, the Energy Commission's certificate is "in lieu of" other state, local, and regional permits (*ibid*.) The Commission's streamlined permitting process accomplishes a primary objective of the Renewable Energy Action Team, as identified in the Governor's Executive Order S-14-08 — to create a "one stop" process for permitting renewable energy generation facilities under California law. Accordingly, Commission staff has coordinated joint environmental review with the California Department of Fish and Game and the Lahontan Regional Water Quality Control Board, as well as the U.S. Fish and Wildlife Service. Staff has incorporated all required terms and conditions that might otherwise be included in state permits into the Energy Commission's certification process. 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:

Incidental Take Permit: California Endangered Species Act (Fish and Game Code §§ 2050 et seq.) The California Endangered Species Act (CESA) prohibits the "take" (defined as "to hunt, pursue, catch, capture, or kill" or attempt to hunt, pursue, catch, capture, or kill") of state-listed species except as otherwise provided in state law. Construction and operation of the BSEP project could result in the take of desert tortoise and Mohave ground squirrel, both listed as threatened under CESA. Staff has reviewed information supplied by the applicant (BS 2008i) and has coordinated closely with CDFG to develop the conditions of certification in this section. These conditions of certification would ensure that the project is not likely to jeopardize the continued existence of desert tortoise or Mohave ground squirrel or result in the degradation of occupied habitat. Energy Commission staff has also determined, in consultation with the CDFG, that: 1) the take is incidental to otherwise lawful activities, 2) impacts of the take are minimized and fully mitigated, and 3) the applicant has provided assurance of adequate funding to implement the conditions of certification.

Streambed Alteration Agreement: California Fish and Game Code §§ 1600 1607. Pursuant to these sections, CDFG typically regulates all changes to the natural flow, bed, or bank, of any river, stream, or lake that supports fish or wildlife resources. Construction of the BSEP would result in permanent impacts to 16 acres of state jurisdictional waters. Staff has reviewed information supplied by the applicant (DB 2008e) and has coordinated with CDFG to develop staff's proposed

Conditions of Certification **BIO-18**. Implementation of this condition would minimize and offset impacts to state waters and would assure compliance with CDFG codes that provide protection to state waters.

Potential take of the desert tortoise, listed as threatened by the USFWS, requires compliance with the federal Endangered Species Act (ESA) (16 USC §§ 1531 et seq.). "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. The BSEP does not involve federal action; therefore the project will obtain take authorization through Section 10 of the Endangered Species Act (ESA). Section 10 permitting requires preparation of a Habitat Conservation Plan (HCP) to ensure the continued viability of listed species and their habitats, followed by issuance of an Incidental Take Permit and preparation of an Implementation Agreement. Staff's proposed Condition of Certification **BIO-9** also requires the applicant to implement all terms and conditions developed as part of the HCP process. Staff's proposed Conditions of Certification **BIO-9** through **BIO-13** were developed in consultation with USFWS and are likely to be consistent with terms and conditions required as part of the HCP. These conditions of certification would ensure that the project is not likely to adversely affect the desert tortoise or its critical habitat.

FACILITY CLOSURE

In the future, BSEP would experience either a planned closure or be unexpectedly (either temporarily or permanently) closed. When facility closure occurs, 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 (BS 2008a). To address unanticipated facility closure, an "on-site contingency plan" would be developed by the project owner and approved by the Energy Commission Compliance Project Manager (CPM). Facility closure requirements are discussed in more detail in the **General Conditions** section of this Final Staff Assessment. 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-7.**

The facility closure plan should address habitat restoration measures to be implemented in the event of a planned or an unexpected permanent closure and must also include a funding mechanism to ensure sufficient funds are available for decommissioning and habitat restoration. Planned or unexpected permanent facility closure should address the removal of the transmission conductors since birds are known to collide with transmission line ground wires.

Staff's proposed Condition of Certification **BIO-19** contains measures to ensure that impacts to biological resources are addressed prior to the planned permanent or unexpected permanent closure of the project.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received comments on the Biological Resources section of the Preliminary Staff Assessment (PSA) from the California Unions for Reliable Energy (CURE) (ABJC 2009f), Beacon Solar LLC (applicant) (DB 2009n, DB 2009o), and the California Department of Fish and Game (CDFG) (DFG 2009b). CURE also submitted comments on the applicant's June 22, 2009 submittal on project design refinements (ABJC 2009g). Staff has summarized these comments and provided responses below.

CURE Comment- *Flawed Survey Methods for Desert Tortoise*: CURE objected to staff's reliance on the results of the applicant's desert tortoise surveys for the PSA analysis, asserting that the applicant's survey efforts did not meet protocol standards (USFWS 1992). They noted that in several reports submitted by the applicant the survey width of transects was specified as 10 meters (32.8 feet) apart rather than the 30-foot wide swath required by the protocol. Furthermore, CURE offered calculations based on information in the applicant's 2008 Spring Survey Report, stating that assuming 9 person days at 10 hours/day would result in only 90 person hours, and that this was only 1/3 of the survey effort needed to cover the 2012-acre site.

Response: In their response to CURE's comments (EDAW 2009) the applicant noted that the reference in several of their reports to the 10-meter belt transects was a typographical error and should have been a reference to 30-foot-wide belt transects. The applicant also supplied additional details indicating that the surveyor's work days were generally averaging 10 hours or longer (EDAW 2009).

Staff has reviewed the applicant's recent submittal (EDAW 2009), and the table titled "Desert Tortoise Focused Surveys, 2008" from Appendix A in the applicant's 2008 Spring Survey Report (EDAW 2008d) which was cited by CURE as one source of information for their calculations. Staff has also reviewed the discussion of desert tortoise survey methods provided in Appendix F of the Application for Certification (BS 2008a), and the qualifications of the personnel comprising the applicant's desert tortoise survey team (BS 2008a). Based on that review staff determined that the survey effort involved more than 200 person hours in 2008 alone (10 survey days, at least two surveyors per day for approximately 10 hour/day). Appendix F of the AFC (BS 2008a) also describes desert tortoise surveys that were conducted in 2007 in accordance with USFWS protocol (USFWS 1992).

Staff has concluded that the desert tortoise surveys conducted by the applicant for the BSEP are adequate to meet past and current USFWS protocol standards (USFWS 1992, 2009), and provided an adequate foundation for the analysis of impacts in the FSA.

CURE Comment- *PSA Relies on Flawed Desert Tortoise Habitat Evaluation:* CURE commented that the analysis in the PSA was founded on the applicant's incorrect conclusion that the project site does not provide suitable habitat to support desert tortoise, asserting that the applicant had failed to adequately assess the following habitat variables:

Food Resources: CURE commented that a portion of the plant site could provide habitat to support resident desert tortoise because preferred food such as *Astragalus laynae*, *Lotus humistratus*, and *Mirabilis bigelovii* are present.

> **Response:** *Astragalus laynae*, *Lotus humistratus*, and *Mirabilis bigelovii* occur within the area surveyed but beyond the project site boundaries (EDAW 2008d) and therefore these preferred food items would not be available to desert tortoise within the plant site.

Shrub Cover: CURE noted that portions of the site are characterized by suitable shrub species composition and cover to provide suitable habitat for desert tortoise.

> **Response**: Based on a review of the applicant's submittals (BS 2008a, BS 2008i) describing shrub cover in relation to habitat suitability, and staff's confirmation of this information during multiple site visits, staff has concluded that shrub cover is minimal and discontinuous, and that much of the site does not provide suitable conditions to support desert tortoise.

Soil Characteristics: CURE stated that soil types present on the site have been classified by the USDA Natural Resource Conservation Service as highly friable, and are suitable for desert tortoise burrowing and nesting.

> **Response**: Staff agrees with the applicant's response (EDAW 2009) regarding soil friability, in which they stated that friable soils cannot be too loose and without the structure of either shrub roots or moisture-holding particles because such soil will not support a large tortoise burrow. The applicant notes that soils under the *Atriplex polycarpa* shrubs in the northwest were very fine, compacted, and showed evidence of inundation, none of which characterizes desert tortoise habitat (BS 2008a, BS 2008i). Staff has reviewed the applicant's submittals (BS 2008a, BS 2008i, EDAW 2009) describing the soil characteristics in relation to habitat suitability, and has concluded that while portions of the site provide soil conditions suitable for burrowing, that by itself does not make the habitat suitable for desert tortoise because other crucial habitat elements are either scarce or missing.

Hydrology. CURE noted that the project site contains well-drained soils, receives relatively little rainfall, and has no wetlands, all suggesting that the site's hydrology does not limit desert tortoise habitat suitability.

> **Response**: Staff has concluded that the hydrological characteristics of parts of the plant site would not preclude desert tortoise occupation, but that periodic flooding in the northwest, resulting from agricultural activities, might do so. However, even if hydrology on the entire site was suitable for desert tortoise, the area still would not be suitable for occupation by resident desert tortoise because of the absence of other critical habitat components.

Suitability of Adjacent Habitat; CURE comments that the documents submitted by the applicant indicate that good desert tortoise habitat exists adjacent to the site, and that this is yet another variable indicating that the site provides suitable habitat for desert tortoise.

Response: Staff agrees with CURE's observation that moderate to good quality desert tortoise habitat is adjacent to portions of the project site, but does not agree this makes habitat on the plant site suitable for desert tortoise in the absence of other important habitat elements such as food and cover.

Habitat Degradation: CURE disagreed with applicant's argument that past disturbance has degraded the site and that the site's degraded conditions make it unsuitable for desert tortoise. They note that the amount of time an organism spends in a location is not necessarily correlated with habitat value or subsequent effects on fitness, and comment that while occupancy by desert tortoise might be low, the site's habitat value may be high.

Response: Based on a review of the applicant's submittals (BS 2008a, BS 2008i) describing habitat at the plant site, and staff's confirmation of this information during multiple site visits, staff agrees with the applicant's assessment of the site as having been significantly degraded by agricultural activities. Staff concludes that agricultural activities have resulted in vegetation removal, introduction or exotic species and alteration of the surface soil, all of which have diminished the suitability of the habitat for desert tortoise.

Connectivity. CURE commented that a portion of the plant site may provide habitat connectivity for desert tortoise, noting that according to the applicant's habitat assessment, areas B, D, E, and the wash have shrub cover that is partially connected to tortoise habitat outside the site.

Response: Staff agrees with CURE's comment that the wash provides some connectivity with adjacent suitable habitat, and portions of the wash provide a potential movement corridor for desert tortoise and other wildlife. However staff also agrees with the applicant's characterization of the wash as having extensive barren stretches that are not hospitable to desert tortoise. Staff has concluded that the barren stretches within the wash resulting from past disturbance has reduced the value of wash as a corridor for wildlife movement, but has not eliminated it.

Conclusion on Desert Tortoise Habitat Evaluation. Staff does not agree with CURE's assertion that the desert tortoise habitat assessment provided by the applicant was substantially flawed, and finds no information in CURE's comments that would change the FSA's conclusion that 2,012-acre plant site provides little or no habitat to support resident desert tortoise.

CURE Comment: ***DT Remains Found on Site*** CURE notes that an intact juvenile desert tortoise carcass was detected in the plant site, and that the individual had succumbed to raven predation. If the tortoise had originated outside of the site, the raven would have had to carry it at least 2,300 feet to its resting point. CURE concludes that a more plausible explanation is that the tortoise occurred near the carcass location when it was predated, indicating that the fallow agricultural-disturbed atriplex scrub community in which the carcass was found provides habitat for desert tortoises.

Response: Staff agrees that one cannot rule out the possibility that a raven captured and ate the juvenile tortoise on the plant site. However, ravens are known to carry food and resources long distances, flying up to 40 miles in a day (Boarman 2003) and it is not unlikely that a raven could have carried a small prey item like a juvenile tortoise up to 2,300 feet. Coyotes or other scavengers could also have moved the carcass. Even if the carcass originated on the site rather than being imported, staff believes its presence is slim evidence for concluding that the project site's fallow agricultural disturbed atriplex scrub provides suitable habitat for desert tortoise.

CURE Comment*: Mohave Ground Squirrel Habitat Assessment Flawed*: CURE comments that the PSA incorrectly accepts the Applicant's position that the 2,012-acre plant site provides little or no habitat to support the Mohave ground squirrel. CURE challenges the evidence that the applicant used to support its conclusion that the plant site is incapable of supporting a resident Mohave ground squirrel population, as follows:

Food Resources: CURE notes that three preferred food items for Mohave ground squirrel are present on the site: winterfat (*Krascheninnikovia lanata*), spiny hopsage (*Grayia spinosa*) and saltbush (*Atriplex* sp.). CURE also cites the Draft Mohave Ground Squirrel Conservation Strategy (Desert Manager's Mohave Ground Squire Work Group 2006) which indicated that the leaves of (*Atriplex* sp.) constituted 60% of the Mohave ground squirrel shrub diet. They also stated that these three shrubs are considered the mainstay food for Mohave ground squirrel when forbs are not available.

Response: Winterfat and spiny hopsage are not present on the plant site, although they were detected during the floristic surveys outside of the project boundaries (BS 2008a, BS 2008i). Even if all three species were present in the site, staff has concluded that these plants do not provide sufficient forage to support a resident population of Mohave ground squirrels, based in part on studies conducted in the Coso Range of Inyo County (Leitner and Leitner 1998). This nine-year study of 754 fecal samples collected at four sites found no evidence of a Mohave ground squirrel diet consisting of only one or any combination of these three food items. CURE has not provided any evidence that Mohave ground squirrels have ever been recorded from monotypic allscale (*Atriplex*) vegetation such as is present on the Plant Site, nor have they offered information indicating that this species can survive on a diet of allscale leaf throughout much of the year.

Vegetative Cover. CURE asserts that the PSA incorrectly concludes that the project site does not provide vegetative cover suitable for Mohave ground squirrel, noting that the only evidence cited to support that conclusion is the Coso study (Leitner and Leitner 2008) and the applicant's anecdotal trapping data (BS 2008i). CURE cites the West Mojave Plan (BLM 2005) commenting that Mohave ground squirrels are generalists in terms of plant community preferences, and have been documented in urban and agricultural plant communities, and in an area entirely surrounded by urban and agricultural development. CURE reports that the West Mojave Plan (BLM 2005) indicated that one squirrel was trapped at the recently opened Hyundai Proving Ground south of California City, where the applicant's consultant had identified habitats as being "marginal." The applicant also cites the West Mojave Plan (BLM 2005) to describe

vegetation surveys at 19 sites where Mohave ground squirrels had been documented as occurring through trapping efforts. Although the data has limitations, it provides relatively extensive information on vegetation characteristics at sites where squirrels occurred. Of the 19 sites examined, three (16%) were dominated by Atriplex, and two (11%) contained abundant Atriplex, but no winterfat or spiny hopsage. The occurrence of Mohave ground squirrels in Atriplex communities lacking winterfat and spiny hopsage provides empirical data that the site provides suitable habitat for Mohave ground squirrel.

Response: Staff has reviewed the studies relating to vegetation communities and Mohave ground squirrels cited by the applicant and by CURE. Staff believes that the Coso study (Leitner and Leitner 2008), which showed that an Atriplex-dominated site was the only one of four study sites that did not support a permanent Mohave ground squirrel population, supports the applicant's conclusion that the Atriplex plant communities at the project site are unlikely to support resident Mohave ground squirrels.

Staff has concluded that the information in the West Mohave Plan (BLM 2005) cited by the applicant does not support the assertion that monotypic atriplex plant community at the project site could support a population of Mohave ground squirrel. While atriplex was a dominant component on many of the 19 "Aardahl-Roush Sites" referenced by CURE, none were comparable to the plant site, where native desert vegetation was completely removed for agriculture and a monotypic stand has come back as regrowth. All 19 sites described in the West Mojave Plan (BLM 2005) where Mohave ground squirrel occurred supported undisturbed and diverse native plant communities. Staff also noted that the primary authority cited in the Mohave ground squirrel species account in the West Mojave Plan is Dr. Leitner, the Mohave ground squirrel expert engaged by the applicant to assess the potential of the site to support this species.

In reviewing the references cited by CURE, staff observed that CURE did not heed the caveat in the Mohave ground squirrel species account of the West Mojave Plan, which cautioned the reader from interpreting too literally the plant community designations (BLM 2005, p. 3-151): "One must exercise caution when accepting plant community designations, for example, like "creosote bush scrub" and "saltbush scrub," because of the variability of shrubs comprising such communities. Creosote bush (*Larrea tridentata*), from which the community derives its name, is necessarily a part of the so named plant community, but is often not the most abundant plant. For example, on the 12 Aardahl-Roush sites that LaRue identified as creosote bush scrub, creosote bush was the most abundant plant only on 1 (8%) of the 12 sites. The dominant perennials in the remaining 11 creosote bush scrub communities included burrobush (*Ambrosia dumosa*) at 10 (91%) sites and Cooper's goldenbush (*Ericameria cooperi*) at 1 (9%) site. Burrobush was also the most abundant perennial species at 2 (40%) of the 5 sites characterized as saltbush scrub." So while atriplex may have been the plant community name, that does not mean atriplex is the dominant species, and does not refer to a monotypic stand of atriplex such as that occurring at the plant site.

Conclusion on Mohave Ground Squirrel Habitat Assessment: Staff finds no information in CURE's comments that would change the FSA's conclusion that 2,012-acre plant site provides little or no habitat to support resident Mohave ground squirrels.

CURE Comment: ***Use of the Term Transient*** – The PSA makes reference to the potential for transient desert tortoise or Mohave ground squirrel to occur within the plant site, despite the lack of habitat that would support these species. CURE objects to this term and concept, commenting that the term is infrequently used in wildlife science, and was undefined in the PSA. CURE states that there is no scientific evidence to support the assumption that any individuals occurring on the Project site would be transients. CURE asserts that if an organism occurs in an area, that area provides habitat. CURE claims that by definition, habitat is defined by the behaviors of an organism, and therefore the PSA's concept of habitat is fundamentally flawed. CURE considers any portions of the Project site where a desert tortoise or Mohave ground squirrel could occur as habitat.

> **Response**: Staff believes that the concept of transient individuals is a familiar one to wildlife biologists. The CDFG California Statewide Habitat Relationships System species accounts use the term transient frequently, and define transient as: "Status of a species or an individual that occurs temporarily in an area; typically in migration or other movement" (Zeiner et al. 1990, glossary, page 721). The term is most frequently used for birds, which often occur in areas during migration that are entirely different from their typical habitats on breeding or wintering grounds, but desert tortoises or Mohave ground squirrels could be also be considered transients at certain times during their lives. For example, individuals departing from unfavorable habitat conditions, juvenile animals dispersing from their natal areas, or males moving in search of females could be considered transients (Gibbons 1986). Transient individuals could therefore appear in areas that provide no habitat to support resident animals, such as a desert tortoise crossing a paved road or a barren playa. The presence of a desert tortoise in these settings does not make the road or the playa suitable habitat.
>
> In the context of this analysis, staff used the term transient to refer to a desert tortoise or Mohave ground squirrel that might occur within the plant site, despite the fact that the plant site does could not support resident individuals because it is highly disturbed and deficient in the requisite food and cover. In developing mitigation recommendations staff made a conservative assumption that one could not rule out the possibility of transient individuals occurring on the site during construction, despite the fact that the project site provides no habitat for resident desert tortoise or Mohave ground squirrels. Staff believes that use of the term and concept of transient individuals was an appropriate and reasonable approach in staff's impact assessment and in their development of mitigation recommendations.

CURE Comment: ***PSA Mitigation Based on Flawed Calculations, Unsupported Reasoning.*** CURE challenged the applicant's recommended mitigation for desert tortoise and Mohave ground squirrel (BS 2008i), and concluded that the PSA's recommendation for mitigation was flawed because it relied on the applicant's flawed analysis and mitigation approach. The applicant's approach is described in considerable

detail in the applicant's Incidental Take Permit application (BS 2008i). To summarize the applicant's detailed explanation, this approach consists of the following assumptions: as many as two Mohave ground squirrels could be impacted by construction on the plant site. To compensate for the loss of two individuals habitat suitable for this species would need to be acquired, protected, and enhanced to increase the carrying capacity for Mohave ground squirrel on the acquired lands. The improved conditions of the protected land would enhance reproduction and survival of Mohave ground squirrel, eventually allowing replacement of the two individuals lost. CURE's comments challenge the basic assumptions of this approach as well as the specifics of how the applicant arrived at the required acreage, as follows:

Correlation of Density and Habitat Quality: CURE notes that one of the core premises of the applicant's calculations for mitigation is that desert tortoise and Mohave ground squirrel density is positively correlated with habitat quality. They comment that a positive correlation between density and habitat quality for a particular species needs to be established before it can be considered valid, and several types of limitations and ecological processes must be considered when density data is used to evaluate habitat quality. As an example, CURE notes that higher-quality habitats may be occupied by dominant individuals, forcing subdominants into lower-quality habitat, and therefore higher densities may be present in poorer, not better, habitats. CURE comments that although behavior studies of Mohave ground squirrels have provided mixed results, there is evidence that the species exhibits some form of territoriality. As a result, the use of density estimates to calculate mitigation is not appropriate without additional consideration and study.

> **Response:** Staff notes that one of CURE's comments was that "habitat is defined by the behaviors of an organism." Better habitat, by definition, would therefore have the potential to support more animals; poorer habitat would support fewer. While tortoises have social hierarchies, defense of territories is highly limited by low mobility. There is no evidence of territoriality in the Mohave ground squirrel. The applicant states that radiotelemetry and trapping studies have repeatedly shown overlapping home ranges for Mohave ground squirrel (EDAW 2009).

Carrying Capacity: CURE objects to the applicant's conclusion that 20 acres would offset impacts to two Mohave ground squirrels, which was based on a study near the Desert Tortoise Natural Area (DTNA) and data from the Coso study site (Leitner and Leitner 2008). The applicant references these studies as providing information on carrying capacity, and subsequently the applicant reasons that fencing acquisition land would increase Mohave ground squirrel carrying capacity by 25 percent. CURE comments that the applicant's use of carrying capacity is confusing and inconsistent with the definition of the term, noting that carrying capacity is the maximum number of individuals an area can support, not the estimated density of individuals. CURE states that predicting carrying capacity is extremely complicated, and rarely do real-world populations exhibit the dynamics used in carrying capacity models. By definition, use of carrying capacity values to calculate the amount of compensation land results in underestimated acreage.

Response: Staff considers the carrying capacity of a given area not as a constant, but as something that varies depending on the availability of resources. It is the maximum number of individuals that can be supported in an area given a specific level of resources. Staff believes it is appropriate to use density estimates for protected (high resources) and unprotected (low resources) lands as indications of carrying capacity when calculating the amount of compensation land required for a certain level of impact mitigation.

Estimate of Take of Mohave Ground Squirrel. CURE asserts that there is no support for the applicant's assumption regarding the number of Mohave ground squirrel individuals potentially impacted by the Project, which is based on the Coso data (Leitner and Leitner 2008). CURE notes that the applicant alludes that Coso data supports a reasonable estimate of two individuals exposed to possible incidental take on 429.5 acres within the plant site. This estimate needs to be substantiated before it can be considered valid. Burt (1936) estimated density at 15 to 20 Mohave ground squirrels per 1 square mile, which is equivalent to 10 to 13.4 individuals per 429.5 acres.

Response: The Burt (1936) study consisted of observations in 1931 near Palmdale and was not based on trapping mark-recapture studies or any other valid scientific sampling scheme, but rather observations of squirrels seen along a stretch of dirt road. Staff does not consider this study a scientifically defensible source of density estimates.

Inflated Estimate of Individuals on Compensation Lands. CURE comments that the applicant used an estimate of one individual per 10 acres of protected land in calculating compensation acreage, and based this estimate on trapping data which exhibited comparable results. CURE asserts that trapping numbers cannot be used to estimate density unless trapping success is incorporated into the estimate. CURE also notes that trapping numbers are further limited unless one incorporates the distinction between the capture of dispersing and resident individuals, which may be impossible without additional studies such as radio-telemetry. If dispersing individuals are captured and used in density calculations, the estimate will be inflated.

Response: The applicant response to CURE's comments (EDAW 2009) notes that if trapping success is less that 1.0, the result would be an underestimate of density, not an overestimate, indicating that protection of habitat would be even more beneficial than estimated in the applicant's analysis. Dispersal in Mohave ground squirrels involves juvenile animals during May and June of their first year. Since the two studies cited in the applicant's analysis involved only adult animals, there would be no inflation of density estimates due to capture of dispersing individuals.

Density Estimate Inconsistent with Trapping Data**.** CURE states that the applicant's "conservative" approach to calculating mitigation uses the value of 0.8 animal/10 acres, which the applicant terms a "generous estimate" for baseline conditions at unprotected land subject to off-highway vehicle (OHV) use and livestock grazing. CURE comments, however, this value does not appear consistent with the applicant's assertion that trapping data from mitigation land purchased for desert tortoise and Mohave ground squirrel strongly indicate that the "population density of the species on this parcel is

currently very low, possibly approaching zero." The trapping data was derived from land in the vicinity of the DTNA, similar to land being proposed for Mohave ground squirrel mitigation by the applicant. CURE notes that an assumption of 0.8 animal/10 acres was a fundamental part of the applicant's compensation land calculations, and undoubtedly the use of an estimate obtained from trapping data near the proposed compensation site (i.e., almost 0.0 animal/10 acres) would have yielded very different results.

> **Response:** Staff believes that the applicant's approach to calculating an appropriate amount of compensation acreage is indeed conservative. The very low Mohave ground squirrel density cited in CURE's comment referred to a recently acquired CDFG parcel near the DTNA that had been impacted by livestock and OHV activity. If the applicant had used these data, rather than the density estimate of 0.8 animals/10 acres for potential compensation land, less compensation land would be acquired.

Desert Tortoise Impact/Compensation Assumptions Unsupported: CURE comments that the PSA relies on the applicant's assumption regarding the number of desert tortoise individuals potentially impacted by the Project, asserting that this assumption is based on a flawed habitat assessment and inadequate surveys, and that the number of individual desert tortoises that the compensation area is expected to support is purely conjecture. CURE notes that the applicant has used desert tortoise density estimates (i.e., one individual per 10 acres) from the DTNA to infer that acquisition and enhancement of 20 acres will offset impacts to two tortoises. CURE states that his inference is not reliable without a comparison of baseline conditions present at the two sites, and a demonstration that the compensation area will undergo the same management regime as the DTNA. The DTNA was established in 1976 and has subsequently been managed specifically for the benefit of the desert tortoise as both a research natural area and an Area of Critical Concern. It also has one of the highest known densities of desert tortoises per square mile in the species' geographic range. Consequently, applying density estimates obtained from the DTNA to land that has been subject to grazing and OHV use will likely underestimate the amount of compensation land required to support two tortoises.

> **Response:** As discussed earlier in this section staff does not agree with CURE's assertions that the applicant's habitat assessment and surveys for desert tortoise were inadequate. However, staff agrees in part with CURE's statement that the number of individual desert tortoises that the compensation area is expected to support is based on conjecture. Estimating the number of desert tortoise that might be produced on compensation lands is of necessity a speculative endeavor; many of the factors affecting how many desert tortoise would survive and reproduce on the compensation lands cannot be predicted or controlled. Staff's proposed Condition of Certification **BIO-11** requires the applicant to control as many of those factors as possible, and requires an assessment of potential compensation lands for their ability to enhance the recovery of the desert tortoise. The applicant would seek compensation lands that have high carrying capacity or the potential for high carrying capacity but currently have lowered densities due to a variety of other factors. Staff believes that the applicant's use of the DTNA for comparative purposes is appropriate because lands are anticipated to be near or adjacent to the DTNA, including in the area

targeted by the Desert Tortoise Preserve Committee (DTPC) for acquisition. It is anticipated that lands outside the DTNA may currently have a lower carrying capacity than the protected DTNA; protecting and enhancing those lands is likely to raise the carrying capacity. Previous land uses (one of several criteria used to select acceptable potential compensation lands in staff's proposed Condition of Certification **BIO-11**) must not have degraded the lands such that the potential for habitat recovery is limited. The DTNA, prior to fencing, was also used for grazing and recreation, so these are not sufficient criteria to reject a property.

Metrics and Basis for Compensation Recommendation: CURE states that the PSA relies on a baseline assessment, impact analysis, and compensation package that apply different units of analysis, which makes it impossible to evaluate the ability of mitigation to offset impacts. They object to the applicant using habitat as the unit of analysis for baseline conditions and proposed mitigation, and individual animals as the unit of analysis for impact assessment. CURE notes that metrics must be comparable to achieve an accurate assessment of project impacts.

Response: Staff agrees that the PSA was not sufficiently clear in describing the metrics and basis for recommending 115 acres of habitat acquisition and protection as full mitigation for desert tortoise and Mohave ground squirrel, and offers the following clarification: Fifteen of the 115 acres of compensatory mitigation is based on impacts to desert tortoise and Mohave ground squirrel resulting from impacts to good quality habitat west of I-14 associated with transmission line construction and operation. Five acres was the estimated extent of the temporary and permanent habitat impact west of I-14, and CDFG recommended 3:1 mitigation for this impact. The remaining portion of the 115-acre compensation requirement was based not on loss of habitat, but on compensation for potential construction- and operation-related impacts to desert tortoise and Mohave ground squirrel. The applicant's Incidental Take Permit application (BS 2008i) provides a detailed explanation of the analysis supporting this recommendation, and it has been summarized briefly above.

Conclusion: Mitigation Approach for Desert Tortoise and Mohave Ground Squirrel: Staff does not agree with CURE's assertion that the applicant's approach to compensation for desert tortoise and Mohave ground squirrel was fundamentally flawed, and concludes that the information supplied by the applicant provided an adequate foundation for staff's impact analysis and mitigation recommendations.

CURE Comment: ***Burrowing Owl Survey Report Inadequate.*** CURE states that the applicant did not meet the California Burrowing Owl Consortium (CBOC 1993) survey protocol and mitigation guidelines because they did not provide a Phase 4 report or otherwise provide the content required therein. CURE contends that without a Phase 4 report it is difficult to determine the applicant's adherence to the other three phases of the protocol, and the extent to which the PSA's proposed mitigation compensates for impacts to burrowing owls. CURE further commented that the description of the 2007 and 2008 burrowing owl survey results was confusing, creating uncertainty as to whether there were 6 or 9 active burrows, and whether there was "potential" or "recent" sign detected. CURE concluded that the applicant's survey results indicate the

presence of between five and nine active burrows within the survey area, possibly more due to a discrepancy in survey areas between the two years, and additional active burrows within the buffer zone.

> **Response**: In reviewing the applicant's reports describing burrowing owl surveys (BS 2008a, EDAW 2008d) staff concludes that the applicant submitted the equivalent of the Phase 4 survey report in these submittals. A Phase 4 report includes a habitat assessment, a description of survey methods and results, and figures depicting the results of the surveys (CBOC 1993) all of which are included in the applicant's reports (BS 2008a, EDAW 2008d). With respect to discrepancies between 2007 and 2008 survey results, the 2008 surveys for burrowing owl were conducted on the additional locations added to the original project site. These locations included an 80-acre area in the north-central portion of the Plant Site, a 14-acre area in the western portion of the Plant Site (north of the dirt access road), and along the pipeline route (with associated buffer out to 1,000 feet) (EDAW 2008d).
>
> Based on the information provided by the applicant, staff has concluded that burrowing owls could occur anywhere within the project site, within the one-mile buffer, and along all of the linear alignments. Staff therefore sees no purpose in demanding additional reports and detail from the applicant, even if staff agreed with CURE's assertion that their reports were inadequate, because the mitigation measures contained in staff's proposed Condition of Certification **BIO-17** would not change as a result of this additional information. Staff is already assuming presence of burrowing owls on the project site and along linear alignments, and is therefore requiring impact avoidance and minimization measures as well as on-site and off-site compensation for impacts to a minimum of two burrowing owl pairs.

CURE Comment: ***Flawed Special Status Plant Surveys.*** CURE states that floristic surveys conducted by the applicant for six special-status plant species potentially occurring in the project area were flawed and did not adhere to an established protocol, concluding that the PSA had no substantial evidence upon which to base its conclusion no impacts would occur to special status plant species. The applicant's 2008 survey report indicates that rare plant surveys followed guidelines provided by the Energy Commission, USFWS, CDFG, and California Native Plant Society (CNPS). CURE states the applicant's reports (BS 2008a and BS 2008d) include no specific information as to how rare plant surveys were conducted. CURE asserts that at a minimum the applicant should have: (1) visited reference sites to determine that target species were identifiable at the time of surveys; (2) provided a detailed description of survey methodology; (3) provided the specific dates of field surveys and total person-hours spent surveying; and, (4) provided a description of the reference site(s) visited and phenological development of target plant species.

> **Response:** The applicant responded to CURE's assertions about the inadequacy of their floristic surveys with information about reference site visits, descriptions of survey methodologies, dates for field surveys and total person hours spend surveying, and a description of reference sites visited and phonological development of target species (EDAW 2009). The applicant stated

that the rare plant surveys they conducted met the guidelines established by the USFWS, CDFG, and CNPS (EDAW 2009). With this additional information staff has concluded that the applicant has satisfactorily complied with the appropriate rare plant survey guidelines and has provided sufficient information for staff's impact analysis.

CURE Comment: ***Genetic Testing Required to Distinguish Red Rock Poppy.*** CURE states that the applicant incorrectly concluded that the pygmy poppy (*Eschscholzia minutiflora* ssp. *Minutiflora),* a relatively common species, occurred on the project site rather than the rare Red Rock poppy *(E. minutiflora* ssp. *Twisselmannii),* a CNPS 1b species*.* The distinction between the two subspecies is very subtle, and the most diagnostic characteristic of Red Rock poppy relative to the other subspecies of *E. minutiflora* is that it is diploid with six chromosomes, whereas ssp. *minutiflora* have 18 chromosomes, respectively. Thus, to distinguish the subspecies and determine the presence or absence of the rare *E. minutiflora* ssp. *twisselmanni*, the applicant would have had to perform genetic testing. Otherwise, the applicant would have to assume presence of *E. minutiflora* ssp. *twisselmanni*. The applicant did not assume presence of this subspecies, and it appears that the applicant did not perform genetic testing.

Response: Both CURE and the applicant (EDAW 2009) have accurately portrayed the taxonomic difficulties in distinguishing the common and rare subspecies, and in considerably more detail that described here. However, based on consultation with poppy expert Mr. Shannon Still (Still 2009), staff has concluded that the plant is not one of the *E. minutiflora* subspecies, but rather is *E. californica californica,* a common species*.* In reviewing a photograph of the plant in question, Mr. Still notes that the petals are indeed fairly small, but comments that he has found occasional *E. californica* plants with smaller petals than these (Still 2009). While unusual, the other characters of the plants still indicate *E. californica* and the molecular work on the plants of the ones he collected as such have always indicated *E. californica* as well. Mr. Still speculates that the dry conditions of the survey year may have led to smaller flowers than usual. He concludes that, while small, the petal size fits the natural range of *E. californica* from what he has seen and collected. Dr. Still also notes that more important to the identification is the wide receptacle rim (often referred to as the "torus" in *Eschscholzia*); this feature is non- existent in all subspecies of *E. minutiflora*. Furthermore, he comments that the foliage of the specimen in the image is fairly typical for *E. californica*. Mr. Still has collected *E. californica* in the nearby Jawbone Canyon area last year and it was abundant, and he was confident that this species would also occur in canyons further north of his collections.

CURE Comment: ***Inconsistent Characterization of Wash***: CURE notes that in one section of the PSA staff states that vegetation in the Pine Tree Creek wash has been highly degraded by past agricultural activities, but this conflicts with other descriptions in the PSA, which characterizes Pine Tree Creek wash vegetation as typical of washes in the Mojave Desert.

Response: Staff believes that CURE has provided an incomplete description of how staff characterized the wash. On page 4.21 the PSA states that: "The

vegetation in the desert wash is highly degraded by past agricultural activities, *but these washes are nevertheless characterized by natural processes that support recruitment of native desert wash vegetation and provide wildlife habitat*." (emphasis added). Staff has added a new section in the FSA ("Functions and Values of Desert Washes") to clarify that while the vegetation in the wash is appropriately described as degraded because it is sparse and heavily dominated by a single native species, scale-broom, the wash provides many important functions and values that are unaffected by the sparse nature of the vegetation.

CURE Comment: *Substantiation of Barren Sections in Wash*: CURE could not find substantiation of the applicant's claims that there are extensive barren sections within the wash. Using Google Earth imagery they observed vegetation throughout Pine Tree Creek Wash, albeit in relatively low abundance in portions of the wash. CURE therefore believes that references to Pine Tree Creek's degraded condition should be qualified or omitted from the PSA.

Response: Figure 3b in the Incidental Take Permit application (BS 2008i) graphically depicts the vegetated and barren areas within the wash, and staff believes it substantiates the applicant's claim that extensive barren reaches occur within the wash, as do site visits by staff.

CURE Comment: *Calculation of Cover in and Mitigation for Wash is Unclear*: CURE commented in their letters on the PSA (ABJC 2009f) and on the design refinements (ABJC 2009g) that in calculating impacts to desert washes, the applicant concluded, and staff accepted, that 2.4 acres were vegetated and 13.6 acres were unvegetated. CURE notes that the accuracy of this calculation is important because the extent of vegetation is the basis for revegetation goals within the wash. CURE comments that the applicant's methods for establishing relative cover of the scale-broom community in the washes are confusing and do not appear to be a valid statistical technique. In particular, the applicant did not explain or cite the statistical process for calculating weighted means. CURE also commented that the applicant's proposal for mitigating impacts to Pine Tree Creek Wash is confusing, and claims the proposal to revegetate only 4.8 acres of the 18.4-acre rerouted wash is not proportional to the extent of impacts proposed to the wash.

Response: The applicant provided a detailed explanation of the methods and calculations used to arrive at the overall estimate of absolute cover for scale-broom occurring in Pine Tree Creek wash (EDAW 2009). Staff accepts the applicant's explanation as to how the data were collected and the calculation was performed, and accepts the estimate that 2.4 acres within the 16 acres waters of the state are vegetated. This estimate was confirmed by staff with a relevé sample conducted by staff on July 18, 2009 in accordance with methods recommended by the California Native Plant Society (CNPS 2003). Measurements from five representative sample sites within the wash indicated total vascular vegetative cover ranging from 7 to 20 percent, with the shrub layers ranging from 5 to 15 percent cover. The balance of plants were annual herbs, predominantly robust, weedy non-native species that are typically still visible in mid-summer such as Russian thistle (*Salsola tragus*), red-stemmed filaree (*Erodium cicutarium*), hare barley (*Hordeum murinum* ssp. *leporinum*), red

brome (*Bromus madritensis* ssp. *rubens*), cheat grass (*Bromus tectorum*) and split grass (*Schismus arabicus*). The clear dominant in the shrub layer was scale broom (*Lepidospartum squamatum*) with some saltbush (*Atriplex polycarpa*) in the channel from the surrounding uplands. Based on information from the applicant and on relevé samples, staff concludes that 15 percent is a reasonable estimate of the vegetative cover in the wash.

CURE Comment: ***Proposed Success Criteria Inadequate:*** CURE commented in their letters on the PSA (ABJC 2009f) and on the design refinements (ABJC 2009g) that the success criteria for hydrological and biological mitigation were inadequate because they either were not criteria, or were too vague to be effective.

Response: Staff agrees that the standards provided by the applicant (AECOM 2009e) to measure success in replicating the hydrological and sediment transport functions of the existing wash are not structured in a way that would provide quantitative parameters for determining success, although staff agrees with the overall goal of these standards. Staff has not included these criteria in the success criteria for the revegetation plan, and has instead developed the quantifiable success standards described in staff's proposed Condition of Certification **BIO-18**.

CURE Comment: ***Nesting Bird Impact Avoidance Measures Inadequate:*** CURE comments that staff's proposed Condition of Certification **BIO-15**, which requires pre-construction nesting bird surveys and subsequent protection of any nesting birds detected, is inadequate to ensure compliance with the Migratory Bird Treaty Act. They note that locating bird nests can be extremely difficult, have the potential to disturb nesting birds or expose them to increased risk of predation if done incorrectly. CURE suggests that conditions associated with nesting bird impacts need to be more explicit than currently provided. CURE also comments that given the known difficulty in locating bird nests, the condition should not allow nest surveys to occur concurrent with any other survey efforts.

Response: Staff agrees with some of CURE's recommended revisions, including the suggestion that more guidance be given on the qualifications and techniques used during the nesting bird surveys. Such guidance has been added in staff's proposed Condition of Certification **BIO-15**. Based on personal field experience, however, staff does not agree that surveyors cannot successfully search for nests at the same time they are conducting surveys for other wildlife such as desert tortoise, and has made no revisions reflecting that comment.

CURE Comment: ***Evaporation Ponds:*** CURE commented the PSA did not sufficiently address potential wildlife risks associated with the evaporation ponds, noting that impacts to terrestrial wildlife comments in addition to birds must be considered in analyzing biological impacts from evaporation ponds. CURE also noted that impacts to birds from hyper-salinity and salt encrustation must be considered.

Response: Staff's has addressed CURE's concerns with staff's proposed Condition of Certification **BIO-14** which requires netting on the ponds to exclude birds and terrestrial wildlife as well as monitoring to ensure the netting is effective.

CURE Comment: ***Collision Impacts to Birds:*** CURE comments that the PSA did not adequately address the potential risk of collision with structures at the project site, particularly to nocturnal migrants.

Response: CURE has provided no new information or studies that were not already considered by staff in analyzing the potential collision impacts to nocturnal migrants or that would change the conclusions of the FSA with respect to risks to nocturnal migrants. The cruising altitude of nocturnal migrants is between 300 and 2,000 feet (Kerlinger1995), well above the height of project structures. Lighted structures can play a role in nocturnal migrant collisions (Kerlinger 2004), but there will be no tall structures at the site with steady burning lights like those that have been implicated in such collisions.

CURE Comment: ***Improper Deferral of Plans, Proposals and Surveys to Mitigate Impacts:*** CURE comments that the PSA improperly defers the development of plans, proposals, and surveys to mitigate significant biological resource impacts, and cites several conditions of certification as examples of improper deferral:

Response: Staff does not need every detail on mitigation that would ultimately be implemented to determine if an impact to biological resources can be successfully mitigated. Staff concludes that because the fundamental mitigation or success criteria are clearly spelled out in the FSA, and because a mechanism (agency review and CPM approval and monitoring) is in place to ensure those criteria are met, implementation of mitigation described in the conditions of certification would reduce impacts to less than significant levels.

CURE Comment: ***Biological Surveys of Proposed Emergency Access Road Inadequate:*** The applicant submitted project design refinements on June 22, 2009 (DB 2009r) which included an emergency access road connecting to Neuralia Road at the northern edge of the BSEP site. The road had not been part of the original BSEP description or study area so the applicant conducted desert tortoise and burrowing owls surveys there in 2009. Based on these surveys and other information the applicant concluded that construction of this road would have no significant impacts to special-status species or other sensitive biological resources (DB 2009r). CURE objected to this conclusion and stated that surveys for desert tortoise and burrowing owl were not conducted according to protocol guidelines, and that no surveys were conducted for six special-status plant species (ABJT 2009f). CURE asserted that without adequate surveys for desert tortoise, burrowing owls, or special-status plant species, staff did not have sufficient information to make conclusions about the impact of the emergency access road to biological resources, or to develop appropriate mitigation measures.

Response: After reviewing the applicant's reports on the 2009 desert tortoise and burrowing owl surveys conducted along the emergency access road (DB 2009r), staff has concluded that the applicant has provided sufficient information

to assess impacts to burrowing owls and desert tortoise and to develop adequate mitigation measures to avoid impacts to these species. Staff has concluded that despite the negative findings of the survey, burrowing owls and desert tortoise could be encountered along the northern emergency access road alignment during construction; staff's proposed Conditions of Certification **BIO-1** through **8, BIO- 11** and **12** and **BIO-17** already provide adequate avoidance, minimization and compensation measures to address potential impacts to these species if they are encountered. Staff does not believe that additional surveys or reports from the applicant would change those conditions of certification or increase the level of protection for desert tortoise and burrowing owl.

Staff agrees with CURE's conclusion about special status plant species along the northern emergency access road. While staff believes that the presence of special status plant species in this area is unlikely based on the degraded quality of the habitat, the possibility of their occurrence cannot be ruled out without floristic surveys. Staff's proposed Condition of Certification **BIO-20** requires such surveys along the road alignment, and requires avoidance of any special status plants detected during the pre-construction surveys.

CURE Comment: ***Biological Surveys of Proposed Emergency Access Road Inadequate:*** CURE noted that the applicant proposed "three key design changes" in their refined project design for the re-routed wash which would assist in successful replacement of the biological and hydrological function and value of the wash (DB 2009r). These design changes included making the channel side slopes more gradual at 4:1 rather than 3:1, incorporating 10-foot drop structures, and reduction in the longitudinal slopes of the channel (DB 2009r). CURE asserts that the applicant failed to demonstrate how these design changes would facilitate replacement of hydrological and biological values and functions (ABJT 2009g).

Response: A detailed analysis of how the new proposed channel design would affect hydrological, geomorphological and biological processes is provided in the **Soil & Water** section and in Appendix C to this section. Staff conducted an independent technical assessment of the proposed channel and its capacity to convey the design discharge and conditions conducive to maintenance of native plant communities and which would provide wildlife habitat. The design for the re-routed wash has not been finalized but staff anticipates that the refined channel design will provide suitable conditions for revegetation of the wash, as described in staff's proposed Condition of Certification **BIO-18**.

Applicant Comment: ***Condition of Certification BIO – 7 Biological Resources Mitigation Implementation and Monitoring Plan*****:** The applicant suggested changes to item #3 of staff's proposed Condition of Certification **BIO-7**, to indicate that the biological resource mitigation measures from the USFWS would be in the form of a Low-Effect Habitat Conservation Plan (HCP).

Response: Staff has not accepted this revision because the USFWS recently determined that the project did not meet the criteria for a Low-Effect HCP. On June 17, 2009, the USFWS issued a Notice of Intent to undertake scoping for an environmental document (Environmental Assessment or Environmental Impact

Statement) to gather the information necessary to help develop a National Environmental Policy Act (NEPA) document in connection with a proposed HCP for the project under Section 10 of the federal Endangered Species Act (Federal Register 74(115), June 17, 2009, pp. 28720-28722).

Applicant Comment: ***Monitor During Construction (BIO-8, #4*)** The applicant suggested changes to clarify that the Designated Biologist would need to walk immediately ahead of equipment during brushing and grading activities only for activities outside of the fenced, cleared project site.

Response: Staff agrees to this clarification, noting that the precaution of having the Designated Biologist in the immediate vicinity of construction activities is needed only in areas that have not been fenced and cleared of desert tortoise. The Designated Biologist must still be present on the plant site at all times during construction, but need not personally supervise all grading and brushing activities within the fenced, cleared site.

Applicant Comment: ***Avoid Vehicle Impacts to Desert Tortoise (BIO-8, #8):*** The **a**pplicant has suggested clarifications to the requirement to check under vehicles for tortoise in those areas that have not been fenced and cleared of tortoise. The applicant also suggested replacing the original language as to how tortoise discovered under vehicles would be moved by incorporating reference to the Beacon Desert Tortoise Removal Plan, a document submitted as an attachment to the applicant's comment letter (DB 2009o).

Response: Staff agrees with some of the clarifications suggested by the applicant for this section because they provide clearer guidance for avoiding vehicle impacts to desert tortoise. However, staff does not agree with replacing the language in this section with reference to the applicant's Beacon Desert Tortoise Removal Plan (Removal Plan). Any tortoise relocation efforts must be handled in accordance with techniques described in the USFWS protocol, consistent with *Guidelines for Handling Desert Tortoise during Construction Projects* (Desert Tortoise Council 1999) or more current guidance on the USFWS website, not the Removal Plan.

While the information in the applicant's Removal Plan is useful and in most places consistent with USFWS guidelines (Desert Tortoise Council 1999), some important elements of it are inconsistent with explicit directions from the USFWS. For example, page 6 of the Removal Plan notes that "In general, it is unwise to translocate tortoises in seasons when daily ground temperatures exceed 43ºC." More specific directions are provided farther down this same page: "During fence construction, re-routed wash construction, along the utility corridor or on the Plant Site next to the exclusion fence, if a tortoise is found under a shrub at temperatures ≥43° C, at the Authorized Biologist's discretion it may be moved to another shrub or known burrow for that tortoise. During any such releases, monitoring would proceed as discussed in Section 3.5, below, to ensure tortoise safety. (Note: Moving a tortoise at this temperature must be approved by USFWS as their protocols state that tortoises shall not be handled when air temperatures at 5 cm above the ground surface exceed 35°C

(http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/dt)." The USFWS guidance from this web page, *Permit Statement Pertaining to High Temperatures for Handling Desert Tortoise*, is unequivocally firm about not moving a tortoise for any reason at temperatures above 35°C, and there are no provisions described there to seek permission for a waiver of this prohibition. The Removal Plan implies otherwise, and therefore is not an appropriate guide for desert tortoise relocation efforts.

Applicant Comment: ***Avoid Wildlife Pitfalls (BIO-8m #9):*** The applicant modified the recommendation that trapped desert tortoise be "removed and relocated" to just "removed."

Response: Staff has not accepted this deletion here or elsewhere in the document. Removal of a desert tortoise from a hazardous location must be followed by relocation to a safe location, as specified in the Desert Tortoise Relocation Plan, which the applicant will need to prepare.

Applicant Comment: ***Desert Tortoise Clearance Surveys (BIO-9, #1a*)**: 1a. The applicant suggested deleting the requirement that the desert tortoise exclusion fence alignment be flagged and the alignment surveyed within 24 hours prior to fence construction. The applicant also deleted the requirement that the Designated Biologists and Biological Monitors conduct 100 percent surveys of an area 90 feet wide (centered on the flagged alignment). The applicant recommended replacing these specifications with the requirement that a Biological Monitor be present during all fence installation activities.

Response: Staff does not agree with these requested changes because they would substantially diminish the level of survey effort needed to find desert tortoise that might occur within range of fence construction impacts, and would unacceptably increase the risk of take of desert tortoise.

Applicant Comment: ***Desert Tortoise Fence Installation (BIO-9, #1a*)**: The applicant suggested minor wording changes on fence installation.

Response: Staff accepts these edits because they help clarify requirements on timing and supervision of fence installation.

Applicant Comment: ***Fence Installation and Material (BIO-9, #1b):*** The applicant suggested change the specifications for the desert tortoise fence from 1-cm mesh to 1 by 2 inch mesh

Response: Staff agrees with this change because the applicant's recommendation is consistent with USFWS guidance (http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/)

Applicant Comment: ***Gates (BIO-9 #1c, d)***. The applicant suggested eliminating the requirement that gates have a cattle grate to discourage entry by desert tortoise. The applicant also suggested adding, "No gates will remain open unless monitored to prevent tortoise entry."

Response: Staff does not accept either suggestion. The cattle grating is necessary to prevent desert tortoise from entering under the gates when they are closed, and it is not clear what might constitute monitoring while the gates are left open.

Applicant Comment: ***Utility Corridor Fencing (BIO-9 #1e):*** The applicant recommended that specifying that the monthly fence inspection be for clarified to refer to permanent fencing, and that immediate temporary repairs be conducted and permanent repairs within two days of observing the damage. The applicant also made other suggestions for minor changes to clarify how temporary and permanent fencing is inspected and repaired.

Response: Staff has accepted these suggested clarifications.

Applicant Comment: ***Burrow Inspection (BIO-9 #5):*** The applicant recommended deleting the reference to use of a fiber optic scope to inspect deep burrows, and revised the relocation recommendations in this section to replace them with methods in the Removal Plan.

Response: Staff has not deleted the references to fiber optic scopes, as scoping prior to burrow inspection is a standard CDFG incidental permit condition for both Mohave ground squirrel and desert tortoise as a means to avoid and minimize direct take. Staff has not accepted the reference for methods to be consistent with the Removal Plan for reasons described earlier.

Applicant Comment: ***Desert Tortoise Relocation/Translocation (BIO-9 #3, 4):*** The applicant deleted this section of the condition (#3) relating to relocation of tortoise west of SR 14 and combined all removal activities into one modified measure. The applicant's rationale for the change is that a translocation plan will not be necessary because any desert tortoises removed from the project area will still be within their home range.

Response: Staff cannot replace the references to the Relocation and Translocation Plans and rely instead on the applicant's Removal Plan. A Translocation Plan approved by USFWS and CDFG must be available as a guide for handling any tortoises encountered on the project site during construction, even though staff agrees that is an unlikely occurrence. The applicant has argued, and staff has accepted the argument, that any tortoises encountered on the plant site would be transient individuals, and therefore would not be within their home range. An approved Translocation Plan must be available if tortoises are encountered within the plant site.

Applicant Comment: ***Monitoring During Clearing (BIO-9 #7):*** The applicant has made revisions clarifying that grading activities would not need supervision within the fenced and cleared site. The applicant also added a reference to the Removal Plan, and deleted the sentence "Any pre-activity tortoise surveys for other construction areas shall be performed within 72 hours of ground disturbing activities."

Response: Staff agrees to most of these clarifications, noting that the precaution of a having a biological monitor present in the immediate vicinity of construction

activities is needed only in areas that have not been fenced and cleared of desert tortoise. Staff also agrees to deleting the sentence about surveys for desert tortoise being conducted within 72 hours of ground-disturbing activities because this sentence was confusing in the context of construction work within the fenced, cleared areas. The applicant's suggested reference to the Removal Plan was not included for the reasons described above.

Applicant Comment: ***Reporting (BIO-9, #8):*** The applicant made minor edits to clarify the requirements for recording information while handling tortoise, and also changed follow-up monitoring requirements to be consistent with the Removal Plan rather than USFWS guidelines (Desert Tortoise Council 1999).

Response: Staff accepts the clarifications on the information that needs to be collected if tortoise are handled, but cannot replace the Desert Tortoise Council (1999) guidelines with those specified in the Removal Plan because the follow-up monitoring measures in this plan have not been reviewed and approved by USFWS and CDFG.

Applicant Comment: ***Mohave Ground Squirrel Translocation Plan (BIO-10):*** The applicant proposes that rather than do a translocation plan for Mohave ground squirrel, inspections and excavations of potential ground squirrel burrows be conducted in conjunction with desert tortoise surveys.

Response: Mohave ground squirrel surveys can be done concurrently with the desert tortoise clearance surveys on the plant site, as suggested by the applicant, but staff will not change there requirement that there be an approved squirrel translocation plan prior to clearance surveys in the unlikely event that during construction they find an active or aestivating ground squirrel in a burrow.

Applicant Comment: ***Criteria for Compensation Lands (BIO-11):*** Applicant wants "shall include" to be replaced with "may include" on the criteria for compensation lands. Their rationale is that they will seek to acquire lands that provide the best compensation for identified impacts, but that there may be a select number of variables that make a particular location a more redeeming option as mitigation land.

Response: Staff does not agree to this change because it would undermine assurances that the compensation lands would meet the specified criteria. Staff believes that there is already sufficient flexibility in the criteria to make it feasible to secure lands that meet these requirements.

Applicant Comment: ***Criteria for Compensation Lands, Proximity to Protected Lands (BIO-11d).*** The applicant requested that the criteria for compensation lands be revised so that compensation lands would be in close proximity to, rather than necessarily adjacent to, larger blocks of lands that are already protected. They also added the language that there would be connectivity between the acquired lands and the already protected lands.

Response: Staff has added the language about connectivity because this provides additional clarity, but has not added "in close enough proximity to" because it is too vague and subject to variable interpretations to be a useful criteria.

Applicant Comment: ***Historical v. Currently Occupied Lands (BIO-11e):*** The applicant suggested the criteria for compensation lands be modified to "historically occupied" rather than "currently occupied." The applicant's rationale for this change is that it is not feasible to confirm current occupancy of compensation lands, requiring intensive trapping studies on proposed mitigation lands, which is unreasonable and economically burdensome.

Response: Staff agrees that it would be burdensome and in some circumstances infeasible to secure survey information regarding the current status of desert tortoise and Mohave ground squirrel population on parcels of land adjacent to the proposed compensation parcels. However, staff cannot agree to changing the critieria to "historically occupied" because that would open the door to acquiring compensation lands adjacent to property with outdated records that had no bearing on the current status of these species on the property. To clarify staff's intent, the "currently occupied" reference has been replaced with the criteria that compensation lands, "be connected to lands for which there is reasonable evidence (for example, recent (<15 years) CNDDB occurrences on or immediately adjacent to the proposed lands) suggesting current occupation"

Applicant Comment: ***Timing of Implementation (BIO-11):*** The applicant suggested a number of changes relating to the timing for implementation of measures described in this condition of certification.

Response: Staff is agreeable to most of these changes, which are generally minor and do not substantially affect the implementation of the measures. However, staff cannot accept one of the suggested changes, which was to delete the "prior to ground disturbing project activities" timing requirement for providing CDFG with the endowment funds. Without a specific requirement as to when the transfer of funds should take place the condition would be unacceptably vague and unenforceable.

Applicant Comment: ***Desert Tortoise Fencing (BIO-12, #3):*** The applicant suggested changing the timing repairs for desert tortoise fences so that fence repairs would occur within two days of detecting problems rather than one.

Response: Staff accepts this suggested revision because it makes for consistency with fence repair requirements in staff's proposed Condition of Certification **BIO-9**.

Applicant Comment: ***Badger and Desert Fox Avoidance Measures (BIO-16):*** The applicant suggested language clarifying that the surveys for American badger and desert kit fox are not independent of desert tortoise clearance surveys. In addition, they comment that this understanding needs to be consistent with the timing in the verification, to make sure that the requirement to submit survey results 30 days prior to

site disturbance does not prevent the Applicant from conducting the requested surveys as part of the DT clearance surveys. As the condition is currently written, surveys for the kit fox and badger would be triggered by fence installation, which would occur prior to desert tortoise clearance surveys.

> **Response**: Staff's intent with this condition was to have surveys conducted for badger and desert kit fox any time there is potential for harm to these species, which would include construction activities associated with desert tortoise fence installation. Staff has revised the condition to clarify this intent, and has revised the verification language to be consistent with the applicant's suggestion and with other similar verification measures relating to submittal of survey results. Staff has also added language indicating that mitigation measures such as collapsing inactive burrows or monitoring active burrows would apply only to burrows that would be subject to construction impacts.

Applicant Comment: ***Burrowing Owl Mitigation (BIO-17):*** The applicant's comments related mostly to two components of the burrowing owl mitigation: (1) the 6-acre relocation area adjacent to project site which would feature at least four artificial burrows, and (2) the 20-acre off-site acquisition lands.

With respect to the 6-acre relocation area, the applicant objected to the requirement that artificial burrows to be installed at least one year prior to construction. They also objected to the staff's condition that these 6-acres, currently owned by the applicant, be turned over in fee title or as a conservation easement to a third party charged with managing the lands for the benefit of burrowing owl. The applicant proposed instead that they manage the lands as described in Attachment BIO-2, Burrowing Owl Passive Relocation Area Management Plan to their comment letter (DB 2009o). That management would end after five years, and if the management goals specified in the Attachment BIO-2 were not met, then the lands would be transferred to the management of a third-party beneficiary.

The applicant had a number of suggested changes to the condition requiring acquisition of 20-acre of off-site compensation lands that would be enhanced and managed for burrowing owls. The applicant deleted requirements that additional funds that might be needed for purchase of the 20-acres be based on the adjusted market value of compensation lands at the time of construction. They also deleted requirements that agreements to delegate land acquisition to CDFG or an approved third party would be implemented within 12 months of the Energy Commission's decision. Criteria for selection of burrowing owl compensation lands (that the lands provide suitable habitat and that they be no farther than five miles from an active burrowing owl nesting territory) were also deleted. No rationale was provided for the deletions.

> **Response**: Staff agrees with the applicant's suggestion to delete the requirement to construct artificial burrows one year prior to construction. Staff also finds merit in the suggestion of having the project owner manage their lands rather than find a third-party recipient to do so because they would likely have more staff available near these lands for effective monitoring and management than CDFG or a conservation organization. Such management, however, would need to be in accordance with a plan approved by Energy Commission staff, CDFG, and

USFWS, and would need to continue for the life of the project. The Attachment BIO-2 provided by the applicant currently cannot be used for this because it offers some but not all of the needed management guidance. Furthermore, this document has not been reviewed and approved by CDFG and USFWS. Staff proposed Condition of Certification **BIO-17** has been revised to include measures that would provide for management and monitoring of the 6-acre relocation area that include CDFG and USFWS review and participation.

With respect to requirements for acquisition of the 20-acres of compensation lands, staff has not changed the criteria or other conditions because the applicant offered no reasons to do so.

Applicant Comment: ***Streambed Alteration Agreement (BIO-18):*** This condition has undergone many changes as a result of the revised engineering plans for the re-routed desert wash. The applicant developed a new design for the channel that is significantly different than the one analyzed in the PSA, and which incorporates eleven, 10-foot high drop structures (DB 2009r, Attachment 1a, Draft Memorandum for Hydrologic and Hydraulic Analysis of Rerouted Channel for Beacon Solar Energy - Mojave, CA). These changes changed the nature of the revegetation effort that would occur within the channel, and render some of the applicant's revisions on this condition moot. However, the primary applicant comments that remain relevant relate to the following issues:

Significance of Impact to Desert Wash: The applicant asserts that impacts to Pine Tree Creek wash is not a significant biological impact, and provides a detailed discussion of the reasons for that assertion.

Response: Staff has provided additional information in this FSA describing the hydrological and biological functions and values of the project area drainages, a discussion of how the hydrological and biological functions are inextricably interconnected, and has offered additional support for staff's conclusion that impacts to the drainages meet the standards of a significant impact under CEQA.

Equipment Laydown Plan. The applicant notes that a Storm Water Pollution Prevention Plan (SWPPP) will be prepared to comply with the National Pollutant Discharge Elimination System (NPDES) requirements for construction activities. The SWPPP will include detailed discussion of best management practices to protect Waters of the State during construction activities, and they recommend against a separate plan for the washes as it adds confusion potentially introduce inconsistencies in proposed management practices.

Response: Staff agrees, and has accepted the applicant's suggested revisions.

Security. The applicant notes that the project owner is required to construct the rerouted wash prior to removal of the existing washes. Because the rerouted wash must be constructed prior to impacts to the existing washes, the applicant claims that basing the value of a security on total costs to construct the engineered channel is unnecessary and excessive.

Response: Staff agrees, and has revised this security measure to reflect costs of implementing the revegetation plan, as well as sufficient security to purchase at least 16 acres of off-site compensation lands should the on-site mitigation measures fail after the 10-year revegetation period.

Off-site Acquisition of Desert Wash. The applicant objected to acquiring off-site compensation lands that included at least 16 acres of state waters; they assert that mitigation for the impact is being implemented onsite and off-site mitigation would be excessive and unnecessary. The applicant suggests that offsite mitigation should be considered as a remedy if onsite mitigation fails.

Response: Staff has agreed that trying to revegetate the channel on-site should be the focus of the mitigation effort, with the acquisition of mitigation lands remaining as a last resort mitigation if the on-site mitigation is unsuccessful.

Applicant General Comment: ***Significance Determinations:*** The applicant objects to staff's conclusions that impacts to vegetation, non-special status wildlife during construction, nesting birds, and impacts from noxious weeds are significant. They note that mitigation measures for these potential impacts are proposed by Staff to reduce impacts to a less than significant impact, but they requested that references to these impacts accurately reflect the current less than significant impact and not imply that mitigation measures are required to reduce significant impacts. Rather, the language should indicate that these measures are intended to merely further reduce impacts.

Response: Staff has made revisions as suggested by the applicant.

Applicant General Comment: ***Mohave Ground Squirrel and Desert Tortoise Mitigation:*** The applicant notes they are seeking incidental take authorization for incidental take of MGS and desert tortoise, including (1) loss of habitat and individuals west of SR-14 and (2) for incidental take of transient individuals of each species on the Plant Site. This is not reflected in the language provided in the PSA (page 4.2-31 and 4.2-34). The language needs to be clear that the compensation acreage to be acquired compensates for habitat and the take of MGS and desert tortoise for the area west of SR-14, and for take of transient MGS and desert tortoise on the Plant Site, during construction and operation.

Response: Staff has clarified the basis for the incidental take authorization as suggested by the applicant.

CDFG Comment: ***Evaporation Pond Impacts to Birds*****:** The CDFG expressed serious concerns about impacts to resident and migratory birds as a result of the evaporation ponds. CDFG stated they were not satisfied with the approach of developing a plan to monitor for bird use at the ponds and then implement a mitigation plan if conditions arose that might pose a threat to birds. They also stated that they preferred a dry cooling option that would eliminate the need for evaporation ponds.

Response: Staff's proposed Condition of Certification **BIO-14** has addressed CDFG's concern by requiring netting to be placed over the evaporation ponds, with a monitoring plan to make sure the nets are working to exclude birds and other wildlife from the ponds.

CDFG Comment: ***Cultural Resource Investigation Must Avoid Impacts to Biological Resources*****.** CDFG expressed concern about the potential impact of ground-disturbing cultural resource investigations on listed species. CDFG was not clear as to whether the cultural resource excavations would take place before of after final Energy Commission approval, noting that "take" coverage under the California Endangered Species Act would not be conferred until such approval was granted.

> **Response**: Cultural resource investigations would take place after the final Energy Commission Decision, and therefore all activities would be covered by the take provisions that are a part of this decision.

CONCLUSIONS

Overview of Vegetation/Wildlife Impacts: Much of the 2,012-acre Beacon Solar Energy Project plant site is barren or sparsely vegetated due to past agricultural disturbances, but it nevertheless supports a diversity of mammals, birds, and reptiles, including some special-status wildlife species. Grading the plant site would not directly or indirectly impact sensitive plant communities, rare plants, or wetlands, but would directly impact some wildlife and would result in removal of vegetation that provides cover, foraging, and breeding habitat. Construction of linear facilities also has potential for impacts to wildlife; transmission line construction west of State Route 14 would permanently impact approximately 5 acres of Mojave creosote bush scrub, which provides habitat for desert tortoise (federal- and state-listed as threatened) and Mohave ground squirrel (state-listed as threatened). Construction of a 40-mile water pipeline would occur mostly within disturbed road shoulder along paved roads or in the center of unpaved roads, but nevertheless has potential to impact special-status species such as burrowing owl, Mohave ground squirrel, and desert tortoise.

Potential direct and indirect construction impacts to vegetation and wildlife could be reduced to less-than-significant levels with implementation of impact avoidance and minimization measures described in staff's proposed Conditions of Certification **BIO-1** through **BIO-8**. Staff's proposed Conditions of Certification **BIO-1** through **BIO-5** requires qualified biologists, with authority to implement mitigation measures necessary to prevent impacts to biological resources, be on site during all construction activities. Staff's proposed Condition of Certification **BIO-6** requires the development and implementation of a Worker Environmental Awareness Program to train all workers to avoid impacts to sensitive species and their habitats. Staff's proposed Condition of Certification **BIO-7** requires the project owner to prepare and implement a Biological Resources Mitigation Implementation and Monitoring Plan that incorporates the mitigation and compliance measures required by local, state, and federal LORS regarding biological resources. Staff's proposed Condition of Certification **BIO-8** describes Best Management Practices requirements and other impact avoidance and minimization measures.

Take of Listed Species: Potential take of desert tortoise and Mohave ground squirrel and loss of habitat for these species would be fully mitigated with staff's proposed Conditions of Certification **BIO-9** through **BIO-12**. Staff's proposed Condition of Certification **BIO-11** requires the applicant to acquire, protect, and enhance approximately 115 acres of habitat suitable for these listed species, and the other

conditions require impact avoidance and minimization measures. These conditions also satisfy the California Department of Fish and Game's requirements under Section 2081 of the California Fish and Game Code.

Raven Predation on Desert Tortoise: Construction, operation and decommissioning of the project could provide attractants in the form of new nesting and roosting sites, trash, and/or water, which draw unnaturally high numbers of desert tortoise predators such as the common raven. Increases in raven predation could contribute to the cumulative significant impacts to the Mojave Desert population of desert tortoise. Staff's proposed Condition of Certification **BIO-13** specifies that the applicant finalize its draft Raven Management and Monitoring Plan in consultation with staff, CDFG, and USFWS. Staff anticipates that the applicant will be able to produce a final plan prior to publication of the Final Staff Assessment and that implementation of the condition would reduce this impact to less-than-significant levels and to the satisfaction of all agencies.

Migratory Birds/Burrowing Mammals: Vegetation at the plant site and along linear facilities provides foraging, cover, and/or breeding habitat for migratory birds, including a number of special-status bird species confirmed to be present at the site (western burrowing owl, loggerhead shrike, LeConte's thrasher, and California horned lark). Migratory birds and their eggs and young are protected by the federal Migratory Bird Treaty Act and Fish and Game Code section 3503. Implementation of staff's proposed Conditions of Certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-15** (Pre-Construction Nest Surveys) would avoid these potentially significant impacts to nesting birds. Potential impacts to burrowing owls, which were documented nesting on the plant site, would be further mitigated by implementation of staff's proposed Condition of Certification **BIO-17**. This condition involves passive relocation of burrowing owls in the path of construction to a relocation area immediately north of the BSEP site, as well as acquisition of 20 acres of off-site lands suitable for burrowing owl.

American badgers were not detected during the surveys, but potential habitat is present for this species at the project site. Construction activities could also crush or entomb American badger, which are protected under Title 14, California Code of Regulations (sections 670.2 and 670.5). Staff's proposed Condition of Certification **BIO-16**, which requires preconstruction surveys and avoidance measures to protect badgers and kit fox, would avoid this potential impact. This condition would also protect desert kit fox, which are known to occur on the site, and which are protected under the California Code of Regulations, chapter 5, section 460.

Threat to Migratory Birds from Evaporation Ponds: The BSEP includes three, 2-acre evaporation ponds that will receive blowdown cooling water. Staff, CDFG, and USFWS are concerned that the proposed ponds could attract ravens, which would in turn prey on desert tortoise in adjacent habitat areas. In addition, waterfowl, shorebirds, and other resident or migratory birds could be harmed by selenium poisoning or hyper-saline conditions if they drink evaporation pond water or eat aquatic invertebrates (or their terrestrial emergents) inhabiting evaporation pond water. Staff has addressed these concerns with Condition of Certification **BIO-14**, which requires the evaporation ponds to be covered with netting to exclude birds and other wildlife. Implementation of this condition of certification would reduce the potential adverse effects of the evaporation ponds to wildlife to less-than-significant levels.

Rosamond Alternative: Pipeline installation along the southern 23 miles of the 40-mile Rosamond Alternative water pipeline alignment would occur almost entirely within the existing road bed and shoulder, minimizing the potential for impacts to sensitive biological resources. A total of 11.2 acres of native plant communities, Mojave creosote scrub and saltbush scrub, would be impacted by pipeline construction, 11 of which provide good to fair habitat for desert tortoise and Mohave ground squirrel. Direct and indirect impacts to native plant communities would be minimized through implementation of staff's proposed Conditions of Certification **BIO-8**, **BIO-20** and **BIO-21**. These conditions include measures to protect Joshua trees and drainages as Environmentally Sensitive Areas, recommendations to enhance revegetation success and measures to avoid spread of noxious weeds. Pre-construction floristic surveys would be conducted in spring 2010 in accordance with guidelines described in staff's proposed Condition of Certification **BIO-20** to determine whether special-status plants occur within areas that might be directly or indirectly impacted by pipeline construction. In the unlikely event that special-status plant species are detected during the surveys, staff has concluded that direct and indirect impacts to such occurrences can be avoided with measures described in **BIO-20**.

To compensate for impacts to 11.2 acres of good to fair desert tortoise and Mohave ground squirrel habitat, staff's proposed Condition of Certification **BIO-21** specifies acquisition of 33.6 acres of suitable habitat for these species. The proposed 3:1 mitigation ratio is consistent with Energy Commission staff and CDFG mitigation recommendations for impacts to desert tortoise and Mohave ground squirrel habitat in this region. Staff's proposed Conditions of Certification **BIO-1** through **BIO-8** and **BIO-12** requires implementation of avoidance, minimization, and compensation measures to mitigate for impacts to desert tortoise and Mohave ground squirrel.

Impacts to Pine Tree Creek: One of the most significant biological impacts of the project is elimination of Pine Tree Creek and another dry desert wash on the plant site, resulting in loss of approximately 60 acres of desert wash scrub and 16 acres of jurisdictional waters of the state. While the vegetation in the desert wash is highly degraded by past agricultural activities, these washes are characterized by natural processes of soil deposition, channel formation, and development of microtopography and soil crusts, all of which support recruitment of native desert wash vegetation and provide wildlife habitat. The applicant proposes to replace the desert washes with an engineered diversion channel to the south and east of the project site and to replicate the hydrological and biological functions and processes in this new drainage.

The design for the re-routed wash has not been finalized and several significant issues remain unresolved, including grade control structure design, extent of needed bank protection and soil cement channel lining, and how the re-routed channel will intercept and divert flood flows from the natural drainage into the engineered channel. **Soil & Water** Appendix C provides a detailed discussion of these remaining uncertainties. Staff anticipates that the applicant's refined channel design will resolve these issues and will provide suitable conditions for revegetation of the wash.

Staff concurs with the applicant's goal of replacing the biological functions and values of the impacted desert wash with the re-routed drainage, and with some modifications have accepted the applicant's recommendations for establishing a native desert shrub

plant community within the engineered channel. Staff's proposed Condition of Certification **BIO-18** specifies that within 10 years the applicant shall establish at least 15 percent of the 41.5-acre channel bottom, or 6.2 acres, with native desert shrub plant community, and that non-native weeds constitute less than 2 percent cover of the vegetated channel. Revegetation must also occur on each of the reaches between drop structures. If these success criteria cannot be achieved within 10 years of completion of construction of the channel, staff's proposed Condition of Certification **BIO-18** requires the applicant to acquire land that includes at least 16 acres of waters of the state in a similar desert wash system. With implementation of staff's proposed Condition of Certification **BIO-18**, staff anticipates that impacts to 16 acres of state waters and loss of the hydrological and biological functions of the project site desert washes would be mitigated to less-than-significant levels. This condition would also fulfill requirements of CDFG's Lake and Streambed Alteration Agreement program.

Many of staff's proposed conditions of certifications require submittal of draft plans, proposals, or survey results prior to the start of construction. **Biological Resources Table 7** summarizes these pre-construction plan requirements.

Biological Resources Table 7
Summary of Pre-Construction Plans and Proposals

Condition of Certification	Plan to be Submitted	Timing
BIO-9	a. Draft Desert Tortoise Translocation Plan b. Final Desert Tortoise Translocation Plan	a. Within 60 days of publication of the Energy Commission Decision b. At least 60 days prior to start of any project-related ground disturbance activities
BIO-10	a. Draft Mohave Ground Squirrel Translocation Plan b. Final Mohave Ground Squirrel Translocation Plan	a. Within 60 days of publication of the Energy Commission Decision b. At least 60 days prior to start of any project-related ground disturbance activities
BIO-11	a. Formal acquisition proposal for desert tortoise and Mohave ground squirrel habitat describing the parcel(s) intended for purchase b. Management Plan for compensation lands	a. No less than 90 days prior to acquisition of the desert tortoise, Mohave ground squirrel compensation lands b. Within 90 days after the land purchase
BIO-13	Final Raven Monitoring, Management, and Control Plan	At least 60 days prior to start of any project-related ground disturbance activities
BIO-17	a. Burrowing Owl Monitoring and Mitigation Plan *(to be prepared only if pre-construction surveys detect owls within 500 feet of proposed construction*) b. Draft Burrowing Owl Relocation Area Management Plan c. Final Burrowing Owl Relocation Area Management Plan d. Formal acquisition proposal for burrowing owl habitat compensation lands *(to be prepared only if burrowing owl acquisition lands are separate from the 115 acres of*	a. At least 30 days prior to the start of any project-related site disturbance activities b. Within 60 days of publication of the Energy Commission Decision c. Prior to any ground-disturbing activities on the project site d. No less than 90 days prior to acquisition of lands

Condition of Certification	Plan to be Submitted	Timing
	compensation lands described in BIO-11) e. Management Plan for compensation lands *(to be prepared only if burrowing owl acquisition lands are separate from the 115 acres of compensation lands described in BIO-11)*	e. Within 90 days after the land purchase
BIO-18	a. Draft Desert Wash Revegetation Plan, draft estimate of costs to fully implement the plan b. Final Desert Wash Revegetation Plan, final cost estimate	a. Within 60 days of publication of the Energy Commission Decision b. Prior to any ground-disturbing activities within waters of the State
BIO-20	a. Report describing results of floristic surveys of Rosamond Alternative pipeline alignment and emergency access road b. Sensitive Plant Protection Plan (to be prepared only if pre-construction surveys detect special status plant species within 50 feet of proposed construction)	a. No later than July 31, 2010 b. At least 60 days prior to start of any project-related ground disturbance activities

With implementation of staff's proposed conditions of certification, construction and operation of the BSEP would comply with all federal, state, and local laws, ordinances, regulations, and standards relating to biological resources. Staff recommends adoption of the following conditions of certification to mitigate potential impacts to sensitive biological resources to less-than-significant levels.

PROPOSED CONDITIONS OF CERTIFICATION

DESIGNATED BIOLOGIST SELECTION[1]

BIO-1 The project owner shall assign at least one Designated Biologist 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 the California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS).

The Designated Biologist must meet the following minimum qualifications:

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

2. three 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;

3. at least one year of field experience with biological resources found in or near the project area;

4. meet the current USFWS Authorized Biologist qualifications criteria (USFWS 2008) and demonstrate familiarity with protocols and guidelines for the desert tortoise, and be approved by the USFWS; and

5. possess a recovery permit for desert tortoise and a California ESA Memorandum of Understanding pursuant to Section 2081(a) for desert tortoise and Mohave ground squirrel or have adequate experience and qualifications to obtain these authorizations.

In lieu of the above requirements, the resume shall demonstrate to the satisfaction of the CPM, in consultation with CDFG and USFWS, that the proposed Designated Biologist or alternate has the appropriate training and background to effectively implement the conditions of certification.

Verification: The project owner shall submit the specified information at least 90 days prior to the start of any project-related site disturbance activities. No site or related facility activities shall commence until an approved Designated Biologist is available to be on site.

[1] USFWS <www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/dt> designates biologists who are approved to handle tortoises as “Authorized Biologists.” Such biologists have demonstrated to USFWS that they possess sufficient desert tortoise knowledge and experience to handle and move tortoises appropriately, and have received USFWS approval. Authorized Biologists are permitted to then approve specific monitors to handle tortoises, at their discretion. The California Department of Fish and Game (CDFG) must also approve such biologists, potentially including individual approvals for monitors approved by the Authorized Biologist. Designated Biologists are the equivalent of Authorized Biologists. Only Designated Biologists and certain Biological Monitors who have been approved by the Designated Biologist would be allowed to handle desert tortoises.

If a Designated Biologist needs to 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 Designated 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 Designated Biologist is proposed to the CPM for consideration.

Designated Biologists shall complete a USFWS Qualifications Form (USFWS 2008) (www.fws.gov/ventura/speciesinfo/protocols_guidelines) and submit it to the USFWS and CPM within 60 days prior to ground breaking for review and final approval.

DESIGNATED BIOLOGIST DUTIES

BIO-2 The project owner shall ensure that the Designated Biologist performs the following during any site (or related facilities) mobilization, ground disturbance, grading, construction, operation, and closure activities. The Designated Biologist may be assisted by the approved Biological Monitor(s) but remains the contact for the project owner and CPM. The Designated Biologist duties shall include the following:

1. Advise the project owner's Construction and Operation Managers on the implementation of the biological resources conditions of certification;

2. Consult on the preparation of the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) to be submitted by the project owner;

3. Be available to supervise, conduct, and coordinate mitigation, monitoring, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as special-status species or their habitat;

4. Clearly mark sensitive biological resource areas and inspect these areas at appropriate intervals for compliance with regulatory terms and conditions;

5. Inspect active construction areas where animals may have become trapped prior to construction commencing each day. At the end of the day, inspect for the installation of structures that prevent entrapment or allow escape during periods of construction inactivity. Periodically inspect areas with high vehicle activity (e.g., parking lots) for animals in harm's way;

6. Notify the project owner and the CPM of any non-compliance with any biological resources condition of certification;

7. Respond directly to inquiries of the CPM regarding biological resource issues;

8. Maintain written records of the tasks specified above and those included in the BRMIMP. Summaries of these records shall be submitted in the Monthly Compliance Report and the Annual Compliance Report;

9. Train the 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>, and

10. Maintain the ability to be in regular, direct communication with representatives of CDFG and USFWS, including notifying these agencies of dead or injured listed species and reporting special-status species observations to the California Natural Diversity Data Base.

Verification: The Designated Biologist shall submit in the Monthly Compliance Report to the CPM copies of all written reports and summaries that document biological resources compliance activities. If actions may affect biological resources during operation a Designated Biologist shall be available for monitoring and reporting. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report unless his/her duties cease, as approved by the CPM.

BIOLOGICAL MONITOR QUALIFICATIONS

BIO-3 The project owner's CPM-approved Designated Biologist shall submit the resume, at least three references, and contact information of the proposed Biological Monitors to the CPM for approval in consultation with CDFG and USFWS. The resume shall demonstrate, to the satisfaction of the CPM, the appropriate education and experience to accomplish the assigned biological resource tasks. Biological Monitors involved in any aspect of desert tortoise surveys or handling must meet the criteria to be considered a USFWS Authorized Biologist (USFWS 2008) and demonstrate familiarity with the most recent protocols and guidelines for the desert tortoise.

Biological Monitor(s) training by the Designated Biologist shall include familiarity with the conditions of certification, BRMIMP, WEAP, USFWS guidelines on desert tortoise surveys and handling procedures <www.fws.gov/ventura/speciesinfo/protocols_guidelines> and all permits.

Verification: The project owner shall submit the specified information to the CPM for approval at least 30 days prior to the start of any project-related site disturbance activities. The Designated Biologist shall submit a written statement to the CPM confirming that individual Biological Monitor(s) has been trained including the date when training was completed. If additional biological monitors are needed during construction the specified information shall be submitted to the CPM for approval at least 10 days prior to their first day of monitoring activities.

BIOLOGICAL MONITOR DUTIES

BIO-4 The Biological Monitors shall assist the Designated Biologist in conducting surveys and in monitoring of mobilization, ground disturbance, grading, construction, operation, and closure activities. The Designated Biologist shall remain the contact for the project owner and CPM.

Verification: The Designated Biologist shall submit in the Monthly Compliance Report to the CPM copies of all written reports and summaries that document biological resources compliance activities, including those conducted or monitored by Biological Monitors. If actions may affect biological resources during operation a Biological Monitor, under the supervision of the Designated Biologist, shall be available for monitoring and reporting. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report unless his/her duties cease, as approved by the CPM.

DESIGNATED BIOLOGIST AND BIOLOGICAL MONITOR AUTHORITY

BIO-5 The project owner's construction/operation manager shall act on the advice of the Designated Biologist and Biological Monitor(s) to ensure conformance with the biological resources conditions of certification.

The Designated Biologist shall have the authority to immediately stop any activity that is not in compliance with these conditions and/or order any reasonable measure to avoid take of an individual of a listed species. If required by the Designated Biologist and Biological Monitor(s) the project owner's construction/operation manager shall halt all site mobilization, ground disturbance, grading, construction, and operation activities in areas specified by the Designated Biologist. The Designated Biologist shall:

1. Require a halt to all activities in any area when determined that there would be an unauthorized adverse impact to biological resources if the activities continued;

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

3. Notify the CPM if there is a halt of any activities and advise the CPM of any corrective actions that have been taken or will be instituted as a result of the work stoppage, and

4. If the Designated Biologist is unavailable for direct consultation, the Biological Monitor shall act on behalf of the Designated Biologist.

Verification: The project owner shall ensure that the Designated Biologist or Biological Monitor 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 within five working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

BIO-6 The project owner shall develop and implement BSEP-specific Worker Environmental Awareness Program (WEAP) and shall secure approval for the WEAP from USFWS, CDFG, and the CPM. The WEAP shall be administered to all on-site personnel including surveyors, construction engineers, employees, contractors, contractor's employees, supervisors, inspectors, subcontractors, and delivery personnel. The WEAP shall be implemented during site mobilization, ground disturbance, grading, construction, operation, and closure. The WEAP shall:

1. be developed by or in consultation with the Designated Biologist and consist of an on-site or training center presentation in which supporting written material and electronic media is made available to all participants;

2. discuss the locations and types of sensitive biological resources on the project site and adjacent areas and explain the reasons for protecting these resources;

3. place special emphasis on desert tortoise and Mohave ground squirrel, including information on physical characteristics, distribution, behavior, ecology, sensitivity to human activities, legal protection, penalties for violations, reporting requirements, and protection measures;

4. present the meaning of various temporary and permanent habitat protection measures;

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

6. include a training acknowledgment form to be signed by each worker indicating that he/she received training and shall abide by the guidelines.

The specific program can be administered by a competent individual(s) acceptable to the Designated Biologist.

Verification: At least 60 days prior to the start of any project-related site disturbance activities, the project owner shall provide to the CPM a copy of the draft WEAP and all supporting written materials and electronic media prepared or reviewed by the Designated Biologist and a resume of the person(s) administering the program.

The project owner shall provide in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all

persons who have completed the training to date. At least 10 days prior to site and related facilities mobilization, the project owner shall submit two copies of the CPM-approved final WEAP.

Training acknowledgement forms signed during construction shall be kept on file by the project owner for at least six months after the start of commercial operation.

Throughout the life of the project, the worker education program shall be repeated annually for permanent employees, and shall be routinely administered within one week of arrival to any new construction personnel, foremen, contractors, subcontractors, and other personnel potentially working within the project area. Upon completion of the orientation, 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.

During project operation, signed statements for operational personnel shall be kept on file for six months following the termination of an individual's employment.

BIOLOGICAL RESOURCES MITIGATION IMPLEMENTATION AND MONITORING PLAN

BIO-7 The project owner shall develop a Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) and submit two copies of the proposed BRMIMP to the CPM (for review and approval) and shall implement the measures identified in the approved BRMIMP. The BRMIMP shall incorporate impact avoidance and minimization measures described in final versions of the Raven Monitoring, Management, and Control Plan, the Desert Tortoise Translocation Plan, the Mohave Ground Squirrel Translocation Plan, Burrowing Owl Mitigation and Monitoring Plan, Sensitive Plant Protection Plan, and the Closure Plan.

The BRMIMP shall be prepared in consultation with the Designated Biologist and shall include 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 identified as necessary to avoid or mitigate impacts;

3. all biological resource mitigation, monitoring, and compliance measures required in federal agency terms and conditions, including those provided in the USFWS Habitat Conservation Plan/Implementing Agreement (HCP/IA);

4. all sensitive biological resources to be impacted, avoided, or mitigated by project construction, operation, and closure;

5. all required mitigation measures for each sensitive biological resource;

6. a detailed description of measures that shall be taken to avoid or mitigate temporary disturbances from construction activities;

7. all locations on a map, at an approved scale, of sensitive biological resource areas subject to disturbance and areas requiring temporary protection and avoidance during construction;

8. aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities; include one set prior to any site or related facilities mobilization disturbance and one set subsequent to completion of project construction. Provide planned timing of aerial photography and a description of why times were chosen. Provide a final accounting of the before/after acreages and a determination of whether additional habitat compensation is necessary in the Construction Termination Report;

9. duration for each type of monitoring and a description of monitoring methodologies and frequency;

10. performance standards to be used to help decide if/when proposed mitigation is or is not successful;

11. all performance standards and remedial measures to be implemented if performance standards are not met;

12. a discussion of biological resources-related facility closure measures including a description of funding mechanism(s); and

13. a process for proposing plan modifications to the CPM and appropriate agencies for review and approval.

Verification: The project owner shall submit the BRMIMP to the CPM at least 60 days prior to start of any project-related site disturbance activities. The CPM, in consultation with other appropriate agencies, will determine the BRMIMP's acceptability within 45 days of receipt. The BRMIMP shall contain all of the required measures included in all biological conditions of certification. No ground disturbance may occur prior to the CPM's approval of the final BRMIMP.

The project owner shall notify the CPM no less than five working days before implementing any modifications to the approved BRMIMP to obtain CPM approval. Any changes to the approved BRMIMP must also be approved by the CPM in consultation with appropriate agencies to ensure no conflicts exist.

Implementation of BRMIMP measures (construction activities that were monitored, species observed) will be reported in the Monthly Compliance Reports 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 which items of the BRMIMP have been completed; a

summary of all modifications to mitigation measures made during the project's site mobilization, ground disturbance, grading, and construction phases; and which mitigation and monitoring items are still outstanding.

IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-8 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:

1. Limit Disturbance Area. 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 prior to construction activities in consultation with the Designated Biologist. Spoils shall be stockpiled in disturbed areas lacking native vegetation and which do not provide habitat for special-status species. Parking areas, staging and disposal site locations shall similarly be located in areas without native vegetation or special-status species habitat. All disturbances, vehicles, and equipment shall be confined to the flagged areas.

2. Minimize Road Impacts. New and existing roads that are planned for construction, widening, or other improvements shall not extend beyond the flagged impact area as described above. All vehicles passing or turning around will do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads (e.g. new spur roads) or the construction zone, the route will be clearly marked (i.e., flagged and/or staked) prior to the onset of construction.

3. Minimize Traffic Impacts. Vehicular traffic during project construction and operation shall be confined to existing 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 25 miles per hour within the project area, on maintenance roads for linear facilities, or on access roads to the BSEP site.

4. Monitor During Construction. The Designated Biologist or Biological Monitor shall be present at the construction site during all project activities that have potential to disturb soil, vegetation, and wildlife. In areas that have not been fenced with tortoise exclusion fencing and cleared, the USFWS-approved Designated Biologist or Biological Monitor shall walk immediately ahead of equipment during brushing and grading activities.

5. Minimize Impacts of Transmission/Pipeline Alignments, Roads, Staging Areas. Staging areas for construction on the plant site shall be within the area that has been fenced with desert tortoise exclusion fencing and cleared. For construction activities outside of the plant site (transmission line, pipeline alignments) access roads, pulling sites, and storage and parking areas shall be designed, installed, and maintained with the goal of minimizing impacts to native plant communities and sensitive biological resources. Transmission lines and all 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 2004) to reduce the likelihood of large bird electrocutions and collisions.

6. Avoid Use of Toxic Substances. Road surfacing and sealants as well as soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to wildlife and plants.

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

8. Avoid Vehicle Impacts to Desert Tortoise. Parking and storage shall occur within the desert tortoise exclusion fencing to the extent feasible. 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 will be left to move on its own. If it does not move within 15 minutes, a Biological Monitor may remove and relocate the animal to a safe location if temperatures are within the range described in the USFWS protocol (www.fws.gov/ventura/speciesinfo/protocols_guidelines and Desert Tortoise Council 1999).

9. Avoid Wildlife Pitfalls. At the end of each work day, the Designated Biologist shall ensure that all potential wildlife pitfalls (trenches, bores, and other excavations) outside the permanently fenced area have been backfilled. If backfilling is not feasible, all trenches, bores, and other excavations shall be sloped at a 3:1 ratio at the ends to provide wildlife escape ramps, or covered completely to prevent wildlife access, or fully enclosed with tortoise-exclusion fencing. All trenches, bores, and other excavations outside the areas permanently fenced with desert tortoise exclusion fencing shall be inspected periodically throughout and at the end of each workday by the Designated Biologist or a Biological Monitor. Should a tortoise or other wildlife become trapped, the Designated Biologist or Biological Monitor shall remove and relocate the individual to a safe location. Any wildlife encountered during the course of construction shall be allowed to leave the construction area unharmed.

10. Avoid Entrapment of Desert Tortoise. Any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches above ground and within desert tortoise habitat (i.e., outside the permanently fenced area) for one or more days/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. These materials would

not need to be inspected or capped if they are stored within the permanently fenced area after the clearance surveys have been completed.

11. Minimize Standing Water. Water applied to dirt roads and construction areas (trenches or spoil piles) for dust abatement shall use the minimal amount needed to meet safety and air quality standards in an effort to prevent the formation of puddles, which could attract desert tortoises and common ravens to construction sites. A Biological Monitor shall patrol these areas to ensure water does not puddle and attract desert tortoise, common ravens, and other wildlife to the site and shall take appropriate action to reduce water application where necessary.

12. Minimize Spills of Hazardous Materials. All vehicles and equipment shall be maintained in proper working 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 properly disposed of at a licensed facility. Servicing of construction equipment shall take place only at a designated area. Service/maintenance vehicles shall carry a bucket and pads to absorb leaks or spills.

13. Worker Guidelines. During construction all trash and food-related waste shall be placed in self-closing containers and removed daily from the site. 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.

14. Avoid Spread of Noxious Weeds. The project owner shall implement the following Best Management Practices during construction and operation to prevent the spread and propagation of noxious weeds:

    a. Limit the size of any vegetation and/or ground disturbance to the absolute minimum and limit ingress and egress to defined routes;

    b. Prevent spread of non-native plants via vehicular sources by implementing Trackclean™ or other methods of vehicle cleaning for vehicles coming and going from construction sites. Earth-moving equipment shall be cleaned prior to transport to the construction site;

    c. Use only weed-free straw, hay bales, and seed for erosion control and sediment barrier installations, and

    d. Avoid using invasive non-native species in landscaping plans and erosion control.

15. Stockpile Topsoil. To increase chances for revegetation success, topsoil shall be stockpiled from the project site and along project linear features

for use in revegetation. Native topsoil from the least disturbed locations and only areas that are relatively free of noxious weeds shall be used as a source of topsoil. Approximately 6-8 inches of topsoil shall be scraped from the borrow sites and stockpiled, with the top 1 inch from the borrow site used as top-dressing in revegetation areas. All other elements of topsoil use shall be as described in *Rehabilitation of Disturbed Lands in California* (Newton and Claassen 2003, pp. 39-40).

16. Implement Erosion Control Measures. Standard erosion control measures shall be implemented for all phases of construction and operation where sediment run-off from exposed slopes threatens to enter "Waters of the State". Sediment and other flow-restricting materials shall be moved to a location where they shall not be washed back into the stream. All disturbed soils and roads within the project site shall be stabilized to reduce erosion potential, both during and following construction. Areas of disturbed soils (access and staging areas) with slopes toward a drainage shall be stabilized to reduce erosion potential.

17. Monitor Ground Disturbing Activities Prior to Site Mobilization. If ground-disturbing activities are required prior to site mobilization, such as for geotechnical borings or hazardous waste evaluations, a Designated Biologist or Biological Monitor shall be present to monitor any actions that could disturb soil, vegetation, or wildlife.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented. Implementation of the measures will be reported in the Monthly Compliance Reports 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.

DESERT TORTOISE RECLOCATION PLAN, CLEARANCE SURVEYS AND EXCLUSION FENCING

BIO-9 The project owner shall undertake appropriate measures to manage construction at the plant site and linear facilities in a manner to avoid or minimize impacts to desert tortoise. Methods for clearance surveys, fence installation, tortoise handling, artificial burrow construction, egg handling and other procedures shall be consistent with those described in the *Guidelines for Handling Desert Tortoise During Construction Projects* (Desert Tortoise Council 1999) or more current guidance provided by CDFG and USFWS. The project owner shall also implement terms and conditions developed as part of the Habitat Conservation Plan process with USFWS. These measures include, but are not limited to, the following:

1. Fence Installation. Prior to ground disturbance, the entire plant site (east of the railroad tracks) shall be fenced with permanent desert tortoise-exclusion fence. To avoid impacts to desert tortoise during fence construction, the proposed fence alignment shall be flagged and the alignment surveyed within 24 hours prior to fence construction. Surveys shall be conducted by the Designated Biologist using techniques approved

by the USFWS and CDFG. Biological Monitors may assist the Designated Biologist under his or her supervision. These surveys shall provide 100 percent coverage of all areas to be disturbed during fence construction and an additional transect along both sides of the proposed fence line. This fence line transect shall cover an area approximately 90 feet wide centered on the fence alignment. Transects shall be no greater than 30 feet apart. All desert tortoise burrows, and burrows constructed by other species that might be used by desert tortoises, shall be examined to assess occupancy of each burrow by desert tortoises and handled in accordance with USFWS-approved protocol.

a. Timing, Supervision of Fence Installation. The exclusion fencing shall be installed prior to the onset of site clearing and grubbing. The fence installation shall be supervised by the Designated Biologist and monitored by the Biological Monitors to ensure the safety of any tortoise present.

b. Fence Material and Installation. The permanent tortoise exclusionary fencing shall consist of galvanized hard wire cloth 1 by 2 inch mesh sunk 12 inches into the ground, and 24 inches above ground (USFWS 2008a, Appendix D).

c. Security Gates. Security gates shall be designed with minimal ground clearance to deter ingress by tortoises, including gates that would exclude public access to the transmission line maintenance road at SR 14..The gates shall remain closed except during vehicle passage and may be electronically activated to open and close immediately after vehicle(s) have entered or exited to prevent extended periods with open gates, which might lead to a tortoise entering. Cattle grating designed to safely exclude desert tortoise shall be installed at the gated entries to discourage tortoises from gaining entry.

d. Utility Corridor Fencing. Utility corridors and tower locations shall be temporarily fenced with tortoise exclusion fencing to prevent desert tortoise entry during construction. Temporary fencing must follow guidelines for permanent fencing and supporting stakes shall be sufficiently spaced to maintain fence integrity.

e. Fence Inspections. Following installation of the desert tortoise exclusion fencing for both the permanent site fencing and temporary fencing in the utility corridors, the fencing shall be regularly inspected. Permanent fencing shall be inspected monthly and during/following all major rainfall events. Any damage to the fencing shall be temporarily repaired immediately to keep tortoises out of the site, and permanently repaired within two days of observing damage. Inspections of permanent site fencing shall occur for the life of the project. Temporary fencing must be inspected weekly and, where drainages intersect the fencing, during and immediately following major rainfall events. All temporary fencing shall be repaired immediately upon discovery and, if

the fence may have permitted tortoise entry while damaged, the Designated Biologist shall inspect the utility corridor or tower site for tortoise.

2. Desert Tortoise Clearance Surveys. Following construction of the tortoise exclusionary fencing around the Plant Site, all fenced areas shall be cleared of tortoises by the Designated Biologist, who may be assisted by Biological Monitors. A minimum of two clearance surveys, with negative results, must be completed, and these must coincide with heightened desert tortoise activity from late March through May and during October. To facilitate seeing the ground from different angles, the second clearance survey shall be walked at 90 degrees to the orientation of the first clearance survey.

3. Relocation for Desert Tortoise West of SR 14. If desert tortoises are detected during clearance surveys within the project impact area west of SR 14, the Designated Biologist shall move the tortoise the shortest possible distance, keeping it out of harm's way but still within its home range. Desert tortoise encountered during construction of any of the utility corridors shall be similarly treated in accordance with the Relocation Plan. Any relocation efforts shall be in accordance with techniques described in the *Guidelines for Handling Desert Tortoise during Construction Projects* (Desert Tortoise Council 1999) or more current guidance on the USFWS website.

4. Translocation Plan for Desert Tortoise East of SR-14. To address desert tortoise encountered during clearance surveys within the project impact area east of SR 14, the project owner shall develop and implement a desert tortoise Translocation Plan. The Translocation Plan shall be consistent with current USFWS approved guidelines, and shall be approved by Energy Commission staff in consultation with the USFWS and CDFG. The Translocation Plan shall designate a translocation site as close as possible to the project, and which provides suitable conditions for long-term survival of the translocated desert tortoise.

5. Burrow Inspection. All potential desert tortoise burrows within the fenced area shall be searched for presence. In some cases, a fiber optic scope may be needed to determine presence or absence within a deep burrow. To prevent reentry by a tortoise or other wildlife, all burrows shall be collapsed once absence has been determined. Tortoises excavated from burrows shall be translocated to unoccupied natural or artificial burrows immediately following excavation in an area approved by the Designated Biologist if environmental conditions warrant immediate relocation.

6. Burrow Excavation. Burrows inhabited by tortoises shall be excavated by the Designated Biologist using hand tools, and then collapsed or blocked to prevent re-occupation. If excavated during May through July, the Designated Biologist shall search for desert tortoise nests/eggs. All desert tortoise handling and removal, and burrow excavations, including nests,

shall be conducted by the Designated Biologist in accordance with the USFWS-approved protocol (Desert Tortoise Council 1999) or more current guidance on the USFWS website.

7. Monitoring During Clearing. Following desert tortoise clearance removal from the plant site, and translocation to a new site heavy equipment shall be allowed to enter the project site to perform earth work such as clearing, grubbing, leveling, and trenching. A Biological Monitor shall be onsite during initial clearing and grading activities. Should a tortoise be discovered, it shall be translocated as described above in accordance with the Relocation Plan.

8. Reporting. The Designated Biologist shall record the following information for any desert tortoises handled: a) the locations (narrative and maps) and dates of observation; b) general condition and health, including injuries, state of healing and whether desert tortoise voided their bladders; c) location moved from and location moved to (using GPS technology); d) gender, carapace length, and diagnostic markings (i.e., identification numbers or marked lateral scutes); e) ambient temperature when handled and released; and f) digital photograph of each handled desert tortoise as described in the paragraph below. Desert tortoise moved from within project areas shall be marked for future identification as described in *Guidelines for Handling Desert Tortoise during Construction Projects* (Desert Tortoise Council 1999) or more current guidance on the USFWS website. Digital photographs of the carapace, plastron, and fourth costal scute shall be taken. Scutes shall not be notched for identification.

Verification: Within 60 days of publication of the Energy Commission Decision the project owner shall submit to Energy Commission Staff, USFWS and CDFG a draft Desert Tortoise Translocation Plan. At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM with the final version of a Translocation Plan that has been approved by Energy Commission staff in consultation with USFWS and CDFG. The CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Desert Tortoise Translocation Plan must be made only after approval by the Energy Commission staff in consultation with USFWS and CDFG. The project owner shall notify the CPM no fewer than 5 working days before implementing any CPM-approved modifications to the Translocation Plan.

Within 30 days after initiation of translocation activities, the Designated Biologist shall provide to the CPM for review and approval, a written report identifying which items of the Translocation Plan have been completed, and a summary of all modifications to measures made during implementation.

Within 30 days of completion of desert tortoise clearance surveys the Designated Biologist shall submit a report to the CPM, USFWS, and CDFG describing how each of the mitigation measures described above has been satisfied. The report shall include the desert tortoise survey results, capture and release locations of any relocated desert tortoises, and any other information needed to demonstrate compliance with the measures described above.

MOHAVE GROUND SQUIRREL CLEARANCE SURVEYS

BIO-10 The project owner shall undertake appropriate measures to manage construction at the plant site and linear facilities in a manner to avoid or minimize impacts to Mohave ground squirrel. These measures include, but are not limited to, the following:

1. Clearance Survey. After the installation of the desert tortoise exclusion fence and prior to any ground disturbance, the Designated Biologist(s) shall examine the area to be disturbed for Mohave ground squirrels and their burrows. The survey shall provide 100 percent coverage of the Project limits. Potentially occupied burrows shall be fully excavated by hand by the Designated Biologist(s).

2. Translocation Plan. The project owner shall develop and implement a Mohave ground squirrel translocation plan to address the handling and disposition of any Mohave ground squirrels encountered during the clearance surveys. The Translocation Plan shall be approved by Energy Commission staff in consultation with CDFG. The Translocation Plan shall designate a translocation site as close as possible to the project, and which provides suitable conditions for long-term survival of the relocated Mohave ground squirrel.

3. Records of Capture. If Mohave ground squirrels are captured via trapping or burrow excavation, the Designated Biologist shall maintain a record of each Mohave ground squirrels handled, including: a) the locations (Global Positioning System [GPS] coordinates and maps) and time of capture and/or observation as well as release; b) sex; c) approximate age (adult/juvenile); d) weight; e) general condition and health, noting all visible conditions including gait and behavior, diarrhea, emaciation, salivation, hair loss, ectoparasites, and injuries; and f) ambient temperature when handled and released.

Verification: Within 60 days of publication of the Energy Commission Decision the project owner shall submit to Energy Commission Staff and CDFG a draft Mohave Ground Squirrel Translocation Plan. At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM with the final version of a Mohave Ground Squirrel Translocation Plan that has been approved by Energy Commission staff in consultation with CDFG. The CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Translocation Plan must be made only after approval the Energy Commission staff in consultation with CDFG. The project owner shall notify the CPM no fewer than 5 working days before implementing any CPM-approved modifications to the Translocation Plan.

Within 30 days of completion of Mohave ground squirrel clearance surveys the Designated Biologist shall submit a report to the CPM and CDFG describing how mitigation measures described above have been satisfied. The report shall include the Mohave ground squirrel survey results, capture and release locations of any relocated squirrels, and any other information needed to demonstrate compliance with the measures described above.

Within 30 days after initiation of translocation activities, the Designated Biologist shall provide to the CPM for review and approval, a written report identifying which items of the Translocation Plan have been completed, and a summary of all modifications to measures made during implementation.

DESERT TORTOISE AND MOHAVE GROUND SQUIRREL HABITAT COMPENSATORY MITIGATION

BIO-11 To fully mitigate for habitat loss and potential take of desert tortoise and Mohave ground squirrel, the project owner shall acquire, in fee or in easement, no less than 115 acres of land suitable for these species and shall provide funding for the enhancement and long-term management of these compensation lands. The responsibilities for acquisition and management of the compensation lands may be delegated by written agreement to CDFG or to a third party, such as a non-governmental organization dedicated to Mojave Desert habitat conservation, subject to approval by the CPM, in consultation with CDFG and USFWS prior to land acquisition or management activities. If habitat disturbance exceeds that described in this analysis, the project owner shall be responsible for acquisition and management of additional compensation lands or additional funds required to compensate for any additional habitat disturbances. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. The acquisition and management of compensation lands shall include the following elements:

1. Selection Criteria for Compensation Lands. The compensation lands selected for acquisition shall:

    a. be in the western Mojave Desert;

    b. provide moderate to good quality habitat for Mohave ground squirrel and desert tortoise with capacity to improve in quality and value for these species;

    c. be a contiguous block of land (preferably) or located so they result in a contiguous block of protected habitat;

    d. be adjacent to larger blocks of lands that are already protected such that there is connectivity between the acquired lands and the protected lands;

    e. be connected to lands for which there is reasonable evidence (for example, recent (<15 years) CNDDB occurrences on or immediately adjacent to the proposed lands) suggesting current occupation by desert tortoise and Mohave ground squirrel, ideally with populations that are stable, recovering, or likely to recover;

    f. not have a history of intensive recreational use, grazing, or other disturbance that might make habitat recovery and restoration infeasible;

g. 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

h. not be encumbered by easements or uses that would preclude fencing of the site or preclude or unacceptably constrain management of the site for the primary benefit of the species and their habitat for which mitigation lands were secured.

2. Review and Approval of Compensation Lands Prior to Acquisition. A minimum of three months prior to acquisition of the property, the project owner, or a third-party approved by the CPM, in consultation with CDFG and USFWS, shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS 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 and Mohave ground squirrel in relation to the criteria listed above. Approval from the CPM, in consultation with USFWS and CDFG, shall be required for acquisition of all parcels comprising the 115.0 acres in advance of purchase.

3. Mitigation Security for Compensation Lands and Avoidance/Minimization Measures. The project owner or an approved third party shall complete acquisition of the proposed compensation lands prior to initiating ground-disturbing project activities. If Security is provided, the project owner, or an approved third party, shall complete the proposed compensation lands acquisition within 12 months of the start of project ground-disturbing activities. The project owner shall also provide financial assurances to the CPM, with copies of the document(s) to CDFG and USFWS, to guarantee that an adequate level of funding is available to implement all impact avoidance, minimization, and compensation measures described in Conditions of Certification BIO-9 through BIO-12. Financial assurance shall be provided to the CPM in the form of an irrevocable letter of credit or another form of security ("Security") approved by the CPM, prior to initiating ground-disturbing project activities. If necessary to draw on these funds, such funds shall be used solely for implementation of the measures associated with the project.

   Prior to initiation of ground disturbance, the Security shall be provided by the project owner and approved by the CPM, in consultation with CDFG, to ensure funding in the amount of $529,000.00. These Security amounts were calculated as follows and may be revised upon completion of a Property Analysis Record (PAR) or PAR-like analysis of the proposed compensation lands:

   a. land acquisition costs for compensation lands, calculated at $3,000/acre for 115 acres: $345,000.00;

   b. costs of enhancing compensation lands, calculated at $250/acre for 115 acres: $28,750; and

c. costs of establishing an endowment for long-term management of compensation lands, calculated at $1,350/acre for 115 acres: $155,250.

4. Compensation Lands Acquisition Conditions. The project owner shall comply with the following conditions relating to acquisition of compensation lands after the CPM, in consultation with CDFG and USFWS, has approved the proposed compensation lands and received Security, if any, as described above.

   a. Preliminary Report: The project owner, or approved third party, shall provide a recent preliminary title report, initial hazardous materials survey report, biological analysis, and other necessary documents for the proposed 115 acres. All documents conveying or conserving compensation lands and all conditions of title/easement are subject to a field review and approval by the CPM, in consultation with CDFG and USFWS, California Department of General Services and, if applicable, the Fish and Game Commission and/or the Wildlife Conservation Board.

   b. Title/Conveyance: The project owner shall transfer fee title or a conservation easement to the 115 acres of compensation lands to CDFG under terms approved by CDFG. Alternatively, a non-profit organization qualified to manage compensation lands (pursuant to California Government Code section 65965) and approved by CDFG and the CPM may hold fee title or a conservation easement over the habitat mitigation lands. If the approved non-profit organization holds title, a conservation easement shall be recorded in favor of CDFG in a form approved by CDFG. If the approved non-profit holds a conservation easement, CDFG shall be named a third party beneficiary. If a Security is provided, the project owner or an approved third party shall complete the proposed compensation lands acquisition within 12 months of the start of project ground-disturbing activities.

   c. Enhancement Fund. The project owner shall fund the initial protection and enhancement of the 115 acres by providing the enhancement funds to the CDFG. Alternatively, a non-profit organization may hold the enhancement funds if they are qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if they meet the approval of CDFG and the CPM. If CDFG takes fee title to the compensation lands, the enhancement fund must go to CDFG.

   d. Endowment Fund. Prior to ground-disturbing project activities, the project owner shall provide to CDFG a capital endowment in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis that will be conducted for the 115 acres of compensation lands. Alternatively, a non-profit organization may hold the endowment fees if they are qualified to manage the compensation

lands (pursuant to California Government Code section 65965) and if they meet the approval of CDFG and the CPM. If CDFG takes fee title to the compensation lands, the endowment must go to CDFG, where it will be held in the special deposit fund established pursuant to California Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation shall manage the endowment for CDFG and with CDFG guidance.

a. The project owner and the CPM shall ensure that an agreement is in place with the endowment holder/manager to ensure the following conditions:

- Interest. Interest generated from the initial capital endowment shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the approved compensation lands, including reasonable administrative overhead, biological monitoring, improvements to carrying capacity, law enforcement measures, and any other action designed to protect or improve the habitat values of the compensation lands.
- Withdrawal of Principal. The endowment principal shall not be drawn upon unless such withdrawal is deemed necessary by the CDFG or the approved third-party endowment manager to ensure the continued viability of the species on the 115 acres. 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 pursuant to Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation will manage the endowment for CDFG with CDFG guidance.
- Pooling Endowment Funds. CDFG, or a CPM- and CDFG-approved non-profit organization qualified to hold endowments pursuant to California Government Code section 65965, may pool the endowment with other endowments for the operation, management, and protection of the 115 acres for local populations of desert tortoise and Mohave ground squirrel. However, for reporting purposes, the endowment fund must be tracked and reported individually.

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

The project owner is responsible for all compensation lands acquisition/easement costs, including but not limited to, title and document review costs, as well as expenses incurred from other state agency reviews and overhead related to providing

compensation lands to the department or approved third party; escrow fees or costs; environmental contaminants clearance; and other site clean up measures.

Verification: No less than 90 days prior to acquisition of the property, the project owner, or a third-party approved by the CPM, in consultation with CDFG and USFWS, shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcel(s) intended for purchase.

Draft agreements to delegate land acquisition to CDFG or an approved third party and agreements to manage compensation lands shall be submitted to Energy Commission staff for review and approval (in consultation with CDFG) prior to land acquisition. Such agreements shall be mutually approved and executed at least 60 days prior to start of any project-related ground disturbance activities. The project owner shall provide written verification to the CPM that the compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient(s). Alternatively, before beginning project ground-disturbing activities, the project owner shall provide Security in accordance with this condition. Within 90 days after the land purchase, as determined by the date on the title, the project owner shall provide the CPM with a management plan for review and approval, in consultation with CDFG, for the compensation lands and associated funds.

Within 90 days after completion of project construction, the project owner shall provide to the CPM verification that disturbance to Mojave creosote scrub habitat west of State Route 14 did not exceed 5.0 acres, and that construction activities at the plant site and along the gas pipeline alignment did not result in impacts to Mojave creosote scrub habitat adjacent to work areas. If habitat disturbance exceeded that described in this analysis, the CPM shall notify the project owner of any additional funds required or lands that must be purchased to compensate for any additional habitat disturbances at the adjusted market value at the time of construction to acquire and manage habitat.

DESERT TORTOISE AND MOHAVE GROUND SQUIRREL COMPLIANCE VERIFICATION

BIO-12 The project owner shall provide staff, CDFG, and USFWS with reasonable access to the project site and mitigation lands under the control of the project owner and shall otherwise fully cooperate with the Energy Commission's efforts to verify the project owner's compliance with, or the effectiveness of, mitigation measures set forth in the conditions of certification. The project owner shall hold harmless the Designated Biologist, the Energy Commission and staff, and any other agencies with regulatory requirements addressed by the Energy Commission's sole permitting authority for any costs the project owner incurs in complying with the management measures, including stop work orders issued by the CPM or the Designated Biologist. The Designated Biologist shall do all of the following:

1. Notification. Notify the CPM, CDFG, and USFWS at least 14 calendar days before initiating ground-disturbing activities. Immediately notify the CPM, CDFG, and USFWS in writing if the project owner is not in compliance with any conditions of certification, including but not limited to any actual or anticipated failure to implement mitigation measures within

the time periods specified in the conditions of certification. CDFG shall be notified at their Central Region Headquarters Office, 1234 E. Shaw Avenue, Fresno, CA 93710; (559) 243-4005. USFWS shall be notified at their Ventura office at 2493 Portola Road, Suite B, Ventura, CA 93003; (805) 644-1766

2. Monitoring During Grading. Remain on site daily while grubbing and grading are taking place to avoid or minimize take of listed species, to check for compliance with all impact avoidance and minimization measures, and to check all exclusion zones to ensure that signs, stakes, and fencing are intact and that human activities are restricted in these protected zones.

3. Fence Monitoring. During construction maintain and check desert tortoise exclusion fences on a daily basis to ensure the integrity of the fence is maintained. The Designated Biologist shall be present on site to monitor construction and determine fence placement during fence installation. During operation of the project fence inspections shall occur at least once per month throughout the life of the project, and more frequently after storms or other events that might affect the integrity and function of desert tortoise exclusion fences. Fence repairs shall occur within two days (48 hours) of detecting problems that affect the functioning of the desert tortoise exclusion fencing.

4. Monthly Compliance Inspections. Conduct compliance inspections at a minimum of once per month after clearing, grubbing, and grading are completed and submit a monthly compliance report to the CPM, USFWS and CDFG. All observations of listed species and their sign shall be reported to the Designated Biologist for inclusion in the monthly compliance report.

5. Annual Listed Species Status Report. No later than January 31 of every year the BSEP facility remains in operation, provide the CPM, USFWS and CDFG an annual Listed Species Status Report, which shall include, at a minimum: 1) a general description of the status of the project site and construction/operation activities, including actual or projected completion dates, if known; 2) a copy of the table in the BRMIMP with notes showing the current implementation status of each mitigation measure; 3) an assessment of the effectiveness of each completed or partially completed mitigation measure in minimizing and compensating for project impacts, and 4) recommendations on how effectiveness of mitigation measures might be improved.

6. Final Listed Species Mitigation Report. No later than 45 days after initiation of project operation provide the CPM a Final Listed Species Mitigation Report that shall include, at a minimum: 1) a copy of the table in the BRMIMP with notes showing when each of the mitigation measures was implemented; 2) all available information about project-related incidental take of listed species; 3) information about other project impacts

on the listed species; 4) construction dates; 5) an assessment of the effectiveness of conditions of certification in minimizing and compensating for project impacts; 6) recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the listed species; and 7) any other pertinent information, including the level of take of the listed species associated with the project.

7. Notification of Injured, Dead, or Relocated Listed Species. In the event of a sighting in an active construction area (e.g., with equipment, vehicles, or workers), injury, kill, or relocation of any listed species, the CPM, CDFG, and USFWS shall be notified immediately by phone. Notification shall occur no later than noon on the business day following the event if it occurs outside normal business hours so that the agencies can determine if further actions are required to protect listed species. Written follow-up notification via FAX or electronic communication shall be submitted to these agencies within two calendar days of the incident and include the following information as relevant:

   a. Injured Desert Tortoise. If a desert tortoise is injured as a result of project-related activities during construction, the Designated Biologist shall immediately take it to a CDFG-approved wildlife rehabilitation and/or veterinarian clinic. Any veterinarian bills for such injured animals shall be paid by the project owner. Following phone notification as required above, the CPM, CDFG, and USFWS shall determine the final disposition of the injured animal, if it recovers. Written notification shall include, at a minimum, the date, time, location, circumstances of the incident, and the name of the facility where the animal was taken.

   b. Desert Tortoise/Mohave Ground Squirrel Fatality. If a desert tortoise or Mohave ground squirrel is killed by project-related activities during construction or operation, or if a desert tortoise or Mohave ground squirrel is otherwise found dead, submit a written report with the same information as an injury report. These desert tortoises 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 pay to have the desert tortoises transported and necropsied. The report shall include the date and time of the finding or incident.

8. Stop Work Order. The CPM may issue the project owner a written stop work order to suspend any activity related to the construction or operation of the project to prevent or remedy a violation of one or more conditions of certification (including but not limited to failure to comply with reporting, monitoring, or habitat acquisition obligations) or to prevent the illegal take of an endangered, threatened, or candidate species. The project owner shall comply with the stop work order immediately upon receipt thereof.

Verification: No later than two calendar days following the above-required notification of a sighting, kill, injury, or relocation of a listed species, the project owner

shall deliver to the CPM, CDFG, and USFWS via FAX or electronic communication the written report from the Designated Biologist describing all reported incidents of the sighting, injury, kill, or relocation of a listed species, identifying who was notified and explaining when the incidents occurred. In the case of a sighting in an active construction area, the project owner shall, at the same time, submit a map (e.g., using Geographic Information Systems) depicting both the limits of construction and sighting location to the CPM, CDFG, and USFWS.

No later than January 31st of every year the BSEP facility remains in operation, provide the CPM an annual Listed Species Status Report as described above, and a summary of desert tortoise exclusion fence inspections and repairs conducted in the course of the year.

RAVEN MONITORING, MANAGEMENT, AND CONTROL PLAN

BIO-13 The project owner shall design and implement a Raven Monitoring, Management, and Control Plan (Raven Plan) that is consistent with the most current USFWS-approved raven management guidelines and that meets the approval of the USFWS, CDFG, and the Energy Commission. The Raven Plan shall: identify conditions associated with the project that might provide raven subsidies or attractants; describe management practices to avoid or minimize conditions that might increase raven numbers and predatory activities; describe control practices for ravens; address monitoring during construction and for the life of the project; and discuss reporting requirements. For the first year of reporting the project owner shall provide quarterly reports describing implementation of the Raven Plan. Thereafter the reports shall be submitted annually for the life of the project. The Raven Plan shall also include a requirement for payment of an in-lieu fee to a third-party account established by the USFWS to support a regional raven monitoring and management plan (USFWS 2009).

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM, USFWS, and CDFG with the final version of the Raven Plan that has been reviewed and approved by USFWS and CDFG. The CPM shall determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Raven Plan must be made only after consultation with the Energy Commission staff, USFWS, and CDFG. The project owner shall notify the CPM no less than five working days before implementing any CPM-approved modifications to the Raven Plan.

Within 30 days after completion of project construction, the project owner shall provide to the CPM for review and approval a report identifying which items of the Raven Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

EVAPORATION POND NETTING AND MONITORING

BIO-14 The project owner shall cover the evaporation ponds prior to any discharge with 1.5-inch mesh netting designed to exclude birds and other wildlife from drinking or landing on the water of the ponds. The netted ponds shall be monitored regularly to verify that the netting remains intact, is fulfilling its

function in excluding birds and other wildlife from the ponds, and does not pose an entanglement threat to birds and other wildlife. The ponds shall include a visual deterrent in addition to the netting, and the pond shall be designed such that the netting will never contact the water. Monitoring of the evaporation ponds shall include the following:

- The Designated Biologist or Biological Monitor shall regularly survey the ponds at least once per month starting with the first month of operation of the evaporation ponds. The purpose of the surveys shall be to determine if the netted ponds are effective in excluding birds, and to determine if the nets pose an entrapment hazard to birds and wildlife. Surveys shall be of sufficient duration and intensity to provide an accurate assessment of bird and wildlife use of the ponds during all seasons. Surveyors shall be experienced with bird identification and survey techniques. Operations staff at the BSEP site shall also report finding any dead birds or other wildlife at the evaporation ponds to the Designated Biologist within one day of the detection of the carcass. The Designated Biologists shall report any bird or other wildlife deaths or entanglements within two days of the discovery to the CPM, CDFG, and USFWS.
- If dead or entangled birds are detected, the Designated Biologist shall take immediate action to correct the source of mortality or entanglement. The Designated Biologist shall make immediate efforts to contact and consult the CPM, CDFG, and USFWS by phone and electronic communications prior to taking remedial action upon detection of the problem, but the inability to reach these parties shall not delay taking action that would, in the judgment of the Designated Biologist, prevent further mortality of birds or other wildlife at the evaporation ponds.
- If after 12 consecutive monthly site visits no bird or wildlife deaths or entanglements are detected by or reported to the Designated Biologist, monitoring can be reduced to quarterly visits.
- If after 12 consecutive quarterly site visits no bird or wildlife deaths or entanglements are detected by or reported to the Designated Biologist, the site visits can be reduced to two surveys per years, during spring and fall migration.

Verification: No less than 30 days prior to operation of the evaporation ponds the project owner shall provide to the CPM as-built drawings and photographs of the ponds indicating that the bird exclusion netting has been installed. The Designated Biologist shall submit annual monitoring reports to the CPM, CDFG, and USFWS describing the dates, durations and results of site visits conducted at the evaporation ponds. The annual reports shall fully describe any bird or wildlife death or entanglements detected during the site visits or at any other time, and shall describe actions taken to remedy these problems. The report shall be submitted to the CPM, CDFG, and USFWS no later than January 31st of every year for the life of the project.

PRE-CONSTRUCTION NEST SURVEYS AND IMPACT AVOIDANCE MEASURES FOR MIGRATORY BIRDS

BIO-15 Pre-construction nest surveys shall be conducted if construction activities will occur from February 1 through August 1. The Designated Biologist or Biological Monitor conducting the surveys shall be experienced bird surveyors and familiar with standard nest-locating techniques such as those described in Martin and Guepel (1993). Surveys shall be conducted in accordance with the following guidelines:

1. Surveys shall cover all potential nesting habitat in the project site and within 500 feet of the boundaries of the plant site and linear facilities;

2. At least two pre-construction surveys shall be conducted, separated by a minimum 10-day interval. One of the surveys needs to be conducted within the 14-day period preceding initiation of construction activity. Additional follow-up surveys may be required if periods of construction inactivity exceed three weeks in any given area, an interval during which birds may establish a nesting territory and initiate egg laying and incubation;

3. If active nests are detected during the survey, a no-disturbance buffer zone (protected area surrounding the nest, the size of which is to be determined by the Designated Biologist in consultation with CDFG and USFWS) and monitoring plan shall be developed. Nest locations shall be mapped using GPS technology and submitted, along with a weekly report stating the survey results, to the CPM; and

4. The Designated Biologist shall monitor the nest until he or she determines that nestlings have fledged and dispersed; activities that might, in the opinion of the Designated Biologist, disturb nesting activities, shall be prohibited within the buffer zone until such a determination is made.

Verification: At least 10 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM a letter-report describing the findings of the pre-construction nest surveys, 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 and shall depict the boundaries of the no-disturbance buffer zone around the nest.

AMERICAN BADGER AND DESERT KIT FOX IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-16 To avoid direct impacts to American badgers and desert kit fox, pre-construction surveys shall be conducted for these species concurrent with the desert tortoise surveys. Surveys shall be conducted as described below:

Biological Monitors shall perform pre-construction surveys for badger and kit fox dens in 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, potentially active, or definitely active.

Inactive dens that would be directly impacted by construction activities shall be excavated by hand and backfilled to prevent reuse by badgers or kit fox. Potentially and definitely active 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, the den shall be progressively blocked with natural materials (rocks, dirt, sticks, and vegetation piled in front of the entrance) for the next three to five nights to discourage the badger or kit fox from continued use. After verification that the den is unoccupied it shall then be excavated and backfilled by hand to ensure that no badgers or kit fox are trapped in the den.

Verification: The project owner shall submit a report to the CPM and CDFG within 30 days of completion of badger and kit fox surveys. The report shall describe survey methods, results, mitigation measures implemented, and the results of the mitigation.

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. Concurrent with desert tortoise clearance surveys, the Designated Biologist shall conduct pre-construction surveys for burrowing owls within the project site and along all linear facilities in accordance with CDFG guidelines (California Burrowing Owl Consortium 1993). If burrowing owls are detected within the impact area or within 500 feet of any proposed construction activities, the Designated Biologist shall prepare a Burrowing Owl Monitoring and Mitigation Plan in consultation with CDFG, USFWS, and Energy Commission staff. This plan shall include detailed measures to avoid and minimize impacts to burrowing owls in and near the construction areas and shall be consistent with CDFG guidance (CDFG 1995).

2. Artificial Burrow Installation. Prior to any ground-disturbing activities, the project owner shall install no less than four artificial burrows, or at least two burrows for each owl displaced by the project, in the proposed relocation area immediately north of the project site, a 6-acre area within the 14.39-acre parcel owned by Beacon Solar, LLC, (APN 469-14-011). Design of the artificial burrows shall be consistent with CDFG guidelines (CDFG 1995). The Designated Biologist shall survey the site selected for artificial burrow construction to verify that such construction will not affect desert tortoise or Mohave ground squirrel. The design of the burrows shall be approved by the CPM in consultation with CDFG and USFWS.

3. Surveys of Relocation Area. The Designated Biologist shall survey the relocation area during the nesting season to assess use of the artificial burrows by owls using methods consistent with Phase II and Phase III Burrowing Owl Consortium Guideline protocols (CBOC 1993). Surveys shall start upon completion of artificial burrow construction and shall continue for a period of five years. If survey results indicate burrowing owls are not nesting on the relocation area, remedial actions shall be developed and implemented in consultation with the CPM, CDFG and USFWS to correct conditions at the site that might be preventing owls from nesting there. A report describing survey results and remedial actions taken shall be submitted to the CPM, CDFG and USFWS no later than January 31st of each year for five years.

4. Protect and Manage 6-Acre Relocation Area. The project owner shall provide a mechanism to protect 6 acres of the 14.39-acre relocation area in perpetuity as habitat for burrowing owls, either in fee title, or as a permanent deed restriction. The project owners shall prepare a draft Burrowing Owl Relocation Area Management Plan for review and approval by the CPM in consultation with CDFG. The overall objective of the plan shall be to manage the 6-acre relocation parcel for the benefit of burrowing owls, with the specific goals of:

   a. Maintaining the functionality of at least four artificial or natural burrows; and

   b. Minimizing the occurrence of weeds (species considered “moderate” or “high” threat to California wildlands as defined by CAL-IPC [2006] and noxious weeds rated “A” or “B” by the California Department of Food and Agriculture and any federal-rated pest plants [CDFA 2009]) at less than 10 percent cover of the shrub and herb layers.

   The Burrowing Owl Relocation Area Management Plan shall include monitoring and maintenance requirements, details on methods for measuring compliance goals and remedial actions to be taken if management goals are not met. A report describing results of monitoring and management of the relocation area shall be submitted to the CPM, CDFG and USFWS no later than January 31st of each year for the life of the project.

5. Acquire 20 Acres of Burrowing Owl Habitat. In addition to protecting the 6-acre relocation area north of the project site, the project owner shall acquire, in fee or in easement, 20 acres of land suitable to support a resident population of burrowing owls and shall provide funding for the enhancement and long-term management of these compensation lands. The responsibilities for acquisition and management of the compensation lands may be delegated by written agreement to CDFG or to a third party, such as a non-governmental organization dedicated to Mojave Desert habitat conservation, subject to approval by the CPM, in consultation with CDFG and USFWS prior to land acquisition or management activities.

Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. Agreements to delegate land acquisition to CDFG or an approved third party and to manage compensation lands shall be implemented within 12 months of the Energy Commission's decision.

a. Burrowing Owl Mitigation Criteria. The terms and conditions of this acquisition or easement shall be as described in **BIO-11**, with the additional criteria to include: 1) the 20 acres of mitigation land must provide suitable habitat for burrowing owls, and 2) the acquisition lands must either currently support burrowing owls or be no farther than 5 miles from an active burrowing owl nesting territory. The 20 acres of burrowing owl mitigation lands may be included with the 115 acres of desert tortoise and Mohave ground squirrel mitigation lands ONLY if these two burrowing owl criteria are met. If the 20 acres of burrowing owl mitigation land is separate from the 115 acres required for desert tortoise and Mohave ground squirrel compensation lands, the project owner shall fulfill the requirements described in BIO-11, including submittal of a formal acquisition proposal no less than 90 days prior to acquisition, and a management plan within 30 days after the land purchase.

b. Security. If the 20 acres of burrowing owl mitigation land is separate from the 115 acres required for desert tortoise and Mohave ground squirrel compensation lands the project owner or an approved third party shall complete acquisition of the proposed compensation lands prior to initiating ground-disturbing project activities. Alternatively, 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 initiating ground-disturbing project activities. Prior to submittal to the CPM, the Security shall be approved by the CPM, in consultation with CDFG, to ensure funding in an amount determined by a Property Analysis Record (PAR) or PAR-like analysis of the proposed compensation lands.

Verification: Within 60 days of publication of the Energy Commission Decision, the project owner shall submit to the CPM, CDFG and USFWS a draft Burrowing Owl Relocation Area Management Plan. Prior to any ground-disturbing activities on the project site the project owner shall submit to the CPM a final Burrowing Owl Relocation Area Management Plan that reflects review and approval by Energy Commission staff in consultation with CDFG and USFWS.

If pre-construction surveys detect burrowing owls within 500 feet of proposed construction activities, the Designated Biologist shall provide to CDFG, USFWS, and the CPM a Burrowing Owl Monitoring and Mitigation Plan at least 30 days prior to the start of any project-related site disturbance activities. The project owner shall report monthly to CDFG, USFWS, and the CPM for the duration of construction on the implementation of burrowing owl avoidance and minimization measures described in the Burrowing Owl Monitoring and Mitigation Plan. Within 30 days after completion of

construction the project owner shall provide to the CDFG and CPM a written construction termination report identifying how mitigation measures described in the plan have been completed.

No less than 90 days prior to acquisition of the property, the project owner, or a third-party approved by the CPM, in consultation with CDFG and USFWS, shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the 20-acre parcel intended for purchase. Prior to start of any project-related ground disturbance activities the project owner shall provide written verification to the CPM that the 20 acres of compensation lands or conservation easements have been acquired and recorded in favor of the approved easement holder(s). Alternatively, before beginning project ground-disturbing activities, the project owner shall provide Security to the CPM in accordance with this condition. Within 90 days of the land or easement purchase, as determined by the date on the title, the project owner shall provide the CPM with a management plan for review and approval, in consultation with CDFG, for the compensation lands and associated funds.

STREAMBED IMPACT MINIMIZATION AND COMPENSATION MEASURES

BIO-18 The project owner shall compensate for permanent impacts to waters of the state by constructing a new channel that replicates the hydrological and biological functions of the impacted drainages, and shall establish a channel maintenance program. The channel created by the applicant shall: be designed to be geomorphologically equivalent to a typical desert wash system; maintain existing hydrological connections and levels of sediment transport; provide conditions that would support recruitment and maintenance of native vegetation, provide wildlife habitat, and maintain the biological functions and values of a natural desert wash ecosystem; be designed, constructed and maintained such that it would not create a movement barrier or hazard for desert tortoise or other wildlife, or be a source of invasive weeds. The project owner shall also implement Best Management Practices and other measures described below to protect jurisdictional waters of the State occurring along linear alignments. The project owner shall implement the following measures to compensate for impacts to waters of the state:

1. Submit Channel Design for Review: No later than 60 days prior to start of site mobilization, the project owner shall submit channel design and construction drawings for review and approval by the CPM in consultation with CDFG, as described in **Soil&Water-5.** The channel shall be designed such that it would remain accessible to desert tortoise and other wildlife at all times (i.e., all side slopes 3:1 or more gradual, with textured soil cement that would enhance traction for tortoise), and would promote a slightly aggradational (depositional) pattern of sediment deposition to allow for natural geomorphic processes;

2. Prepare a Desert Wash Revegetation Plan that follows the outline provided for rehabilitation plans described in Newton and Claassen (2003), *Appendix C: Sample Outline for a Rehabilitation Plan*. The Desert

Wash Revegetation Plan shall meet the following criteria at the end of the 10-year revegetation period[2]:

a. Establishment of at least 15 percent native desert wash shrub cover within the channel bottom (6.2 acres total within the 41.5-acre channel bottom, and under no circumstances less than 4.8 acres);

b. Establishment of at least 7 percent native desert wash shrub cover on each of the 11 channel reaches between drop structures;

c. Maintain percent cover of noxious weeds (defined as non-native species that pose a "moderate" or "high" threat to California wildlands as defined by CAL-IPC (2006) within the channel) below 2 percent within the channel bottom (less than 0.8 total within the 41.5-acre channel bottom);

3. Review and Submittal of Plan and Cost Estimate: Within 60 days of publication of the Energy Commission Decision, the project owner shall submit to the CPM and CDFG a draft Desert Wash Revegetation Plan and a draft estimate of costs to fully implement the plan. Prior to any ground-disturbing activities within waters of the State, the project owner shall submit to the CPM a final Desert Wash Revegetation Plan and a final cost estimate for implementation that reflects review and approval by Energy Commission staff in consultation with CDFG.

4. Acquire Off-Site Desert Wash: If at the end of the 10-year revegetation period the success criteria defined in the Desert Wash Revegetation Plan have not been achieved, the project owner shall acquire, in fee or in easement, land that includes at least 16 acres of desert wash state jurisdictional waters and their immediate watershed and floodplain. Prior to acquisition the applicant shall prepare an acquisition proposal for review and approval by Energy Commission staff and CDFG describing the 16 acres of state waters and the surrounding watershed and floodplain, and shall ensure that the acquired parcel(s) include sufficient area to manage the lands. The responsibilities for acquisition and management of the compensation lands may be delegated by written agreement to CDFG or to a third party, such as a non-profit organization dedicated to Mojave Desert habitat conservation, subject to approval by the CPM, in consultation with CDFG and RWQCB prior to land acquisition or management activities. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. The terms and conditions of this acquisition or easement shall be as described in **BIO-11**, with the additional criteria that the desert wash mitigation lands: 1) include at least 16 acres of state jurisdictional waters; 2) be characterized by similar soil permeability and hydrological and biological functions as the impacted wash; and 3) be within the same watershed as the impacted wash.

[2] The 10-year revegetation period begins upon completion of construction of the new channel.

5. Review and Approval of Compensation Lands Prior to Acquisition. A minimum of three months prior to acquisition of the property, the project owner, or a third-party approved by the CPM, in consultation with CDFG, shall submit a formal acquisition proposal to the CPM and CDFG describing the parcel(s) intended for purchase. This acquisition proposal shall include a description and delineation of waters of the state within the parcel(s); shall describe the floodplain and immediate watershed in the vicinity of the drainage; and shall identify the area of lands surrounding the drainage needed to adequately manage the waters of the state to protect and enhance their biological functions and values. Approval from the CPM, in consultation with CDFG, shall be required for acquisition of all parcels comprising the compensation lands in advance of purchase.

6. Security for Implementation of Mitigation: A security in the form of an irrevocable letter of credit, pledged savings account, or certificate of deposit for the amount of all mitigation measures pursuant to this condition of certification shall be submitted to, and approved by, the CPM, in consultation with CDFG, prior to commencing project activities within waters of the state. The security shall be approved by the CPM, in consultation with CDFG's legal advisors, prior to its execution, and shall allow the CPM at its discretion to recover funds immediately if the CPM, in consultation with CDFG, determines there has been a default. Security shall include an amount equal to the final cost estimate for implementation of the Desert Wash Revegetation Plan, as described above in item 2. In addition, security shall include the include costs of purchasing land with at least 16 acres of desert wash state jurisdictional waters plus the immediate watershed and floodplain.

   Prior to initiation of ground disturbance, the security shall be approved by the CPM, in consultation with CDFG, to ensure funding in the amount of $230,000 plus the final estimated cost of implementing the Desert Wash Revegetation Plan over a ten year period. The security amounts shall include the costs of implementing the Desert Wash Revegetation Plan over a ten-year period, and the costs of acquisition of 50 acres that includes at least 16 acres of desert wash plus the immediate watershed and floodplain. The required acreage may be less than 50 acres, and will depend on the area of adjacent watershed and floodplain needed to adequately protect and manage the 16 acres of waters of the state. Security costs for land acquisition were calculated as follows and may be revised upon completion of a Property Analysis Record (PAR) or PAR-like analysis of the proposed compensation lands:

   - land acquisition costs for compensation lands, calculated at $3,000/acre for 50 acres: $150,000;
   - costs of enhancing compensation lands, calculated at $250/acre for 50 acres: $12,500; and

- costs of establishing an endowment for long-term management of compensation lands, calculated at $1,350/acre for 50 acres: $67,500.

7. Long-Term Biological Monitoring and Management. Long-term biological monitoring and management of the channel shall begin at the end of the 10-year revegetation period and shall continue for the life of the project as described in **SOIL&WATER-8**, and shall occur regardless of the success or failure of the revegetation effort. The goals of the long-term monitoring shall be to:

   a. Maintain percent cover of noxious weeds (defined as non-native species that pose a "moderate" or "high" threat to California wildlands as defined by CAL-IPC (2006) within the channel) below 2 percent within the channel bottom (less than 0.8 total within the 41.5-acre channel bottom).

   b. Maintain the channel as safe for desert tortoise and other wildlife. At no time shall the channel pose an entrapment hazard to desert tortoise and other wildlife. An entrapment hazard is defined as a depression, pit or trench with a depth of one foot or greater and a slope steeper than 3:1.

   Inspections to assess percent weed cover within the channel shall be conducted by the Designated Biologist no less than once per year and only within the peak growing season for weedy annual herbs (February 1 through April 30th). Inspections to assess entrapment hazards for desert tortoise and other wildlife shall occur within 1 day of major storm events. The same remedial actions for managing weeds and entrapment hazards described in the Desert Wash Revegetation Plan shall be employed during the long-term monitoring. Entrapment hazards shall be corrected immediately upon detection. The Designated Biologist shall prepare an annual report describing the methods and results of the inspections, as well as any remedial actions taken, and shall submit these annual reports to the CPM and CDFG no later than January 31st.

8. Equipment Laydown Plan: The project owner shall develop a Storm Water Pollution Prevention Plan for construction activities that includes an engineered plan for the proposed equipment laydown area within the existing wash, as described in **Soil&Water 3.** This engineered plan shall describe protective structures, procedures for moving equipment, fuels and materials, and plan for conveyance of stormflows, during a rainfall event. Prior to initiation of any project activities in jurisdictional areas and no later than 60 days after publication of the Energy Commission Decision, the project owner shall submit this plan for review and approval by the CPM in consultation with CDFG.

9. Right of Access and Review for Compliance Monitoring: The CPM reserves the right to enter the project site and/or allow CDFG to enter the project site at any time to ensure compliance with these conditions. The

project owner herein grants to the CPM and to CDFG employees and/or their representatives the right to enter the project site at any time, to ensure compliance with the terms and conditions and/or to determine the impacts of storm events, maintenance activities, or other actions that might affect the restoration and revegetation efforts. The CPM and CDFG may, at the CPM's discretion, review relevant documents maintained by the operator, interview the operator's employees and agents, inspect the work site, and take other actions to assess compliance with or effectiveness of mitigation measures.

10. Reporting of Special-Status Species: If any special-status species are observed on or in proximity to the project site, or during project 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 CDFG and the CPM.

11. Notification: The project owner shall notify the CPM and CDFG, in writing, at least five days prior to initiation of project activities in jurisdictional areas as noted and at least five days prior to completion of project activities in jurisdictional areas. The project owner shall notify the CPM and CDFG of any change of conditions to the project, the jurisdictional impacts, or the mitigation efforts, if the conditions at the site of a proposed 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 and CDFG no later than seven 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 defined 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, whether native or non-native, 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 storm events; 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.

12. Code of Regulations: The project owner shall provide a copy of the Energy Commission Decision to all contractors, subcontractors, and the applicant's project supervisors. Copies shall be readily available at work sites at all times during periods of active work and must be presented to any CDFG personnel or personnel from another agency upon demand. The CPM reserves the right to issue a stop work order or allow CDFG 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 applicant regarding streambed alteration is incomplete or inaccurate;

    b. New information becomes available that was not known to it in preparing the terms and conditions;

    c. The project or project activities as described in the Final Staff Assessment have changed; or

    d. The conditions affecting biological resources changed or the CPM, in consultation with CDFG, determines that project activities will result in a substantial adverse effect on the environment.

13. Construction Schedule: Pine Tree Creek and the unnamed desert wash shall not be altered until the new channel is constructed and deemed by the CPM ready to accept stormwater flows.

14. Best Management Practices: The applicant shall also comply with the following conditions:

    a. The project owner shall not allow water containing mud, silt, or other pollutants from grading, aggregate washing, or other activities to enter a lake or flowing stream or be placed in locations that may be subjected to high storm flows.

b. The project owner shall comply with all litter and pollution laws. All contractors, subcontractors, and employees shall also obey these laws, and it shall be the responsibility of the operator to ensure compliance.

c. Spoil sites shall not be located within a drainage or locations that may be subjected to high storm flows, where spoil shall be washed back into a drainage or lake.

d. Raw cement/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 and/or entering waters of the state. These materials, placed within or where they may enter a drainage or lake, by project owner or any party working under contract or with the permission of the project owner shall be removed immediately.

e. 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 whatever nature shall be allowed to enter into, or placed where it may be washed by rainfall or runoff into, waters of the state.

f. When operations are 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 drainage.

g. No equipment maintenance shall occur within or near any stream channel where petroleum products or other pollutants from the equipment may enter these areas under any flow.

Verification: Within 60 days of publication of the Energy Commission Decision, the project owner shall submit to the CPM and CDFG a draft Desert Wash Revegetation Plan and a draft estimate of costs to fully implement the plan. Prior to any ground-disturbing activities within waters of the State, the project owner shall submit to the CPM a final Desert Wash Revegetation Plan and a final cost estimate for implementation of revegetation monitoring and management activities that reflects review and approval by Energy Commission staff in consultation with CDFG.

No later than 60 days prior to start of site mobilization, the project owner shall submit channel design and construction drawings for review and approval by the CPM in consultation with CDFG, as described in **Soil&Water-5**.

No fewer than 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall implement the mitigation measures described above. 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 that the above best management practices will be implemented

and provide a discussion of work in waters of the state in Compliance Reports for the duration of the project. Compliance reports shall be monthly for the first five years following completion of construction of the channel, and thereafter shall be submitted every six months.

No less than 90 days prior to acquisition of the desert wash compensation acreage the project owner, or a third-party approved by the CPM, in consultation with CDFG, shall submit a formal acquisition proposal to the CPM and CDFG describing the parcel(s) intended for purchase.

After completion of the 10-year monitoring period for the Desert Wash Revegetation Plan, the project owner shall thereafter submit an annual report to the CPM and CDFG. The report shall describe the methods and results of the long term biological monitoring inspections for weed and entrapment hazards within the channel. The report also shall include a discussion of any remedial actions taken, if any, and shall be submitted no later than January 31st of every year for the life of the project. If any entrapped animals/carcasses are detected CDFG and USFWS shall be notified in writing within 48 hours.

CLOSURE PLAN MEASURES

BIO-19 The project owner shall implement and incorporate into the facility closure plan measures to address the local biological resources related to facility closure. A funding mechanism shall be developed in consultation with the Energy Commission staff to ensure sufficient funds are available for revegetation, reclamation, and decommissioning. The facility closure plan shall address biological resources-related mitigation measures. In addition to these measures, the plan must include the following:

1. removal of transmission conductors when they are no longer used and useful;

2. removal of all above-ground and subsurface power plant site facilities and related facilities;

3. methods for restoring wildlife habitat and promoting the re-establishment of native plant and wildlife species;

4. revegetation of the project site and other disturbed areas utilizing appropriate methods for establishing native vegetation;

5. a cost estimate to complete closure-related activities.

In addition, the project owner shall secure funding to ensure implementation of the plan and provide to the CPM written evidence of the dedicated funding mechanism(s).

Verification: Prior to initiating ground-disturbing project activities the project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding will be available to implement decommissioning and closure activities described

above. The financial assurances may be in the form of an irrevocable letter of credit, a performance bond, a pledged savings account, or another equivalent form of security, as approved by the CPM.

At least 12 months prior to commencement of planned closure activities, the project owner shall address all biological resources-related issues associated with facility closure, and provide final measures, in a Biological Resources Element. The draft planned permanent or unplanned closure measures shall be submitted to the CPM for comment by staff, CDFG, and USFWS. After revision, final measures shall comprise the Biological Resources Element, which shall include the items listed above as well as written evidence of the dedicated funding mechanism(s) for these measures. The final Biological Resources Element shall become part of the facility closure plan, which is submitted to the CPM within 90 days of the permanent closure or another period of time agreed to by the CPM.

In the event of an unplanned permanent closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the on-site contingency plan (see **Compliance** Conditions of Certification).

Upon facility closure, the project owner shall implement measures in the Biological Resources Element and provide written status updates on all closure activities to the CPM at a frequency determined by the CPM.

SPECIAL-STATUS PLANT SURVEYS/PROTECTION PLAN

BIO-20 To avoid impacts to special-status plant species (state-plants, or California Native Plant Society List 1A, 1B, 2, or 3 plants) that might occur along the proposed northern emergency access road or the Rosamond Alternative water pipeline alignment, pre-construction surveys shall be conducted in these areas in Spring 2010. The surveys on the Rosamond Alternative water pipeline alignment would need to be conducted only if the Energy Commission elects to adopt this alternative. If special-status plant species are detected within 50 feet of the project footprint of the proposed northern emergency access road or the Rosamond Alternative alignment, the qualified botanist shall prepare a Sensitive Plant Protection Plan to avoid direct and indirect impacts. The project owner shall implement the following measures:

1. Pre-Construction Floristic Surveys. A qualified botanist shall conduct floristic surveys along the northern emergency access route and along the southern 23 miles of the Rosamond Alternative pipeline alignment. Surveys shall be conducted at the appropriate time of year and according to guidelines from the California Department of Fish and Game (CDFG 2000) and the California Native Plant Society (CNPS 2001).

2. Agency Notification: If state or federal listed plant species are detected during the pre-construction floristic surveys, the CPM and CDFG shall be notified in writing no more than 15 days from detection of the plants. The notification shall be prepared according to agency guidelines, and shall include submission of the GIS shape files and metadata for the plant

occurrences. Concurrent with notification of the appropriate permitting agencies, the project engineer shall also be contacted to ensure adequate time for adjusting the alignment within the right-of-way or narrowing a reach of the project footprint to avoid direct and indirect impacts to the plant occurrence.

3. Sensitive Plant Protection Plan. If special status plant species are detected during pre-construction surveys a qualified botanist shall prepare a Sensitive Plant Protection Plan (Plan). The Plan shall include measures for avoiding direct impacts and accidental impacts during construction by establishing the plant occurrence and an appropriately-sized buffer as an Environmentally Sensitive Area, as described in **BIO-21**. The Plan would also include measures to avoid indirect impacts including: sedimentation from adjacent disturbed soils; alterations of the site hydrology from changes in the drainage patterns; dust deposition; displacement or degradation of the habitat from the introduction and spread of noxious weeds. The plan shall also include a discussion of monitoring and reporting requirements during and after construction.

4. Review and Submittal of Plan: The project owner shall submit to the CPM and CDFG a draft Sensitive Species Protection Plan. Prior to any ground-disturbing activities within 50 feet of the sensitive plant occurrences detected during the pre-construction floristic surveys, the project owner shall submit to the CPM a final Plan that reflects review and approval by Energy Commission staff in consultation with CDFG.

Verification: No later than July 31, 2010 the project owner shall submit a report describing the results of floristic surveys conducted along the proposed northern emergency access road and the Rosamond Alternative pipeline alignment. The report shall be submitted to the CPM and CDFG and shall describe qualifications of the surveyor, survey methods including dates and times, a discussion of visits to reference sites, figures depicting the area(s) surveyed, and a list of plant species detected.

If special-status plant species were detected during the 2010 surveys the project owner shall submit to the CPM and CDFG a Sensitive Species Protection Plan (Plan) at least 60 days prior to the start of any ground-disturbing activities within 500 feet of the Rosamond Alternative alignment or the northern emergency access road. The CPM will determine the Plan's acceptability in consultation with CDFG and USFWS within 15 days of receipt of the Plan. Any modifications to the approved Plan shall be made only after approval by Energy Commission staff in consultation with CDFG. The project owner shall notify the CPM no fewer than 5 working days before implementing any CPM-approved modifications to the Plan.

Within 30 days after completion of construction of the Rosamond Alternative pipeline and the northern emergency access road the project owner shall provide to the CPM and CDFG a construction termination report discussing how mitigation measures described in the Plan were implemented.

ROSAMOND PIPELINE MITIGATION

BIO-21 The following condition would need to be implemented only if the Energy Commission elects to adopt the Rosamond Alternative. To avoid, minimize, and mitigate potential impacts to biological resources associated with construction of the Rosamond Alternative water pipeline, the project owner shall implement the following measures:

1. Establish Environmentally Sensitive Areas: Prior to any ground disturbing activities the Designated Biologist shall flag the Joshua trees depicted in Figure A-4 and the desert washes/drainages shown in Figures A-2a, and b as Environmentally Sensitive Areas (ESAs). Work shall not begin until the ESAs are delineated on the ground with orange safety netting established under supervision of the Designated Biologist. The ESAs for desert washes shall be delineated to protect all the drainages outside of permitted construction (i.e., at the edge of pavement or edge of ROW, depending on the segment), with fencing extending 20 feet out from the drainage along the edge of the construction footprint on both sides of the stream. The ESA fences for Joshua trees shall be installed 20 feet out from the base of the trunk, except where they occur on road edges; on this boundary, the fencing shall be installed at the edge of pavement. The ESA fences shall remain in place for the entire duration of construction. No earth-moving activities, vegetation removal, vehicles, heavy equipment, or other construction shall be permitted within the ESAs.

2. Identify and Avoid Noxious Weed Occurrences. The Designated Biologist shall identify and fence noxious weed occurrences within the construction footprint to prevent their spread into uninfested areas from contaminated tires and undercarriages, or by using the contaminated soil for backill in other areas. Noxious weeds ranked as having a “high” threat to California wildlands as defined by CAL-IPC (2006), noxious weeds rated “A” by the California Department of Food and Agriculture, and any federal-rated pest plants (CDFA 2009) shall be fenced wherever they occur within the construction footprint; fencing shall be installed at the perimeter of the occurrence. If the occurrence cannot be avoided, the area shall be scraped of its upper 12 inches of soil and the contaminated soil disposed of at an appropriate landfill under the guidance or approval of the County Agricultural Commissioner.

3. Minimize Soil Compaction: Soil compaction shall be minimized in areas that support native vegetation, except on slopes greater than 5 percent and as necessary to prevent slope failure. In areas that would support natural revegetation the upper 6-12 inches of soil shall be loosened.

4. Revegetate Disturbed Areas: Upon completion of construction, all disturbed areas shall be revegetated, excluding the road and roadbed. The following measures shall be implemented for the revegetation effort:

    a. Stockpile Native Topsoil: Topsoil shall be stockpiled from the project site for use in revegetation of the disturbed soils of the trench. The upper 1 inch of topsoil which contains the seedbank shall be scraped

and stockpiled for use as the top-dressing for the revegetation area. An additional 6 to 8 inches of soil below the top 1 inch of soil shall also be scraped and separately stockpiled for use in revegetation areas. All other elements of soil stockpiling shall be described on pages 39-40 of *Rehabilitation of Disturbed Lands in California* (Newton and Claassen 2003),

b. Revegetate With Native Species: Only seed locally occurring species from shall be used for revegetation. Seeds shall contain a mix of short-lived early pioneer species such as native annuals and perennials and subshrubs (for example, squirreltail, cheesebush, matchweed, peppergrass, rabbitbrush, creosote bush, burro-weed, wolfberry, Nevada tea, needlegrass, rice grass, goldenhead). Seeding 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 Mojave Desert region revegetation projects, including recommended seed treatments, are included in Appendix A-8 of the same report. The list of plants observed during the 2010 special-status plant surveys of the Rosamond Alternative can also be used as a guide to site-specific plant selection for revegetation.

5. Acquire Habitat: To fully mitigate for habitat loss and potential take of desert tortoise and Mohave ground squirrel, the project owner shall acquire, in fee or in easement, no less than 33.6 acres of land suitable for these species and shall provide funding for the enhancement and long-term management of these compensation lands. The responsibilities for acquisition and management of the compensation lands may be delegated by written agreement to CDFG or to a third party, such as a non-profit organization dedicated to Mojave Desert habitat conservation, subject to approval by the CPM, in consultation with CDFG and USFWS prior to land acquisition or management activities. If habitat disturbance exceeds that described in this analysis, the project owner shall be responsible for acquisition and management of additional compensation lands or additional funds required to compensate for any additional habitat disturbances. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. The acquisition and management of compensation lands, including selection criteria, review and approval of lands prior to acquisition, and acquisition conditions shall be as described in staff's proposed Condition of Certification **BIO-11**.

Verification: Within 90 days after completion of project construction, the project owner shall provide to the CPM verification that disturbance to Mojave creosote scrub habitat did not result in impacts to Mojave creosote scrub habitat adjacent to work areas. If habitat disturbance exceeded that described in this analysis, the CPM shall notify the project owner of any additional funds required or compensation acreage that must be purchased to compensate for any additional habitat disturbances at the adjusted market value at the time of construction to acquire and manage habitat .

No less than 90 days prior to acquisition of the property, the project owner, or a third-party approved by the CPM, in consultation with CDFG and USFWS, shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcel(s) intended for purchase.

Draft agreements to delegate land acquisition to CDFG or an approved third party and agreements to manage compensation lands shall be submitted to Energy Commission staff for review and approval (in consultation with CDFG) prior to land acquisition. Such agreements shall be mutually approved and executed at least 60 days prior to start of any project-related ground disturbance activities. The project owner shall provide written verification to the CPM that the compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient(s). Alternatively, before beginning project ground-disturbing activities or any other activities that could result in take, the project owner shall provide Security in accordance with this condition. Within 90 days after the land or easement purchase, as determined by the date on the title, the project owner shall provide the CPM with a management plan for review and approval, in consultation with CDFG, for the compensation lands and associated funds.

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BIOLOGICAL RESOURCES, APPENDIX A

(ROSAMOND RECYCLED WATER PIPELINE ALTERNATIVE)

Testimony of Carolyn Chainey-Davis, Richard L. Anderson and Susan D. Sanders

INTRODUCTION

This report describes the vegetation and wildlife resources occurring along the southern 23 miles of the 39.61-mile Rosamond Alternative water pipeline alignment (Biological Resources Appendix A - Figure 1). The biological resources of the northern 17.6 mile segment of the pipeline alignment are not addressed in this report because they have already been assessed as part of the Beacon Solar Energy Project (BSEP) (the previously proposed natural-gas pipeline). In addition to describing the biological resources along the pipeline alignment, this report discusses the potential direct, indirect, and cumulative impacts to these resources from construction of the pipeline and its components (staging areas, booster stations, jack and bore sites), and recommends mitigation measures to avoid, minimize, or mitigate for impacts to biological resources.

DESCRIPTION OF ROSAMOND ALTERNATIVE

Staff evaluated the feasibility of using non-potable water as an alternative to using potable groundwater. Staff identified the Rosamond Community Services District (RCSD), as a potential supplier of tertiary treated wastewater. The Rosamond Community Services District (RCSD) has submitted to staff a Letter of Intent to provide the BSEP with tertiary-treated water for BSEP's planned process needs (RCSD 2009d). The District's wastewater treatment plant produces enough effluent to meet the annual quantity of water demanded by the proposed BSEP cooling tower. All of the effluent is currently being disposed of in evaporation ponds. The RCSD is currently constructing treatment plant upgrades that include a tertiary level treatment facility. Upon completion of phases I and II, the wastewater treatment plant will have sufficient capacity to provide the tertiary-treated quality of water that is suitable for the proposed BSEP. The wastewater treatment plant upgrades will be completed prior to the planned operation of the BSEP.

From the point of delivery at the water treatment plant in Rosamond, to California City Boulevard at Trescape Road, the Rosamond Alternative would be constructed largely within the existing road prism (road bed and road shoulder) of predominantly improved gravel and dirt roads. These roads occur in the rural-residential and undeveloped areas between the north boundary of EAFB and California City Boulevard, and along Rosamond Boulevard, a paved four-lane arterial in the commercial district of Rosamond. The north end of the alignment continues along the broad south shoulder of California City Boulevard (a two-lane collector) to Neuralia Road, and then north to the BSEP plant site. This latter segment is identical to the southern segment of the BSEP gas pipeline, which was analyzed under the Biological Inventory for the BSEP (BS 2008a).

The 25-foot (ft) wide pipeline construction footprint accommodates the pipeline trench, backfill material, room for crews and equipment to maneuver around the trench, and control traffic. Most of the alignment is on roads wide enough to accommodate

construction to one side or the other and still maneuver traffic around construction without any off road disturbance. However, an approximate 4-mile segment in the northern half of the alignment (Division Road and Sunset Road area) would occur on narrower dirt roads where construction would extend off the road shoulder approximately ten (10) feet into the adjacent habitat of mostly grazed but undisturbed creosote bush scrub and saltbush scrub. Duration of the pipeline construction is estimated at approximately three (3) months, assuming one mile per day to one-half mile per day.

Five 2-acre staging areas were selected to utilize already disturbed area, to the greatest extent possible, to minimize impacts to native vegetation from staging areas. The five jack & bore areas (for boring the pipeline beneath railroad, pipeline and highway crossings) each require a disturbance area of 60-ft by 60-ft area at each end of the bore (15-ft by 36-ft bore pit plus room for equipment). Many of the jack and bore sites are already disturbed by construction and maintenance of the railroad, highway, or existing gas pipelines that the alignment would cross.

Disturbed areas were also selected for the two booster stations; one at the point of delivery at the wastewater treatment ponds in Rosamond and a second along the north boundary of EAFB.

METHODS

The Study Area encompasses a 2000-ft wide area centered on the alignment from the point of delivery at the wastewater treatment ponds in Rosamond and extending north 23 miles (Biological Resources Appendix A - Figure 1). Field surveys were conducted from July 18 - 20, 2009 for the vegetation mapping and habitat assessments for special-status plants. The botanical surveys were conducted by botanist Carolyn Chainey-Davis. Segments of the alignment that fell within the existing road prism were surveyed by car except to conduct ground surveys at all drainage crossings and occurrences of sensitive resources such as Joshua trees (*Yucca brevifolia*). Segments that would affect native habitats off-road were surveyed on foot. The alignment was also searched for other unique plant assemblages, sensitive habitats, or native species recognized in area plans such as native cactus, creosote bush rings, and Mojave yucca; however, none of these were found within or adjacent to the project footprint.

Wildlife biologist Richard Anderson conducted a habitat assessment for desert tortoise (*Gopherus agassizii*) and Mojave ground squirrel (*Spermophilus mohavensis*) and other special status wildlife species on July 19 and 20, 2009. This wildlife reconnaissance survey was conducted during daylight and consisted of slowly driving the route several times, and included the same 2000-ft wide, 23-mile long Study Area described above. The biologist stopped often and investigated the surrounding area on foot. During these driving surveys the biologist observed and documented wildlife and habitat quality. Habitat quality was documented out to 1000 feet on either side of the pipeline alignment.

VEGETATION MAPPING

Each aerial photo “signature” type was ground-surveyed to determine dominant and associate species, using the California Native Plant Society (CNPS) rapid assessment protocol (CNPS 2004) for classifying vegetation in the field. Estimates of aerial dominance were made visually when a habitat was clearly dominated by one or two species. After identifying aerial signatures in the field, vegetative units or polygons were then delineated on high resolution digital orthophotos.

Plant community designations were based generally on Holland (1986) to ensure consistency with previous BSEP mapping efforts (BS 2008a). Communities are defined using basic rules of dominance - the type being named by the single or shared dominant species in the defining layer in a given stand of vegetation. For each series description the species composition, structure, and physical and geographical setting, are briefly discussed.

In a deviation from Holland, saltbush scrubs were broadly subdivided into two edaphic groups based roughly on soil salinity, i.e., a “halophytic phase” (saline-alkaline and often mesic) and a xerophytic phase (drier and less saline-alkaline). Although the dominant species are roughly the same in both groups, the associated species are very different and the soil chemistry and site physiography is also important to several special-status plants.

Highly disturbed habitats were distinguished from those that were only lightly disturbed (e.g., sheep-grazed but little or no topographic disturbance). Areas mapped as disturbed were developed, paved, unvegetated, or with very sparse vegetation (e.g., < 5 percent cover) on a site with significant topographic disturbance, such as urban parcels that had been bladed.

Global Positioning System/Geographic Information System

Data were collected in the field with Trimble Juno ST Handheld Field Computer with Global Positioning System (GPS) using Trimble Terrasync version 3.01. Energy Commission Cartography Unit staff post-processed the data using Trimble GPS Pathfinder Office software version 4.00. Data were differentially corrected using Automatic Standard Carrier and Code Processing. Reference position used was from base provider. Base provider used was CORS, Helendale, CA. Differentially corrected data were then exported to ESRI shapefile format, and the Global Information Systems (GIS) coordinate system used was UTM 10 North, datum NAD 1983 (Conus).

The 1 Pixel = 1 foot resolution Seamless Image Database SID aerial photos that were used in the field and electronically to digitize the mapping units were provided to Energy Commission staff by the Rosamond Community Services District. The GIS stage of the vegetation mapping was done in ArcGIS Desktop 9.3.1 from geo-referenced versions of the field mapping. A 25-foot buffer of pipeline to represent the maximum possible construction footprint was created using the buffer tool in ArcMap toolbox. Acreages of habitat affected were made using the clip tool in ArcMap toolbox any of the first acreage

data sets that intersected the 25-ft buffer were extracted to create a second acreage data set. A third-party software tool was used to calculate acreage of the second acreage data set:

<http://www.spatialecology.com/htools/addarea.php>. The source of data for location of roads was from 2009 Tele Atlas© Data.

SPECIAL-STATUS PLANT HABITAT ASSESSMENT

Before conducting field work staff reviewed existing information and prepared lists of special-status species with potential to occur in the vicinity of the study area. Sources of information included a records search of the California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB 2009) for the Rosamond, Soledad Mountain, Bissell, Sanborn, and Mohave NE U.S. Geological Survey (USGS) 7.5 minute quadrangles. The CNPS Electronic Inventory (CNPS 2009) and the species list for the BSEP (BS 2008a) were also consulted. The CNDDB results are included in Attachment B. Other sources consulted include: *Natural Resource Conservation Service Web Soil Survey* (NRCS 2009), Integrated Natural Resources Management Plan for Edwards Air Force Base, California (EAFB 2002), and the *West Mojave Plan* (BLM 2004).

Due to survey timing, many annual and perennial herbs encountered could not be identified to the species level, or to a level necessary to detect rare plant taxa, if present. The special-status plant component of this assessment was therefore limited to an assessment of the habitat suitability for special-status species with known occurrences in the west Mojave region (CNDDB 2009, CNPS 2009).

ASSESSMENT OF WATERS

The delineation of "Other Waters" (unvegetated waterways, including ephemeral desert washes) was based on ordinary high water criteria contained in the US Army Corps of Engineers Regulatory Guidance Letter No. 05-05 "*Ordinary High Water Mark Identification*" (USACE 2005). Field characteristics used to assess other waters and ordinary high water mark (OHWM), to the extent that they can be identified and are deemed reasonably reliable. These characteristics include but are not limited to: natural line impressed on the bank; shelving; changes in the character of the soil; scour and deposition; sediment sorting; leaf litter disturbed or washed away; defined bed and banks; water staining, and changes in the character of the soil or plant community.

All drainages depicted in the USGS GIS dataset for "regional drainages" were surveyed at the point where they cross the alignment or one of its components. In addition to examination for one or more of the features described above for identifying other waters, notes were also made about any changes in the species composition and the presence or absence of desert wash vegetation. Channel dimensions or absence of a defined bed and bank were also noted, and photos taken.

The assessment of potential wetlands was based on the *Corps of Engineers Wetland Delineation Manual* and *Arid West Supplement* (USACE 1987, 2006), using indicators of wetland hydrology (*e.g.*, saturation, water-stained leaves, oxidized root channels, etc.), and dominance by hydrophytic vegetation (facultative or wetter); however, no soil pits were excavated because no potential wetlands were observed based on dominance

by wetland plants and indicators of wetland hydrology. The current indicator status for wetland plants occurring in the project area was obtained from national list of wetland indicator status for plants from the USDA-NRCS PLANTS Database, available on-line (USDA 2009). Other sources consulted in the pre-field review include the National Wetlands Inventory (USFWS 2009).

ASSESSMENT OF DESERT TORTOISE AND MOHAVE GROUND SQUIRREL HABITAT

Wildlife habitat quality was rated in the field as poor, fair, good or excellent with the focus on desert tortoise and Mohave ground squirrel habitat requirements. It was assumed that habitat suitable for desert tortoises was suitable for Mohave ground squirrels. It was additionally assumed that some habitat too fragmented for desert tortoises could be viable Mohave ground squirrel habitat. Polygons of each habitat category within the Study Area were mapped in the field on high resolution digital orthophotos. The habitat polygons delineated in the field were digitized with ArcGIS Desktop 9.3.1, and acreages of each habitat category impacted by the Rosamond pipeline were calculated ArcMap toolbox, as described above. Habitat quality was classified as follows:

- **Poor** quality habitat includes areas of low vegetative diversity (mostly non-native vegetation), non-friable soils, highly disturbed, highly fragmented, abundant trash, in close proximity to development and heavily overgrazed.
- **Fair** quality habitat includes areas of moderate vegetative diversity with mostly native shrub vegetation, friable soils, some micro-relief, some fragmentation, little human activity, no adjacent development or evidence of over grazing.
- **Good** quality habitat includes areas of high native vegetative diversity, mature/maturing shrubs, very minor human activity, minor fragmentation such as small dirt roads with little evidence of traffic, friable soils, well developed micro relief and moderately to little grazing. Without grazing, some good habitat would be classified as excellent quality.
- **Excellent** quality habitat includes areas of high native vegetative diversity, mature shrubs, well developed micro-relief, friable soils, little to no fragmentation, no nearby development, low or no recent grazing and little human activity.

EXISTING CONDITIONS

ENVIRONMENTAL SETTING

The Rosamond Alternative project area is located in the western Mojave Desert region on broad alluvial plains lying southwest of the Tehachapi Range and north of the San Gabriel Mountains. This region is characterized by temperature extremes and hot, dry lowlands of open (low cover) Mojave creosote bush scrub on alluvial fans and bajadas. Saltbush scrubs occur in the alkaline basins and on the thin residual soils of the low bedrock hills between the Antelope Valley and Fremont Valley, both undrained and closed basins spanned by the alignment. The region occurs within the California desert floristic province (Hickman 1993).

Elevations in the Rosamond Alternative project area range from approximately 2,300 feet at the point of delivery in southeast Rosamond (Antelope Valley), to 2,560 feet. This highest elevation on the alignment occurs along the railroad corridor through a saddle in the Rosamond Hills near the center of the alignment, to near 2,800 feet at the northern end near California City Boulevard in the higher plains of the southern Fremont Valley. Soils are predominantly sandy to gravelly, well-drained alluvial sediments of the Quaternary age on plains and bajadas of mixed origin.

Plant communities and other cover types are depicted in the vegetations map of the 2000-foot wide Study Area (Biological Resources Appendix A - Figures 2a-l), include: Joshua tree woodland; Mojave creosote bush scrub; disturbed creosote bush scrub; saltbush scrub (halophytic [saline-alkaline] phase); saltbush scrub (xerophytic [dry, non-saline] phase); disturbed saltbush scrub; and disturbed (developed or unvegetated). Representative photos of these habitats are provided in Biological Resources Appendix A - Figures 3a-b.

Point of Delivery (Wastewater Treatment Ponds) to Rosamond Blvd

The Rosamond Alternative pipeline alignment begins in the Antelope Valley region of the Mojave Desert at the wastewater treatment plant in an industrial area of Rosamond, just outside the west-central boundary of EAFB. The pipeline and booster station would be constructed in highly disturbed, unvegetated land within the existing facility, following an alignment within the broad but unpaved 10th St. West road prism (Biological Resources Appendix A - Figure 2a). Heading north along 10th St West, the pipeline would be constructed entirely within the existing disturbed roadbed. The alignment passes through a patchwork of undeveloped but highly disturbed parcels alternating with parcels of remnant, alkali scrubs of saltbush (halophytic—or saline/alkaline--phase) in the low, sandy, saline-alkaline basin that ultimately empties into Rosamond Dry Lake, approximately one and one-half miles to the east.

Rosamond Blvd to Sierra Highway

From the intersection of 10th St West and Rosamond Boulevard, the alignment turns west and follows the paved road shoulder of Rosamond Boulevard, a paved four-lane arterial in the commercial district of Rosamond (Biological Resources Appendix A - Figure 2a). This segment ends and turns north at Sierra Highway (a SR 14 frontage road) after a proposed bore underneath the existing railroad crossing of Rosamond Boulevard. There are a few undeveloped but highly disturbed parcels of saltbush scrub tucked in between the developed parcels in this segment; however, construction would occur entirely within the paved road prism.

Sierra Highway to Sopp Road

From the intersection of Rosamond Boulevard and Sierra Highway the alignment heads north through a saddle in the Rosamond Hills in the Tropico Hills-Rosamond Hills drainage basin along a meandering railroad maintenance road (Biological Resources Appendix A - Figures 2b and 2c). This road is bounded on one side by the railroad tracks on the east side and a paved highway frontage road on the west. The alignment intersects both the unpaved railroad maintenance road and a narrow strip of disturbed saltbush. The habitat ranges in width from approximately 50 feet to 100 feet and has a large component of noxious weeds in the herb layer, characteristic of railroad corridors.

The alignment (and railroad) sits in a topographic low position, relative to the alluvial fans, bajadas, and pediments of good quality creosote bush scrubs and sparse Joshua tree woodlands to the east and west; however, the strip of habitat remains highly impaired by the paved highway and the tall railroad embankment that confine it. One Joshua tree occurs on the western edge of the 50-foot wide strip between Sierra Highway and the railroad tracks.

Sopp Road to Lone Butte Road

After another proposed bore under the existing railroad crossing of Sierra Highway (within the paved road prism), the alignment heads west along Sopp Road (Biological Resources Appendix A - Figure 2c). It is a short segment of unpaved road with high quality saltbush scrub and sparse Joshua trees to the south and variously disturbed industrial and residential parcels alternating with remnant undisturbed habitat on the north side. However, the road is wide enough to accommodate construction within the existing road bed and disturbed shoulder.

Lone Butte Road to Trotter Avenue

Sopp Road dead ends near the northwest corner of EAFB, at which point it turns north, following the existing road and shoulder of Lone Butte Road, a broad and unpaved road that transects a patchwork of variously disturbed saltbush, junkyards, and residential on the west side, and good quality saltbush scrub (xerophytic—or dry and non-saline—phase) behind the EAFB fenceline off the east shoulder (Biological Resources Appendix A - Figure 2c). Construction would occur within the existing roadbed and disturbed shoulder. No Joshua trees occur within the area directly affected.

Trotter Avenue to Division Street

The alignment turns east on Trotter Avenue, a broad, unpaved road that follows the north boundary of EAFB, with predominantly disturbed and developed parcels of industrial and abandoned residences on the north side of the road (Biological Resources Appendix A - Figures 2c and 2d). Good quality saltbush scrubs with widely scattered Joshua trees occur outside the base fenceline on the bajada upslope but would not be directly affected by construction in the road. A staging area would be located within one disturbed-developed parcel near the west end, and a booster station located at the intersection with Division Street in a parcel of disturbed (unvegetated) land and saltbush scrub.

Division Street from Trotter Avenue to Silver Queen Road

After skirting the northern flank of the Rosamond Hills and EAFB along Trotter Avenue, the alignment turns north and heads toward Fremont Valley, following a somewhat narrower road prism of approximately 18 to 20 feet (Biological Resources Appendix A - Figure 2d). The unpaved road transects a one-mile patchwork of residential parcels, undeveloped and highly disturbed (bladed) saltbush scrub in various stages of recovery, and remnant parcels of creosote bush with widely scattered Joshua trees. Habitat quality of the vegetated parcels ranges from low to moderate. Several sapling-to-mature Joshua trees were mapped on one side or the other of Division Street in this reach. A maximum 25-foot wide construction footprint would require temporary disturbance to 5 to 7 feet of off-road habitat. The affected habitat ranges from variously weedy and

disturbed saltbush scrub, to only lightly or undisturbed saltbush or creosote bush scrub, but flanked on one side by the existing road prism. North of East Reed Avenue, the adjacent habitat is creosote bush scrub and saltbush scrub (dry, non-saline phase) that has been recently and historically grazed by sheep but otherwise undisturbed topographically or by urbanization. A few small to large areas off-road have apparently been cleared for use by sheepherders for temporary corralling, loading and unloading.

Division Street from Silver Queen Road to Sunset Road

From Silver Queen Road north, along Division, the gravelly, unpaved road is slightly narrower (e.g., 16 ft vs. 18-20 ft); consequently, approximately 9 or 10 feet of off-road habitat would be affected. The alignment here is bounded by saltbush scrubs (dry phase) and creosote bush scrub of low to moderate habitat quality due to a long history of sheep grazing, which has resulted in a sparse cover of shrubs in some areas (Biological Resources Appendix A - Figure 2d). Several small to large disturbed areas occur off-road near intersections; areas apparently used by sheepherders. Just north of Silver Queen Road, the alignment leaves the road prism for an approximate 1000-foot segment to avoid an “S” curve in the road and follow a straight alignment from one end of the curve to the other. A staging area would also be located at this point; the affected habitat is predominantly sparse and sheep-grazed, low-to-moderate quality creosote bush scrub. The northern end of Division Street, at Sunset Road, is bounded by open, hummocky sand sheets of sparse saltbush scrub sparsely vegetated sand sheets and clay pans. No Joshua trees were found along this segment of Division or anywhere north of this segment; however, the County road right-of-way (ROW) is wide enough to permit shifting the alignment to avoid sensitive resources or high quality habitat on one side or the other.

Sunset Road to 20th Street East

After a short segment bounded by open, hummocky sand sheets and sparse, grazed saltbush scrub in the low-lying area at the west end of Sunset, the narrow (approximately 16- to 20-feet wide) unpaved Sunset Road segment includes a proposed staging area and bore under the eastbound railroad tracks, and then up the gravelly northern flank of Sanborn Hill, one of several low bedrock hills in the project vicinity (Biological Resources Appendix A - Figure 2d). From the grazed, open saltbush scrubs in the low-lying areas near the railroad, the habitat on Sanborn Hill transitions quickly to more diverse (ungrazed) habitat of good quality with a denser shrub cover and good native species diversity and richness in the herb layer. Approximately 9 to 13 feet of off-road habitat would be affected on this narrow reach.

20th Street East from Sunset Road to SR 58

After following Sunset Road off the northeast flank of Sanborn Hill, the alignment turns north on 20th Street East to State Route 58 (SR 58), an unpaved road approximately 20-25 feet wide; up to 5 feet of off-road habitat would be affected in some reaches. The alignment is bounded by grazed creosote bush and saltbush (dry phase) scrubs of low to moderate habitat quality before a proposed bore under a disturbed, broad swath of existing gas pipelines just south of SR 58 (Biological Resources Appendix A - Figure 2e). Another bore and staging area is proposed at the north end of this segment at the turnaround on the end of the highway frontage road. The construction here would occur entirely in disturbed area before continuing under SR 58.

20th Street East from SR 58 to Cache Creek

This segment begins with a staging and bore at the toe of the north embankment of SR 58. From here, the alignment follows 20th Street East, a broad (>25 ft) unpaved road that passes a claypan of sparse saltbush; this is an apparent low-lying area at the terminus of a desert wash that becomes diffuse and undefined at this point where it disappears into the surrounding saltbush scrubs of moderate habitat quality (Biological Resources Appendix A - Figure 2e). Another staging area would be located in the disturbed (unvegetated) areas at the turnaround at the end of Altus Avenue (an uncompleted highway frontage road). From Altus Avenue north, the alignment transitions to a grazed creosote bush scrub of moderate to good quality. Continuing along 20th Street East the road is fairly wide with several small to large disturbed areas at intersections used, apparently, by sheepherders for staging; consequently, off-road impacts would not occur here until the road narrows just south of East Rosewood Boulevard. An approximate 9- to 12-foot strip of off-road creosote bush scrub of good habitat quality would be affected on the short reach. The road widens again just north of East Rosewood Blvd on its way to the Cache Creek crossing. The road is flanked by grazed but good quality creosote bush scrub; however, the wide road prism would accommodate construction without affecting any native vegetation off the road shoulder.

Cache Creek to California City Blvd

This segment begins with a road wash-out at Cache Creek, the only named blue line feature in the project area. This is the largest of the numerous ephemeral drainages that occur in the project area but most of these lack a defined bed and bank. Cache Creek has two forks, both of which have washed out the road crossings and have made them impassable. North of the wash-out at the first fork on 20th Street East, the alignment briefly turns east on 22nd Avenue before turning north again on 22nd Street East. The second and northernmost fork of Cache Creek has washed out 22nd Street East just north of 22nd Avenue. Both Cache Creek channels are approximately 12-15-ft wide and up to 4-feet in depth where they cross the road and the channel bottom and banks are disturbed by motorbikes. No desert wash vegetation occurs on Cache Creek within or adjacent to the project area. A staging area was located in a disturbed area approximately 1000 feet north of the north fork of Cache Creek. The unpaved roads, which are bounded by creosote bush scrub of moderate to good quality, are generally 20 feet or wider in this segment; only minimal native vegetation would be affected by pipeline construction (Biological Resources Appendix A – Figures 2f and 2g).

California City Blvd and Neuralia Road to the BSEP Plant Site

The northern 17.6 miles of the Rosamond Alternative water pipeline alignment is identical to that analyzed for the BSEP gas pipeline and was surveyed and described in detail in the biological resources report for that project (BS 2008a). This northern segment of the Rosamond Alternative would be buried within a broad, disturbed and managed road shoulder of California City Boulevard before heading north on Neuralia Road (Biological Resources Appendix A - Figures 2g to 2l). The road is flanked by creosote bush scrub; however, construction would be confined to the existing disturbed area at the edge of California City Boulevard and will avoid areas with native vegetation.

SOILS

An examination and discussion of the project area soils are included here because many rare plant species in California and elsewhere are restricted to specific soil types, also known as “edaphic endemics” (Tibor 2001). Information on soils, including soil reports and soil maps, was obtained from the Natural Resource Conservation Service (NRCS) Web Soil Survey (NRCS 2009).

The mechanism of a rare plant’s adaptation and subsequent restriction to unusual soils may be complex but usually involves physiological tolerances to mineral imbalances or toxicities. For example, several rare plants of the west Mojave Desert region are associated with hyper-saline/alkaline soils associated with playas, such as Alkali mariposa lily, sage-like loeflingia, and Lancaster milk-vetch. Others are “neoendemics” of geological young habitats such as sand dunes. The species composition of a site, at the association level, typically offers strong clues as to a site’s drainage class and soil chemistry.

In the Rosamond Dry Lake area alkali flats, mapped as Pond series” or “Pond-Oban complex” soils (NRCS 2009) occur on the talfs (flat plains) and toeslopes west of Rosamond Dry Lake. These areas support a halophytic phase of saltbush scrub that is very different from the saltbush scrubs that occur in the better drained and non-saline soils of the rest of the project area. The dominant species are the same but the co-dominants and associates in the herb layer are quite different. These basin floors and playa margins are also surrounded by shoreline sand deposits, relics from wetter middle and late Pleistocene climates when the lakes were filled with water. The high salinity and exchangeable sodium ion content of some soils, particularly soils in the lakebed basins, inhibit many plant species, leaving a suite of adapted species specifically associated with saline-alkaline soils.

In these closed drainages, precipitation tends to pond locally and lateral transport is slow both above and below ground. These conditions favor the accumulation of finer sediments, although not nearly as fine or poorly drained nor as saline-alkaline as the playa and playa margins a mile east of the alignment. The soils at the southern end of the alignment are moderately saline and moderately well drained, compared to the well-drained and excessively well-drained, coarser and non-saline soils found elsewhere along the alignment.

Wind-laid sand deposits, in the form of sand sheets and hummocks formed around the base of creosote bush, were observed in the area near Division and Sunset; these are mapped as “Cajon loamy sands”; non-saline sandy soils on 0-5 percent slopes and are somewhat excessively drained (NRCS 2009). The dunes and hummocks appear to be generally active, perhaps in part because regular sheep grazing has disturbed the soil.

Torrifluvents occur in the moderately saline topographically low area just north and south of the SR 58 crossing. Torrifluvents are recently deposited, stratified alluviums of alluvial plains which are periodically flooded. These occur in the basin floor and are conspicuously less vegetated and with lower species diversity than the surrounding soils but are only rarely flooded (NRCS 2009).

Aside from the restricted landforms and soils of interest mentioned above, the dominant soil type within and immediately adjacent to the construction footprint in the area north of EAFB are well-drained to excessively drained sandy alluviums of predominantly granitic origin in the Rosamond series clay loams and Garlock series loamy sand and gravelly loamy sands. These soils are typically non-saline but sometimes very slightly saline (NRCS 2009).

From Rosamond Boulevard north, through the Rosamond Hills area along Sierra Highway and the railroad tracks, soils are predominantly well-drained to excessively drained, non-saline soils of granitic origin on backslopes, toeslopes, and rocky pediments that include Hi Vista sandy loams, Cajon sands, and Muroc sandy loams, Rock outcrops, and Torriorthents on the steeper active slopes, occur on the slopes above and away from the alignment.

Along Rosamond Boulevard, the alignment would be constructed within the existing pavement or road shoulder; however, the segment is bordered by a few undeveloped parcels of Hesperia series fine sandy loams, and Rosamond sandy loams, both of which are well-drained alluviums that are non-saline to only very slightly saline (NRCS 2009).

PLANT COMMUNITIES

Biological Resources Table Appendix A – Table 1 summarizes the acreage of plant communities and cover types found within the Study Area. Areas mapped as "Developed/Disturbed" include unpaved and paved roads and road shoulders, a rail line, and other areas cleared for residential, industrial, and commercial uses. In addition to the developed areas, which dominate the project construction footprint, four plant communities—three Mojavean desert scrubs and an open Joshua tree woodland-scrub—were mapped within the Study Area The four communities —Joshua tree woodland, Mojave creosote bush scrub, saltbush scrub (halophytic phase), and saltbush scrub (xerophytic phase)—were further subdivided into seven mapping units based on level of disturbance and are described in detail below.

Areas that had significant recent topographic disturbance but were in some early stage of recovery and had enough remnant vegetation to identify the plant community were mapped as disturbed (for example, "disturbed creosote bush scrub"). These areas are also small and patchy or linear, surrounded by development or transportation corridors, and lack the connectivity, sustainability, and integrity to support the ecological and habitat functions of undisturbed community types. Conversely, areas that have been and are currently sheep-grazed were not mapped as disturbed; the structure and species composition have been affected by the grazing but the basic ecological and habitat functions and values are still intact.

Biological Resources Appendix A - Table 1 Plant Communities/Cover Types within the Rosamond Alternative Study Area

Plant Communities/Cover Type	Acreage
Rosamond Pipeline	
Developed/Disturbed (paved and unpaved roads, vacant disturbed lots, developed areas)	969.87
Joshua Tree Woodland	84.21
Mojave Creosote Bush Scrub	2,255.00
Disturbed Creosote Bush Scrub	163.66
Saltbush Scrub (halophytic phase)	322.12
Saltbush Scrub (xerophytic phase)	1,706.14
Disturbed Saltbush Scrub (xerophytic phase)	338.13
Rock Outcrop	8.16
SUBTOTAL STUDY AREA	**5,987.24**

The species composition, structure, and physical and geographical setting of each of the communities listed above are discussed below. Plant community designations are based generally on Holland (1986) to ensure consistency with previous BSEP mapping efforts (BS 2008a).

Mojave Creosote Bush Scrub

Creosote bush scrubs are the dominant habitat in the study area, representing 2,255 acres or 38 percent of the total study area. This open to sparse community of widely spaced, evergreen, microphyllus shrubs is best represented in the northern two-thirds of the study area. Here the soils are well-drained, nonsaline alluviums of a typically very low available water holding capacity on backslopes and toeslopes, fans, lower bajadas, and well-drained plains. It intergrades with saltbush scrub on sites with higher soil salinity, and sites with thin residual soils (Holland 1986). Joshua tree (*Yucca brevifolia*) is an occasional component of the creosote bush scrub in the Rosamond Hills area and scattered north of EAFB but makes up less than a few percent cover in this mapping unit.

Creosote bush (*Larrea tridentata*) is the clear dominant in most areas, and occurs as an open, often species-poor shrub-scrub of microphyllous shrubs and sub-shrubs 0.5 to 2 meters high in the project area. It varies from a species-poor community, such as that found along Division Street, to an enriched community of greater shrub diversity in the area around Cache Creek. The most common associates in the habitats occurring along the alignment include white bursage (also known as burro-weed) (*Ambrosia dumosa*), winterfat (*Krascheninnikovia lanata*), and Nevada tea (*Ephedra nevadensis*); other associated shrubs and subshrubs include box thorn (*Lycium andersonii*), cheesebush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), and goldenhead (*Acamptopappus shockleyi*). No cacti were observed except for a few widely scattered silver cholla (*Cylindropuntia echinocarpa* ssp. *echinocarpa*), and native bunchgrasses are occasional, predominantly desert needlegrass (*Achnatherum speciosum*). Most of this community, as it occurs in the project area, has a history of sheep-grazing, which continues today and has had a conspicuous effect on the species composition of the herb layer; invasive non-native plants such as red-stemmed filaree (*Erodium cicutarium*)

and cheatgrass (*Bromus tectorum*) have a cover of 10-20 percent in many areas. Characteristically, creosote bush scrubs have a conspicuous component of colorful annual wildflowers in years of average or better rainfall; however, surveys for this reconnaissance-level assessment were conducted in mid-July.

Mojave creosote bush scrub is an open to somewhat sparse community across its range, depending on the soil moisture/productivity; the total cover is typically between 5 and 10 percent, as high as 15-20 percent in late seral stages (Marshall 1995), and the community in the study area is representative of the type. All examples within or adjacent to the alignment were in a mid-seral stage. A few early seral examples were seen near California City Boulevard in the areas mapped as “Disturbed creosote bush scrub” that had been brushed or bladed in recent years. Creosote bush density and cover are generally decreased by disturbance (Marshall 1995); in a comparison between vegetation on disturbed and undisturbed Mojave Desert sites, creosote bush was dominant on all control sites and subdominant to white bursage on disturbed sites. Species with high recruitment and mortality rates, such as white bursage, are dominant in the colonizing stage and species with low recruitment and mortality, such as creosote bush, eventually dominate the landscape, although colonizing species usually remain present. Creosote bush may require as much as 100 years to recover following disturbance from fire (Marshall 1995).

Creosote bush achieves its status as one of the most stable members of desert communities by cloning (vegetative propagation). When drought is extreme, old branches and roots die back. When rains return, branches are replaced by sprouts originating near the outside of the root crown. Creosote bush clones gradually expand to form rings many meters in diameter. It may occasionally sprout from its root crown after disturbance. New sprouts were produced by creosote bush on a Mojave Desert site that had been denuded by grading (Marshall 1995) and a similar example was seen at the northern end of the study area in the area mapped as “disturbed creosote bush scrub”; however, the time required to reach maturity may be 50-100 years at some sites. Age distribution in many stands of creosote bush indicates that seed germination and survival under natural conditions are rare. Creosote bush requires summer rains for successful sexual reproduction.

Creosote bush is known to attain ages of several thousand years; some creosote bush clones may be the earth's oldest living organisms. The age of the largest clone in Johnson Valley, California, is estimated at 9,400 years (Marshall 1995). The average longevity of creosote bush was estimated to be 1,250 years at a study site in Dateland, California. No creosote bush rings were observed in the habitats along the pipeline alignment, or viewed remotely from aerial photos, but may occur away from the alignment is less disturbed areas.

Many animals bed in or under creosote bush and domestic sheep dig shallow beds under creosote bush because it provides the only shade in this desert scrub community. Desert reptiles and amphibians use creosote bush as a food source and perch site and hibernate or aestivate in burrows under creosote bush, avoiding predators and excessive daytime temperatures. Desert tortoises dig their shelters under creosote bush where its roots stabilize the soil (Marshall 1995). Seventy-one percent of desert tortoise burrows studied near San Bernardino, California, were associated with creosote bush

[Baxter et al 1988). Merriam's kangaroo rats often make their dens under creosote bush. Many small mammals, such as black-tailed hare, browse creosote bush or consume its seeds and browse terminal twigs. Creosote bush dominates the diet of desert woodrat in the Mojave Desert.

Creosote bush scrub is extensive from the Death Valley region southward across the Mojave Desert to the little San Bernardino Mountains, eastward to northwestern Arizona and southern Nevada. It is the dominant plant community below 3,000 or 4,000 feet in this region, and ranges from 600 to 4200 ft elevation.

Saltbush Scrub (xerophytic phase)

The xerophytic phase of saltbush scrub (predominantly allscale) is the second most common plant community in the study area, comprising 1706.14 acres of the study area. Disturbed saltbush scrub makes up another 388.13 acres, for a total of 2094.27 acres of the study area. Alkali desert scrubs of mixed saltbush and other chenopods are a heterogeneous habitat whose component plant assemblages vary considerably in composition along gradients of moisture, salinity, and microtopography. They are often subdivided into two phases: xerophytic and halophytic. The xerophytic phase described in this mapping unit occurs on dry, well-drained and generally non-saline to slightly saline soils, in contrast to the moderate to hyper-saline-alkaline soils of the playas, playa margins, and basin bottoms that support the halophytic phase saltbush scrub. The xerophytic phase consists of open stands of very low to low (0.25-2.0 m) grayish, spinescent, leptophyllous to microphyllous shrubs and subshrubs, which are physiognomically uniform, widely spaced, occur on relatively dry soils, and exhibit low to moderate osmotic tolerance. Soils in allscale stands (i.e., xerophytic phase) contained few salts, though the water table was as shallow as 5 m (16.4 ft), but permanent water was mostly much deeper. The soils under allscale communities are often very deep, tend to have high proportions of silt and clay, and have a much greater moisture holding capacity than soils of creosote bush communities. Conversely, soils supporting desert holly (*Atriplex hymenolytra*) are often very coarse and gravelly.

Allscale (*Atriplex polycarpa*) is the dominant species in the xerophytic phase of saltbush scrub in the project area; however shadscale (*A. confertifolia*) is also important. Fourwing saltbush (*A. canescens*) was also observed but not dominant. Other important shrubs here include rubber rabbitbrush (*Chrysothamnus nauseosus*), matchweed (*Gutierrezia microcephala*), bush buckwheat (*Eriogonum fasciculatum*), goldenhead, white bursage, creosote bush, cheesebush, and occasional Joshua tree. Only a few cacti—widely scattered silver cholla--were found along the alignment.

Areas mapped as “Disturbed saltbush scrub”, most common in the segment between Sierra Highway and the railroad tracks, are dominated by allscale and pioneer species such as rabbitbrush, match weed, and cheesebush, with occasional shadscale and fourwing saltbush. Weedy, non-native herbs dominate the herb layer, and include cheatgrass, red-stemmed filaree, bristly fiddleneck (*Amsinckia tessellata* var. *tortifolia*), Russian thistle (*Salsola tragus*), and Sahara mustard (*Brassica tournefortii*), and an annual pepperweed (*Lepidium* sp.).

Saltbush scrub has become a much more important constituent of many cold desert communities than before exploitation of western rangelands. Shadscale increases as more desirable forage species are weakened. However, compositional change under protection or under grazing treatments favorable to range improvement is not linear over time and may require either man caused natural catastrophic events to be set in motion (Rowlands 1988). Other species of shrubby saltbushes probably live about as long or within an order of magnitude. In cold desert communities, plants seem to be highly plastic with no reliable size-age relationship. However, general patterns may be inferred. Dominant shrub species of the alkali desert scrub may live for decades; overstory species, such as Joshua trees, and creosote bush, live for centuries; and pioneer subshrubs, except under continuous grazing pressure, do not persist for more than a decade. Recovery following severe disturbance in alkali scrub, like other desert scrub types, requires decades and perhaps centuries (Rowlands 1988).

Alkali desert scrub, which includes mixed saltbush scrubs, occurs in California throughout the Mojave Desert, parts of the Colorado Desert, parts of northeastern California within the Great Basin, and in the southern San Joaquin Valley. Examples of the halophytic phase of alkali scrub are common in California deserts, but are scattered and usually associated with dry lakes and flood plains of rivers such as the Mojave, Colorado, and Amargosa. Alkali Scrub phases occur from below sea level in Death Valley to over 5900 ft in some Great Basin locations.

Saltbush Scrub (halophytic phase)

In addition to the described soil chemistry for a particular soil 'series' (NRCS 2009), the species composition of a site, at the association level, typically offers strong clues as to a site's drainage class and soil chemistry.

The halophytic phase of saltbush scrub consists of evergreen to partly deciduous, suffrutescent species 8 to 32 inches in height which exhibit varying degrees of succulence, are generally more closely spaced than the xerophytic phase, tolerate periodic flooding, and generally exhibit a high degree of osmotic tolerance. In the project area, they occur on moderately saline-alkaline soils in the Pond soil series (NRCS 2009) of the playa margins, toe slopes, and basin bottoms that support the halophytic phase saltbush scrub. At sites where the halophytic phase predominates, the available groundwater is usually closer to the surface than associated with the soils and landforms of the xerophytic phase.

This plant community is dominated by shadscale but spinescale (*A. spinifera*), Mojave sea-blite (*Suaeda moquinii*) and alkali goldenbush (*Isocoma acradenia* ssp. *acradenia*) are also common. Forbs and grasses are important constituents of the halophytic phase and the overall plant cover is denser than the xerophytic phase. Common and characteristic herbs of the halophytic phase of saltbush scrub observed in the project area during the mid-July surveys include arrow-weed (*Pluchia sericiea*) alkali pineapple weed (*Chamomila occidentalis*), kochia (*Kochia californica),* and annual atriplex (*Atriplex* sp.). Cacti are noticeably absent from this phase.

Joshua Tree Woodland

Joshua tree woodlands, although generally sparse in absolute or relative cover, are a conspicuous and important component in some areas and are both an indicator and icon of the Mojave Desert landscape (Baldwin et al 2002). Joshua tree habitats are characterized as open, “succulent woodlands” of widely scattered Joshua trees with a low to more or less dense community of broad-leaved evergreen and deciduous shrubs found in desert scrub habitats. Its density in the project area is low, making up less than 10 percent cover (the typical threshold for woodland tree cover) and as little as approximately 3-5 percent cover in this mapping unit. Areas where Joshua tree were only scattered or make up less than 3-5 percent cover were mapped according to the dominant shrub species: creosote bush or saltbush. Joshua trees are usually are the only arborescent shrubs present.

Joshua tree is recognized in several vegetation types, but while often a visual dominant, it is rarely a true dominant in terms of abundance; its identification as a “woodland” is somewhat erroneous but even with low relative cover (relative to the cover of shrubs in the understory) it nevertheless exerts a strong influence on the habitat values of the community. Because Joshua trees are the only sizable trees in many Joshua tree habitats, this species enhances the shrublike character of desert scrub habitat. Joshua trees provide song perches, lookout posts, and nest sites for birds (e.g., ladder-backed woodpecker, cactus wren, Scott's oriole). The sharp spiny leaves provide protective havens for birds and lizards (Miller and Stebbins 1964). The desert night lizard, in particular, requires fallen Joshua tree branches, dead clumps of Joshua Trees or other yucca species, or other debris for shelter.

Species composition in Joshua tree woodland varies depending on the dominant shrub species in the understory, i.e., in areas where creosote bush is dominant, common and characteristic species of that community would be present. Conversely, common shrubs, sub-shrubs, and herbs of the xerophytic phase of saltbush scrub occur in the understory of Joshua tree woodland where saltbush dominates the shrub layer. The Joshua tree root system is described as deep and extensive (Gucker 2006). A large number of small fibrous roots penetrate down and horizontally, extending as much as 36 feet out in one documented case.

Joshua tree is a Mojave Desert endemic. Its distribution follows the Mojave Desert boundary in southern Nevada, southwestern Utah, western Arizona, southeastern California, and northern Baja California. Joshua tree occurs in hot, dry sites on flats, mesas, bajadas, and gentle slopes. In the project area, it occurs on the well-drained alluvial plains and lower slopes in the Rosamond Hills area (north end of the Sierra Hwy segment) and continues sporadically north to Division, stopping south of Silver Queen Road. A total of 84.21 acres were mapped within the study area. Joshua tree habitats occur in broad valleys where soils are deep, on alluvial or rocky slopes, and on pediments with minimal runoff surrounding desert, mountains and plains. Soils must be well drained but may vary considerably in other characteristics. Typical soils may be loose, porous, loamy, sandy, or fine gravelly and are more permeable with lower salt concentrations and more organic matter than other soils, especially those at lower elevations.

Joshua trees, though very conspicuous, generally contribute little vegetation cover or stem density; thus, they should be regarded dominant only in terms of stature. Large Joshua trees may exceed 20 ft in height with maximum height ranging from 40 to 50 ft. More specifically, however, Joshua tree is a 20- to 70-ft tall, evergreen, tree-like plant. Trees exceeding 40 feet are rare, and height is easily overestimated. Tree size and growth form often vary with site and climate conditions.

Sensitive Vegetation Communities

Sensitive vegetation communities are those that are considered rare in the region, support special status plant or animal species, or receive regulatory protection. Examples include riparian vegetation, and wetland habitats. Aside from Joshua trees, which are recognized in several area plans and ordinances, including the California Desert Native Plant Act and the Mojave Specific Plan of the Kern County General Plan, no other sensitive vegetation communities occur along the alignment. Other unique or uncommon species or plant associations that were specifically surveyed for along the alignment include creosote bush rings, Mojave yucca, barrel cactus and other cacti (other than the common silver cholla), but these were not found. Playas, dunes and sand sheets, and claypans were searched for because of their potential to support rare plant taxa and were noted under “Soils”, above, where found along the alignment

EPHEMERAL DRAINAGES/WATERS OF THE STATE

The USGS topographic maps encompassing the pipeline alignment identify Cache Creek as the only named blue-line feature that crosses the alignment. Cache Creek is an ephemeral desert wash in the northern portion of the alignment that ultimately drains into the Koehn Lake basin. The USGS topographic maps also depict numerous smaller ephemeral drainages that cross the pipeline alignment, but most of these drainages are very poorly defined channels with no evidence of recent or annual flooding. Only features with a defined bed and bank and other indicators of ordinary high water mark (OHWM) were included in the analysis of impacts. All features depicted in the USGS topographic maps were surveyed where they occur within or adjacent to the ROW. Field characteristics used to define or identify OHWM include: scour or deposition, shelving, drainage patterns, changes in topography or vegetation, etc. (USACE 2005). Twelve drainages were documented that exhibit a defined bed and bank morphology where they occur within the ROW. They range in size from 1.5 to 6 feet in width and up to 2 feet in depth (bank-full position). The Cache Creek channels, including two branches that cross the ROW, are approximately 12 to 15ft wide and up to 4 feet in depth.

Drainages in the project area are ephemeral and lack connection with a navigable water, and lack riparian or desert wash vegetation, or vegetation that differs from the surrounding uplands. These ephemeral drainages nevertheless provide valuable habitat functions and values that may include: groundwater recharge, seasonal habitat and water source for area wildlife, seasonally cooler or more mesic habitat, different soil chemistry (e.g., more alkaline) or naturally disturbed and sandy soils for many common and several special-status plant species that is not provided by the adjacent uplands.

Cache Creek crosses the alignment as a road washout on 20th St East in the northern portion of study area, south of California City Boulevard. Both the channel and banks are used now by off-road vehicles (motorbikes). This ephemeral desert wash has a

direct connection to Eagle Spring at its headwaters in the Piute Mountains, to Koehn Lake, a dry lake that floods seasonally, and is presumed to be a jurisdictional waters of the State.

Rosamond Dry Lake, located approximately one and a half miles east of the wastewater treatment ponds at the point of delivery, is the terminus for the first few drainages that cross the alignment. All other features appear to be isolated drainages and are not connected to a navigable waterway or perennial water body. These drainages simply fan out and disappear in the sandy or gravelly basins that surround the alignment after channeling stormwater runoff from the surrounding low hills, but they are nevertheless treated here as potential waters of the State. There is no outlet for these features; stormwater must leave by evaporation or groundwater infiltration, and no perennial streams or water bodies are connected to any of the drainages crossed by the alignment. Rosamond Dry Lake, the terminus of several drainages at the southern end of the alignment, floods seasonally, as does Koehn Lake, the terminus of Cache Creek. However, most of the other drainages never reach these basins because they fan out and infiltrate the alluvial sediments and groundwater before ever reaching the dry lakebeds.

None of the drainages in the project area contain desert wash vegetation (mesquites, acacias, etc.) or vegetation that is compositionally different from the surrounding uplands beyond a few very widely scattered cheesebush, occasionally a greater density of non-native annual grasses, and one wash near the point of delivery contained a scattering of sagebrush on the banks; consequently, no desert wash vegetation was mapped within the study area. Cache Creek may support desert wash vegetation downstream or at various points along its path but not within the study area. No wetlands occur within or adjacent to the pipeline alignment or components.

Because the drainages in the project area, including Cache Creek, are isolated waters with no direct connection to a perennial stream or other navigable waters or permanent water source such as a lake or spring, they are unlikely to qualify as federally jurisdictional features subject to regulation under the federal Clean Water Act. The features are presumed, however, to qualify as waters of the State, subject to jurisdiction under Section 1600 of the California Fish and Game Code. The U.S. Army Corps of Engineers issued an approved jurisdictional determination for the BSEP Plant Site drainage, Pine Tree Creek, on February 5, 2008, concluding that drainages on the plant site are not jurisdictional waters of the U.S. because they were tributaries to a non-navigable waterway, Koehn Lake (BS 2008a, Appendix F.2).

Cache Creek and the numerous additional unnamed drainages in the project area are typical of the drainages that characterize most of the arid southwest in that they are ephemeral streams rather than perennial (an ephemeral stream is defined as one that flows briefly in direct response to precipitation). Dry desert washes like many of those in the project area support many of the same hydrological and ecological processes as perennial streams, and provide the following functions and values: landscape hydrologic connections; stream energy dissipation during high-water flows that reduces erosion and improves water quality; water supply and water-quality filtering; surface and subsurface water storage; groundwater recharge; sediment transport, storage, and deposition aiding in floodplain maintenance and development; nutrient cycling; wildlife

habitat and movement/migration; support for vegetation communities that help stabilize stream banks and provide wildlife habitat (Levick et al. 2008). All of the drainages in the project area are functionally intact and have had relatively little disturbance; however, Cache Creek, within the pipeline alignment) is currently used by off-road vehicles (dirt bikes) which are eroding the banks and degrade the value of the habitat for wildlife.

WILDLIFE RESOURCES

Throughout the Study Area small mammal sign was abundant with many borrows and signs of activity. This was true of low quality highly disturbed habitat as well as good quality habitat with little or no disturbance. Numerous ground squirrels were observed, all of those identified being whitetail antelope squirrels (*Ammospermophilus leucurus*).

The southernmost reach of the pipeline passes through urban, suburban, and industrial developed areas. These areas were highly disturbed and fragmented with no biological value for desert tortoise or Mohave ground squirrels. The next several miles of the proposed pipeline route runs between railroad tracks and Sierra Hwy. The southern portion of this reach is highly disturbed and bordered by development on one or more sides. As the proposed pipeline route moves north of this reach it enters an undeveloped but highly fragmented and somewhat disturbed area with no habitat value for desert tortoise but potential habitat value for Mohave ground squirrel. As the route moves north towards the north boundary of Edwards Air Force Base, the habitat quality improves and becomes moderate to good quality habitat for desert tortoise and Mohave ground squirrel. North along Division Street, east to Sunset road and north to California City Boulevard the habitat quality is moderate to good. Some parcels would be excellent quality if not for overgrazing by sheep. The route from Trotter Avenue to California City Boulevard has abundant wildlife activity and sign.

Wildlife Habitat

The habitat along the pipeline route provides forage, cover, roosting, and nesting/denning habitat for a variety of wildlife species. Biological Resources Appendix A - Figure 4 shows the extent of good, fair and poor habitat for desert tortoise and Mohave ground squirrel within the pipeline alignment; no excellent habitat for these species was observed during the field surveys. Areas depicted as fair and good habitat on Biological Resources Appendix A - Figure 4 generally corresponds to areas of Mohave creosote scrub and saltbush scrub that have minor disturbance. These areas are considered desert tortoise and Mohave ground squirrel potential habitat and are shown on the Wildlife Habitat Value map (Biological Resources Appendix A – Figure 4).

SPECIAL-STATUS SPECIES - PLANTS

Biological Resources Appendix A – Table 2 lists the special-status plants with potential to occur in the study area based on known occurrences in the vicinity and the presence of suitable habitat. “Suitable habitat” includes a consideration of both general and micro-habitat preferences, such as preferred substrates or hydrology, and a consideration of the known elevation range for the taxon.

Biological Resources Appendix A - Figure 5 shows the location of all CNDDB (2009) documented special-status plant occurrences within a 10-mile area centered on the alignment. This includes plants listed under the state and federal endangered species

acts, and CNPS List 1A, 1B, 2, and 3 plants. CNPS List 4 (watch list) plants were also considered in this analysis but their locations are not tracked by CNDDB. Location information for CNPS List 4 plants was obtained from the Calflora database (Calflora 2009) and from the CNPS Electronic Inventory (CNPS 2009) but is only descriptive and in most cases too general to identify as a point feature.

No federal-listed species have potential to occur within the Study Area, but two state-listed species, Red Rock tarplant (state-designated 'Rare') and Mojave tarplant (State-listed Endangered), have been recorded approximately 15 miles away in gravelly volcanic tuffs and riparian scrubs (respectively) in the Piute Mountains (CNDDB 2009). Based on the absence of nearby records and the lack of suitable habitat, staff concludes that these two species are not likely to occur in the Study Area.

Biological Resources Appendix A – Table 2 - Special-Status Plant Species with Potential to Occur in the Rosamond Alternative Study Area

Common Name *Scientific Name*	Listing Status (Fed/ State/ CNPS)	Distribution	Habitat	Bloom Period	Potential in Project Area (Pipeline and Components)
Spanish needle onion (*Allium shevockii*)	-/-/1B.3	Known only from Spanish Needle Peak, NE Kern County	Pinyon-juniper woodland, Upper montane conifer forest; rocky sites; 850 - 2500 m	May-Jun	No suitable habitat in project area; low to no potential to occur
Horn's milk-vetch *Astragalus hornii* var. *hornii*	-/-/1B	South San Joaquin Valley, Western Transverse Ranges, western edge Mojave Desert; west-central Nevada	Meadows and seeps, playas and lake margins; 60-150 m (850 m in w Mojave Desert); salty flats and lake shores (alkaline)	May-Oct	Low to moderate potential on sandy, possibly mesic (but not hydric) flats south of Rosamond
Lancaster milk-vetch *Astragalus preussii* var. *laxiflorus*	-/-/1B	Antelope Valley in the southwest Mojave Desert; known in CA only from near Lancaster and Edwards AFB (EAFB), extremely rare; only reported once in recent years. East into Utah and Arizona.	Chenopod scrub; 700 m; alkaline flats	Mar-May	Moderate to high potential near EAFB south of Rosamond on the alkaline flats
Alkali mariposa lily *Calochortus striatus*	-/-/1B	Western Mojave Desert and western Nevada	Chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps; 70-1595 m; mesic, alkaline areas	Apr-Jun	Moderate to high potential near EAFB south of Rosamond on the alkaline flats
White pygmy poppy *Canbya candida*	-/-/4	Western Mojave Desert and adjacent Sierra Nevada	Mojavean desert scrub, pinyon and juniper woodland; 600-1460 m; gravelly, sandy, granitic places	Mar-Jun	Moderate to high potential in the non-alkaline, gravelly habitats north of EAFB such as the Sanborn Hill area
Mojave spineflower *Chorizanthe spinosa*	-/-/4	Western Mojave Desert	Chenopod scrub, Joshua tree woodland, Mojavean desert scrub; 6-1300 m; sandy to gravelly flats and slopes	Mar-Jul	Moderate to high potential in the non-alkaline, sandy or gravelly areas north of EAFB such as the Sanborn Hill area
Desert cymopterus *Cymopterus deserticola*	-/-/1B	Western Mojave Desert	Joshua tree woodland, Mojavean desert scrub; 300-950 m; fine to coarse, loose, sandy soil of flats in old dune areas with deep, well-drained sand	Mar-May	Moderate to high potential in the sandy, non-alkaline sites north of Rosamond, particularly north of EAFB near Division and Sunset
Red Rock tarplant *Deinandra arida*	-/R/1B	Red Rock Canyon in the western Mojave Desert of eastern Kern County	Mojavean desert scrub; 300-950 m; in clay soils of washes along ephemeral seeps and streams and on adjacent sand flats in moist, subalkaline, gravelly sand; in wetter years also found on volcanic tuff at base	Apr-Nov	Restricted to canyons and tributaries in Red Rock canyon, over 20 miles from the project area. The valley settings, soils and habitats found in the project area are not likely to support this species.

Common Name *Scientific Name*	Listing Status (Fed/ State/ CNPS)	Distribution	Habitat	Bloom Period	Potential in Project Area (Pipeline and Components)
			and on lower slopes of ridges and cliffs		
Mojave tarplant *Deinandra mohavensis*	-/E/1B	Extirpated in San Bernardino County, still occurs in Riverside and San Diego Counties.	Chaparral, coastal scrub, riparian scrub; 640-1600 m; low sand bars in river beds, along stream channels or in ephemeral grass areas in riparian scrub and chaparral (mesic)	Jun-Oct	Nearest record is over 20 miles to north in Jawbone Canyon area in vernally moist grassy swales, seeps, and creeks. The drier soils and valley setting and habitats found in project area are not likely to support this species.
Recurved larkspur *Delphinium recurvatum*	-/-/1B	Great Central Valley, southern Inner South Coast Ranges (Caliente Range), western Mojave Desert	Chenopod scrub, cismontane woodland, valley and foothill grassland; 3-750 m; poorly drained, fine, alkaline soils in grassland and Atriplex scrub	Mar-Jun	Low to moderate potential in alkaline soils around EAFB; historic collection west of Kramer (1952), not collected since
Kern buckwheat (*Eriogonum kennedyi* var. *pinicola*)	-/-/1B.1	Sweet Ridge area in mountains east of Tehachapi, Kern Co.	Chaparral, pinyon-juniper woodland; clayey soils; 1340-1950 m	May-Jun	Low to no potential; higher elevations and habitats not present in project area to support this taxon
Barstow woolly sunflower *Eriophyllum mohavense*	-/-/1B	central Mojave Desert (west-central San Bernardino Co.)	Chenopod scrub, Mojavean desert scrub, playas; 500-960 m; flats, slight rises, and tops of very low hills or ridges	Apr-May	Moderate to high potential on the bajadas and plains north of EAFB
Red Rock poppy *Eschscholzia minutiflora* ssp. *twisselmannii*	-/-/1B	El Paso and Rand mountains of the western Mojave Desert	Mojavean desert scrub; 680-1230 m; desert washes, flats, and slopes	Mar-May	Known occurrences generally 15 miles or more to the north in mountainous areas on rocky volcanic tuffs; however, 3 historic collections attributed to Rosamond area.. Marginally suitable habitat is present in the project area in the creosote bush scrubs and other non- or sub-alkaline, gravelly, well-drained slopes and washes north of EAFB.
Golden goodmania *Goodmania luteola*	-/-/4	Southern San Joaquin Valley and on the northwestern edge of the Mojave Desert in California in Fresno, Inyo, Kern, Los Angeles, Madera and Tulare counties; also in Mineral County, NV	Mojavean desert scrub, meadows and seeps, playas, valley and foothill grassland; 20-2200 m; alkaline or clay substrates	Apr-Aug	Moderate to high potential near EAFB south of Rosamond on the alkaline flats

Common Name *Scientific Name*	Listing Status (Fed/ State/ CNPS)	Distribution	Habitat	Bloom Period	Potential in Project Area (Pipeline and Components)
Pale-yellow layia (*Layia heteroticha*)	-/-/1B.1	Tehachapi Mtns, western San Joaquin Valley, north Western Transverse Ranges; outer South Coast Ranges	Cismontane woodland, coastal scrub, pinyon-juniper woodland, valley & foothill grassland; open clay soils, sometimes alkaline; 270-1750 m	Mar-Jun	Low potential; habitats known to support this species not found in the project area
Sagebrush loeflingia *Loeflingia squarrosa* var. *artemisiarum*	-/-/2	Great Basin Floristic Province, Mojave Desert (se Kern, ne Los Angeles cos.); to OR, WY	Desert dunes, Great Basin scrub, Sonoran desert scrub; 700-1615 m; sandy dunes and flats	Apr-May	Moderate to high potential on the sandy dunes/flats north of EAFB and sandy areas near Rosamond
Creamy blazing star *Mentzelia tridentata*	-/-/1B	central Mojave Desert	Mojavean desert scrub; 700-1160 m; rocky, gravelly, sandy areas	Mar-May	Low potential to occur in Rosamond alignment south of California City. Nearest occurrences generally 15 miles or more to the north; At least marginally suitable habitat is present in the project area in the creosote bush scrubs and other non- or sub-alkaline, gravelly, well-drained slopes and washes north of EAFB
Crowned onion *Muilla coronata*	-/-/4	southern High Sierra Nevada (e slope), east of Sierra Nevada, n&w Mojave Desert; sw Nevada	Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland; 765 - 1960 m; open desert scrub and woodland, in heavy soils	Mar-Apr	Low potential; documented in more montane elevations and none closer than the Tehachapi Mtns west of Mojave
Charlotte's phacelia *Phacelia nashiana*	-/-/1B	southern High Sierra Nevada, Tehachapi Mountain Area (e slope), w edge Mojave Desert	Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland ; 600 - 2200 m; sandy to rocky, granitic slopes	Mar-Jun	Low potential; occurrences generally more montane than elevations found in alignment south of California City Blvd, e.g., on gravelly scree slopes and canyons of the Piute Mtns, Southern Sierra, etc.. At least marginally suitable habitat is present in the project area in the gravelly, well-drained slopes around Sanborn Hill, e.g.
Piute Mountains jewel-flower (*Streptanthus cordatus* var. *piutensis*)	-/-/1B.2	Kern Co endemic; Piute Mountains, southern Sierra Nevada	Pinyon-juniper woodland; clayey, metamorphic-derived soils, including road banks and cliffs; 1095-1735 m	May-Jul	Low to no potential; higher elevations and habitats known to support this taxon not present in project area
Golden violet (*Viola aurea)*	-/-/2.2	Mojave Desert, eastern Sierra Nevada and Western Nevada	Great Basin scrub, Pinyon-juniper woodland; sandy sites; 1000 – 2040m	Apr-Jun	Historic collection attributed to "Mojave" nearby but no suitable habitat present in the project area

Sources: CNDDB 2009; Calflora 2009; CNPS 2009

Status Codes:

Federal: FE - Federally listed, endangered: species in danger of extinction throughout a significant portion of its range

FT - Federally listed, threatened: species likely to become endangered within the foreseeable future

State
SE - State listed as endangered
ST = State listed as threatened
R = State listed as rare.

California Native Plant Society
List 1B - Rare, threatened, or endangered in California and elsewhere
List 2 - Rare, threatened, or endangered in California but more common elsewhere
List 3 - Plants which need more information
List 4 - Limited distribution – a watch list
0.1 - Seriously threatened in California (high degree/immediacy of threat)
0.2 - Fairly threatened in California (moderate degree/immediacy of threat)
0.3 - Not very threatened in California (low degree/immediacy of threats or no current threats known)

Special-status plant species are unlikely to occur within the construction footprint because construction is confined largely to the road or road shoulder and heavily disturbed areas. Special-status plants could potentially occur outside but adjacent to the construction footprint where roads abut undisturbed habitat in creosote bush scrub and saltbush scrub habitat. These habitats are found in the well-drained, non-saline/alkaline saltbush and creosote bush scrubs between the north side of EAFB and California City Boulevard. Special-status plants potentially occurring in this region include: desert cymopterus and Barstow woolly sunflower, Red Rock poppy, Mojave spineflower, white pygmy poppy, and golden violet. Alkali-dependent plants such as Alkali mariposa lily, Lancaster milk-vetch, sagebrush loeflingia, and golden goodmania are more likely to occur in the alkali flats near the wastewater treatment ponds.

SPECIAL-STATUS SPECIES - WILDLIFE

Special-status wildlife species potentially occurring in the Study Area are discussed below and are listed in **Biological Resources Appendix A – Table 3**.

Biological Resources Appendix A – Table 3: Special-Status Wildlife Species with Potential to Occur in the Rosamond Alternative Study Area

WILDLIFE			
Common Name	***Scientific Name***	**Status State/Federal**	**Potential for Occurrence**
Reptiles			
Desert tortoise	*Gopherus agassizii*	ST/FT	High
Birds			
Burrowing owl	*Athene cunicularia*	CSC/BCC	High
American peregrine falcon	*Falco peregrinus anatum*	SFP/__	Low
Northern harrier	Circus cyaneus	CSC/__	Low
California horned lark	*Eremophila alpestris actia*	WL/__	High
Loggerhead shrike	*Lanius ludovicianus*	CSC/BCC	High
Le Conte's thrasher	*Toxostoma lecontei*	WL/BCC	Moderate
Mammals			
Pallid bat	*Antrozous pallidus*	CSC/__	Low
Spotted bat	*Euderma maculatum*	CSC/__	Low
Mohave ground squirrel	*Spermophilus mohavensis*	T/__	High
American badger	*Taxidea taxus*	CSC/__	High

Sources: CDFG 2009; CNPS 2009

Status Codes:

Federal: FE - Federally listed, endangered: species in danger of extinction throughout a significant portion of its range
FT - Federally listed, threatened: species likely to become endangered within the foreseeable future
BCC: Fish and Wildlife Service: Birds of Conservation Concern: Identifies migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent highest conservation priorities <www.fws.gov/migratorybirds/reports/BCC2002.pdf>

State CSC = California Species of Special Concern. Species of concern to CDFG because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.
SE - State listed as endangered
ST = State listed as threatened
R = State listed as rare.
SFP = Fully protected
WL = Watch List: includes species formerly on California Species of Special Concern List (Remsen 1978) but which did not meet the criteria for the current list of special concern bird species (Shuford and Gardali 2008).

Desert Tortoise

The desert tortoise's range includes the Mojave Desert region of Nevada, southern California, and the southwest corner of Utah and the Sonoran Desert region of Arizona and northern Mexico. The desert tortoise range is divided into Mojave and Sonoran populations. The desert tortoise in the vicinity of the Rosamond alternative water pipeline is part of the Mojave population, which is primarily found in creosote bush-dominated valleys with adequate annual forbs for forage.

Desert tortoise activity is seasonally variable, and in California, peak adult and juvenile activity typically coincides with the greatest annual forage availability during the early spring and summer. However, tortoises will emerge from their burrows at any time of year when the weather is suitable. Hatchling desert tortoises typically become active earlier than adults do, and their greatest activity period can be expected between late winter and spring. During active periods, tortoises feed on a wide variety of herbaceous plants, including cactus, grasses, and annual flowers (USFWS 1994).

Annual home ranges have been estimated between 10 and 450 acres and are age, sex, seasonal, and resource density dependent, with some overlap between individuals (USFWS 1994). More than 1.5 square miles of habitat may be required to meet the life history needs of a tortoise, and individuals have been known to travel as much or more than 7 miles at a time (BLM 2001). In drought years, tortoises can be expected to wander farther in search of forage. During their active period, desert tortoises retreat to shallow burrows and aboveground shade to escape the heat of the day and will also retire to burrows at nighttime. Desert tortoises are primarily dormant in winter in underground burrows and sometimes congregate in communal dens.

No live desert tortoises were detected during the survey, but extensive Mojave creosote bush scrub and saltbush scrub adjoins the pipeline through much of the Study Area (see Biological Resources Appendix A - Figure 4), providing fair to good habitat for desert tortoise.

Mohave Ground Squirrel

The Mohave ground squirrel is rare throughout its range and is restricted to the Mojave Desert in San Bernardino, Los Angeles, Kern, and Inyo counties. This species inhabits desert areas, including alluvial fans, basins, and plains with deep sandy or gravelly friable soils with an abundance of native herbaceous vegetation. Mohave ground squirrels can be found in Mojave creosote bush scrub, shadscale desert scrub, alkali scrub, and Joshua tree woodland. This species feeds on green vegetation and seeds but may also eat carrion (BS 2008a).

This diurnal ground squirrel is active above ground in the spring and early summer. Emergence dates vary from March to June, depending on elevation. Squirrels begin aestivation in July or August. Stored body fat is the principal source of energy for aestivation, although food is also stored in the burrows. Home range size averages approximately 0.91 acres and varies from 0.25 to 2 acres.

Populations of Mohave ground squirrel have been diminished by urban development, off-road vehicle use, and agriculture. The Mohave ground squirrel is threatened by loss of habitat and degradation of habitat due to urban, suburban, and rural development; agriculture; military activities; energy development; livestock grazing; and off-highway vehicle use.

Protocol surveys were not conducted for Mohave ground squirrel, and instead the evaluation of potential presence of this species was based on habitat assessments. An extensive area of Mojave creosote bush scrub and saltbush scrub adjoins the pipeline throughout much of the Study Area (see Biological Resources Appendix A - Figure 4), and this habitat provides suitable habitat for the Mohave ground squirrel.

Desert Kit Fox

The desert kit fox (*Vulpes macrotis*) is not a special-status species, but it is protected under Title 14, California Code of Regulations (sections 670.2 and 670.5), and potential impacts to individuals of this species must be avoided (CDFG 2009). Desert kit fox were not detected along the pipeline route, but the northern two thirds of the Study Area includes suitable foraging and denning habitat for this species.

American Badger

American badgers were once fairly widespread throughout open grassland habitats of California. They are now uncommon, permanent residents throughout most of the state, with the exception of the northern North Coast area. Known to occur in the Mojave Desert, they are most abundant in the drier open stages of most shrub, forest, and herbaceous habitats with friable soils. In the southwest, badgers are typically associated with Mojave Creosote Bush Scrub and sagebrush. Badgers are fossorial, digging large burrows in dry, friable soils and will use multiple dens/cover burrows within their home range. They typically use a different den every day, although they can 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 in depth. Natal dens are larger and more complex than cover dens. In undisturbed, high-quality habitat, badger dens can average 0.64 dens per acre, but are much lower in highly disturbed areas (Sullivan 1996).

No American badgers were detected during project surveys although the California Natural Diversity Data Base (CNDDB) indicates an occurrence in the Study Area. The northern two-thirds of the Study Area offers fair to good habitat for this species.

Spotted Bat

Spotted bats occur throughout western North America, and have been found from below sea level to 9,000 feet in arid, low desert habitats to high elevation conifer forests (WBWG 2005). Prominent rock features appear to be a necessary feature for roosting; roost sites are cracks, crevices, and caves, usually high in fractured rock cliffs (WBWG 2005). Spotted bats feed primarily on moths and are apparently solitary but occasionally roost or hibernate in small groups (WBWG 2005). This species is infrequently captured, although in the southwest spotted bats have been most often captured over water (WBWG 2005).

Pallid Bat

Pallid bats range throughout western North America, inhabiting low elevation rocky arid deserts and canyonlands, shrub-steppe grasslands and higher elevation coniferous forests (WBWG 2005a). They are most abundant in xeric ecosystems, including the Great Basin, Mojave, and Sonoran deserts. This species can be a solitary rooster, or can occupy small or large roost groups; day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, hollow trees or bark, and various human structures such as bridges, barns, porches, bat boxes, and human-occupied as well as vacant buildings (WBWG 2005a).

Western Burrowing Owl

Western burrowing owls inhabit arid lands throughout much of the western United States and southern interior of western Canada (Haug et al. 1993). In the Mojave Desert region, and in many other areas, this species has declined because of habitat modification, poisoning of its prey, and introduced nest predators. The burrowing owl is crepuscular and nocturnal and usually non-migratory in this portion of its range.

Burrowing owls are unique among the North American owls in that they nest and roost in abandoned burrows, especially those created by California ground squirrels, kit fox,

desert tortoise, and other wildlife. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats. They often return to burrows used in previous years, especially if they were successful at reproducing there in previous years (Gervais et al. 2008). The southern California breeding season (defined as from pair bonding to fledging) generally occurs from February to August with peak breeding activity from April through July (Haug et al. 1993).

In the Mojave Desert, burrowing owls generally occur at low densities 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 (Gervais et al. 2008). Burrowing owls tend to be opportunistic feeders. Large arthropods, mainly beetles and grasshoppers, comprise a large portion of their diet. Small mammals, especially mice and voles (*Microtus*, *Peromyscus*, and *Mus* spp.), are also important food items. Other prey animals include reptiles and amphibians, young cottontail rabbits, bats, and birds, such as sparrows and horned larks. Consumption of insects increases during the breeding season (Haug et al. 1993).

No burrowing owls were observed during the 2009 surveys, but suitable burrowing owl habitat occurs throughout the northern two-thirds of the Study Area.

American peregrine falcon

Peregrine falcons are uncommon breeding residents and migrants in California, nesting on high cliffs, near wetlands, lakes, rivers, or other water. They hunt for birds by swooping from flight onto flying prey. Peregrine falcons probably use the airspace near the pipeline route occasionally, but are not expected to nest in the area. Habitat within the Study Area provides no nesting sites for this species and limited foraging opportunities.

Northern harrier

Northern harriers breed in open wetlands, including marshy meadows, wet lightly grazed pastures, old fields, freshwater and brackish marshes, and dry uplands including upland prairies, mesic grasslands, drained marshlands, croplands, cold desert shrub-steppe, and riparian woodland. The densest populations of northern harriers are typically associated with large tracts of undisturbed habitat dominated by thick low vegetation growth (Macwhirter and Bildstein 1996). Harrier prey includes small and medium-sized mammals (primarily rodents), birds, reptiles, and frogs.

Within eastern Kern County, the northern harrier is present year-round, but the population fluctuates due to seasonal migration. Northern harriers rarely breed within the eastern portion of Kern County (Morlan 2008). However, annual breeding activity has been documented in the vicinity (Morlan 2008). Nesting typically occurs in close proximity to marsh habitat or otherwise routinely saturated areas, including active alfalfa fields.

Habitat within the Study Area provides no nesting sites for this species and limited foraging opportunities.

Loggerhead Shrike

Loggerhead shrikes are uncommon residents throughout most of the southern portion of their range, including southern California. In southern California they are generally much more common in interior desert regions than along the coast (Humple 2008). In the Mojave Desert this species appears to be most numerous in flat or gently sloping deserts and desert/scrub edges, especially along the eastern slopes of mountainous areas (Humple 2008). Loggerhead shrikes initiate their breeding season in February and may continue with raising a second brood as late as July; they often re-nest if their first nest fails or to raise a second brood (Yosef 1996).

This species can be found within lowland, open habitat types, including creosote bush scrub and other desert habitats, sage scrub, non-native grasslands, chaparral, riparian, croplands, and areas characterized by open scattered trees and shrubs. Fences, posts, or other potential perches are typically present. In general, loggerhead shrikes prey upon large insects, small birds, amphibians, reptiles, and small rodents over open ground within areas of short vegetation, usually impaling prey on thorns, wire barbs, or sharp twigs to cache for later feeding (Yosef 1996).

Loggerhead shrikes are relatively common in eastern Kern County and are typically associated with open desert, Joshua tree woodland, and populations are thought to be stable or even increasing in eastern Kern County (Morlan 2008). Suitable habitat for loggerhead shrike occurs throughout the scrub habitats within the Study Area, and loggerhead shrikes were observed during the 2009 survey.

Le Conte's Thrasher

This species inhabits some of the hottest and driest habitats in the arid southwest, including the Mojave Desert where they occur year-round. Preferred habitats include sparse desert scrub, alkali desert scrub, and desert succulent scrub habitats with open desert washes. They seek gentle to rolling slopes bisected by dry desert washes, conditions found on alluvial fans that are found in the pipeline route area. The Le Conte's thrasher population densities are among the lowest of passerine (perching) birds, estimated at less than five birds per square kilometer in optimal habitats (Fitton 2008). This low population density decreases the probability of their detection during field surveys. This species requires areas with an accumulated leaf litter under most plants as cover for its preferred arthropod prey; it also feeds on seeds, insects, small lizards, and other small vertebrates.

This species could use habitat within the Study Area and vicinity for nesting, foraging, and cover.

California horned lark

California horned larks prefer areas with sparse vegetation and exposed soil. In western North America, this species is associated with desert brushlands, grasslands, and similar open habitats, as well as alpine meadows (Garrett and Dunn 1981). Throughout their range, horned larks avoid all habitats dominated by dense vegetation and become scarce and locally distributed in heavily forested areas.

Multiple individuals of this species were observed during the 2009 survey within the 1000-foot buffer of the Study Area.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

IMPACTS TO PLANT COMMUNITIES

Biological Resources Appendix A – Table 4 summarizes construction impacts to native plant communities and other cover types. The pipeline alignment was designed to minimize impacts to native vegetation and sensitive resources by confining the construction footprint to the road bed and embankment along a network of existing roads. Biologists were consulted during the design phase of the development of the alignment and design modifications were incorporated to avoid biological resources. For example, staging areas were sited in already disturbed or developed areas, and jack and bore areas were placed in disturbed road and railroad embankments. Consequently, most of the impact area (82 percent) within the construction footprint is within already disturbed and/or developed with paved and unpaved roads and road shoulder, vacant and bladed urban lots. Much of the native vegetation that would be affected within the construction footprint is of low quality because these roadside lands are weedy, fragmented, subject to vegetation maintenance and disturbance.

Biological Resources Appendix A – Table 4: Impacts to Plant Communities/Cover Type from Construction

Plant Community/Cover Type	Project Feature	Impact (ac)	Total Impact (ac)
Developed-Disturbed	Pipeline	65.80	**76.17**
	Staging Area	5.06	
	Jack & Bore Area	0.52	
	Booster Station	4.79	
Creosote Bush Scrub	Pipeline	3.76	**4.29**
	Staging Area	0.53	
Disturbed Creosote Scrub	Pipeline	0.00	**1.99**
	Staging Area	1.99	
Saltbush Scrub (xerophytic phase)	Pipeline	4.28	**6.8**
	Staging Area	0.39	
	Jack & Bore Area	0.21	
	Booster Station	1.89	
Disturbed Saltbush Scrub (xerophytic phase)	Pipeline	0.99	**3.02**
	Staging Area	1.98	
	Jack & Bore Area	0.05	
Saltbush Scrub (halophytic phase)	Pipeline	0.06	**0.11**
	Jack & Bore Area	0.05	
Rock outcrops		0.00	
Joshua Tree Woodland		0.00	
	TOTAL		**92.36**

Pipeline trenching and staging areas would affect 6.28 acres of creosote bush scrub, (1.99 acres of which is disturbed) and 9.93 acres of saltbush scrub (3.02 acres of which is disturbed). The construction impacts to native plant communities would be largely temporary, with the only permanent loss the 1.89 acres of saltbush scrub (xerophytic phase) at a booster station. These impacts are less than significant from a vegetation perspective because these plant communities are common and widespread plant communities in the Mojave Desert, and because the impacts are small and temporary. However, the affected habitat in the project area also provides moderate to good habitat for the desert tortoise (federal- and state-listed as threatened) and Mojave ground squirrel (state-listed as threatened). Potential impacts to listed wildlife species associated with creosote bush scrub are described in more detail below.

While the project impacts to native plant communities are small and mostly temporary, the temporal loss for these arid plant communities from pipeline construction can span decades to centuries (Lathrop & Archibold 2004; Marshall 1995). The disturbed soils will be revegetated, but in the Mohave Desert revegetation success is highly dependent on techniques used. Failed revegetation projects often result from the inability of sites to begin natural soil-forming processes (Haigh 1992). Soil-forming processes require nitrogen capital, nutrient exchange capacity, and an active community of soil organisms (Newton and Claassen 2003) all of which would be absent in the disturbed soil within the trench.

To increase chances for revegetation success within disturbed native plant communities, topsoil should be stockpiled from the project site for use in revegetation of the disturbed soils of the trench; native topsoil from the least disturbed locations on the project site will contain a seedbank of native species and beneficial soil organisms. Only areas that are relatively free of noxious weeds should be used as borrow sites. The efficacy of topsoil salvage and replacement can be variable (Abella et al 2007), depending on soil depth, the length of time soil is stored, and mixing of the uppermost layer—where most seeds are contained—and the lower layers. Based on soil seed bank sampling in the northern Mojave (Guo et al 1999), 91 percent of the total seeds were in the upper 2cm of soil and only 9 percent occurred between 2-10 cm. Consequently, only the upper 1 inch of topsoil should be scraped and stockpiled for reuse as the top-dressing for the trench and may need to be applied by hand to ensure even coverage. An additional 6 to 8 inches of soil below the seedbank shall also be scraped and temporarily stockpiled for re-use, followed by an application of the soil seed bank (the upper 1 inch of soil). Duration of the pipeline construction is estimated at approximately one mile per day to one-half mile per day, ensuring that the soil would not be stockpiled long enough to adversely affect viability of the soil seed bank.

Seeding of the areas where native topsoil is used may hinder natural regeneration, depending on the species used. However, a speedy recovery of native species can also prevent quick recolonization by noxious weeds and other invasive non-native plants. Consequently, in addition to the use of native topsoil, disturbed areas need to also be seeded, but only with locally collected native seed from the West Mojave Desert region. Appropriate seeds would include a mix of short-lived early pioneer species such as native annuals and perennials and subshrubs such as squirreltail, cheesebush, matchweed, peppergrass, and rabbitbrush.

Soil disturbance from construction activity often renders habitat vulnerable to invasion by non-native species (Lathrop & Archibald 1980); many noxious weeds are associated with disturbed areas and they are already common in some areas of the alignment along roadway rights-of-way (ROW). The spread of invasive plants is a major threat to biological resources in the Mojave Desert because non-native plants can displace native plants (and the wildlife that depend on them), increase the threat of wildfire, alter the habitat structure and ecological function of wetland, riparian, and desert wash communities, and invade threaten special-status plant occurrences and habitat (Zouhar et al 2008; Lovich 1998; Lovich et al 1997, Lovich et al 1996). Construction activities have the potential to indirectly affect botanical resources through the spread of weeds already present in the construction footprint to currently uninfested areas, and by the accidental introduction of new weed species from contaminated equipment and straw (used for erosion control).

These potential impacts to native plant communities would be avoided or minimized through implementation of staff's proposed conditions of certification. These conditions include measures to establish and protect Joshua trees and drainages as Environmentally Sensitive Areas, recommendations to enhance revegetation (**BIO-21**) and avoiding spread of noxious weeds (**BIO-8**, **BIO-21**). In addition, disturbed areas along the pipeline shall be revegetated, as described in staff's proposed Condition of Certification **BIO-21**.

IMPACTS TO SPECIAL STATUS PLANTS

No federal-listed Threatened or Endangered plants are known from the project vicinity or are expected to occur. The state-listed Red Rock tarplant (state Rare) and Mojave tarplant (state Endangered) are not expected to occur in the project area; these two species occur approximately 15 miles away in gravelly volcanic tuffs and riparian scrubs (respectively) in the Piute Mountains, and no such habitat is present in or near the Study Area. The valley setting, soils and habitats found in the project area are not likely to support these two state-listed species. Based on the July reconnaissance surveys of the pipeline alignment, staff has concluded that construction impacts to special-status plant species are unlikely because they are unlikely to occur within the mostly disturbed project footprint. In the unlikely event that special-status plant species are detected during the surveys (e.g., in adjacent off-road habitat), staff has concluded that direct and indirect impacts to such occurrences can be avoided. This conclusion is based on consultation with the project engineer (LaMoreaux 2009) who has confirmed that sufficient flexibility is available in the 65-ft county right-of-way to shift the pipeline alignment away from sensitive plant occurrences. The pipe joints provide three-degree deflexion so that the pipeline alignment can be moved within the ROW as necessary to avoid sensitive resources. Furthermore, if necessary the construction footprint can be narrowed to 16 feet for short reaches (LaMoreaux 2009).

Staff's proposed Condition of Certification **BIO-20** requires pre-construction floristic surveys and development of a Sensitive Species Protection Plan (Plan) if plants are detected during pre-construction surveys. The Plan would include measures for avoiding direct impacts by working with the project engineers to adjust the alignment to avoid the plants and an adequate buffer surrounding it. The Plan would be reviewed and approved by Energy Commission staff and CDFG prior to initiation of pipeline

construction, and would include measures to avoid or minimize indirect impacts including: sedimentation from adjacent disturbed soils; alterations of the site hydrology from changes in the drainage patterns; dust deposition; displacement or degradation of the habitat from the introduction and spread of noxious weeds. The Plan would also include a discussion of monitoring and reporting requirements during and after construction.

With implementation of staff's proposed Condition of Certifications **BIO-20** and **BIO-21**, construction of the Rosamond Alternative pipeline will not result in significant impacts to special-status plant species.

Impacts to Desert Washes and Other Waters

Construction of the pipeline would result in a total of 750 ft^2 (0.02 ac.) of direct, temporary impacts within the north and south forks of Cache Creek (see Biological Resources Appendix A - Figure 5b). This impact estimate is based on the assumption that trenching the pipeline across the creek will result in a maximum 25-foot wide impact area across the north and south forks of Cache Creek, 12- and 15-feet wide, respectively (LaMoreaux 2009). Three additional small, unnamed ephemeral washes, ranging in channel width from 1.5 feet to 8 feet, would be temporarily affected where the alignment has off-road impacts to adjacent habitat (see Biological Resources Appendix A - Figure 5a). A total of 0.003 ac (122 ft^2, 27 lineal feet of channel) of unnamed ephemeral washes would be temporarily affected by trenching and construction activities. Trenching and construction activities could result in minor indirect impacts to water quality within the seasonal features from the erosion and sedimentation. No permanent loss of hydrologic or biological function and value would result from the temporary construction within Cache Creek or the three affected unnamed ephemeral washes. No desert wash or other riparian habitat or vegetation occurs within or adjacent to the ROW, or would be affected directly or indirectly by construction.

Staff's proposed Condition of Certification **BIO-18** and **SOIL&WATER-5** includes Best Management Practices and other measures that would avoid and minimize impacts to waters of the state and potential adverse effects to water quality. With implementation of these conditions no significant impacts would occur to waters of the state or water quality.

IMPACTS TO WILDLIFE

Impacts to Migratory/Special-Status Bird Species

Native vegetation within and near the Rosamond Alternative pipeline provides foraging, cover, and/or breeding habitat for migratory birds, including a number of special-status bird species likely to be present at the site. Loggerhead shrike, LeConte's thrasher, and California horned lark are special-status species likely to breed and forage in plant communities near the pipeline alignment. Pipeline construction could eliminate nesting habitat for these and other species and could result in direct and cumulative impacts to these species due to habitat loss or injury/fatality of individuals. No impacts to northern harrier or peregrine falcon are anticipated because these species occur only infrequently in the vicinity of the project area and do not breed there.

The loss of active bird nests or young is regulated by the federal Migratory Bird Treaty Act and Fish and Game Code section 3503. Implementation of Staff's proposed Conditions of Certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-15** (Pre-Construction Nest Surveys would avoid direct impacts to nests, eggs, or young of migratory birds and would avoid or minimize the impacts of construction disturbance to nesting birds.

Impacts to Burrowing Owls

Burrowing owls, a state species of special concern, could nest on or near the pipeline alignment and could be directly impacted by construction, or indirectly impacted by disturbance associated with construction noise and increased traffic. To avoid potential impacts to burrowing owls, staff's proposed Condition of Certification **BIO-17** requires pre-construction surveys of the pipeline route for burrowing owls. If burrowing owls are detected within 500 feet of proposed construction activities, implementing the measures described in **BIO-17** would avoid direct and indirect impacts associated with pipeline construction.

Impacts to Bats

No spotted bats were observed during the surveys, but no surveys were specifically conducted for this species or any other bats. Staff considers it unlikely that spotted bats inhabit the pipeline route because of the low vegetative cover, high levels of disturbance in some areas, and absence of water features or rocky roost sites that might attract this species. No mitigation is recommended because no impacts are anticipated.

No pallid bats were observed during the surveys, but no surveys were specifically conducted for this species or any other bats. Pallid bats were recorded in 1997 in Red Rock Canyon State Park near an active maternity colony in a mine shaft in the vicinity of a desert spring (CNDDB 2008). It is unlikely that pallid bats inhabit the pipeline route because of the low vegetative cover, high levels of disturbance in some areas, and absence of water features and suitable roosting sites. No mitigation is recommended because no impacts are anticipated.

Impacts to Desert Kit Fox and American Badger

Construction of the Rosamond alternative pipeline could kill or injure desert kit fox and American badger due to construction traffic, by crushing with heavy equipment, or could entomb them within a den if avoidance measures are not implemented. Construction activities could also result in disturbance or harassment of individuals. Staff's proposed Condition of Certification **BIO-16** requires that concurrent with the desert tortoise clearance survey, a qualified biologist perform a preconstruction survey for kit fox dens along the pipeline route, and implement avoidance measures if dens are detected within or near the impact area.

Impacts to Desert Tortoise and Mohave Ground Squirrel

The southern portion of the pipeline route from Rosamond to the north east corner of Edwards Air Force Base is mostly poor habitat for desert tortoises and Mohave ground squirrel due to disturbance by suburban, urban, industrial and rural development. This

area is also highly fragmented by roads and railroads. The presence of transient desert tortoises and Mohave ground squirrel in this poor habitat is unlikely but possible. Further north on the alignment disturbed areas diminish and fair to good desert tortoise and Mohave ground squirrel habitat prevails from the northwest corner of Edwards Air Force Base to California City Boulevard. **Biological Resources Appendix A–Table 4** (above) describes the total acres of plant communities disturbed by the project. **Biological Resources Appendix A–Table 5** summarizes the acreages of desert tortoise and Mohave ground squirrel habitat impacted by project features. Fair and good habitat quality are considered desert tortoise and Mohave ground squirrel habitat, the poor quality habitat is considered unsuitable for both species. Of the 92.36 acres disturbed by the project, 11.2 acres of desert tortoise and Mohave ground squirrel habitat will be impacted and the remaining 81.16 acres of project disturbance is on disturbed areas and low quality habitat generally unsuitable for desert tortoise and Mohave ground squirrel.

Biological Resources Appendix A – Table 5: Desert Tortoise and Mohave Ground Squirrel Habitat Impacted by Construction

Habitat Type	Project Feature	Impact (ac)
Creosote Bush Scrub	Pipeline	3.76
	Staging Area	0.53
Saltbush Scrub (xerophytic phase)	Pipeline	4.28
	Staging Area	0.39
	Jack & Bore Area	0.21
	Booster Station	1.89
Saltbush Scrub (halophytic phase)	Pipeline	0.06
	Jack & Bore Area	0.05
	TOTAL	**11.20**

Pipeline construction will result in temporary loss of 11.2 acres of habitat for desert tortoise and Mohave ground squirrel. Construction activities could also result in direct mortality, injury, or harassment of individuals as a result of encounters with vehicles or heavy equipment. The potential for increased traffic-related mortality is greatest along paved roads where vehicle frequency and speed is highest. Desert tortoises and Mohave ground squirrels may also be affected on dirt roads. The unimproved county roads where the pipeline will be placed are used relatively infrequently, and would experience increased vehicle traffic during construction compared to current use. Upon completion of pipeline construction levels of vehicle traffic are expected to return to pre-project conditions; the dirt and gravel roads will not be widened, paved, or otherwise improved or experience any other changes that would make them more accessible or attractive for use by on or off-road vehicles.

Other potential direct effects of pipeline construction include desert tortoise or aestivating Mohave ground squirrels being crushed or entombed in their burrows, and disturbance by noise or vibrations from the heavy equipment that might disrupt foraging or breeding activities. Desert tortoise may also be attracted to the construction area by application of water to control dust, placing them at higher risk of injury or mortality. Tortoise may take shelter under parked vehicles and be killed, injured, or harassed when the vehicles are moved.

To compensate for loss of 11.2 acres of good to fair desert tortoise and Mohave ground squirrel habitat, staff's proposed Condition of Certification **BIO-21** specifies acquisition of 33.6 acres of suitable habitat for these species. Staff has recommended avoidance and minimization measures to reduce potential construction impacts to desert tortoise and Mohave ground squirrel, including requirements to have a qualified biologist present at all times in the immediate vicinity of project activities that would disturb soil, vegetation, and wildlife, worker training programs, speed limits for construction vehicles and other measures. These are described in staff's proposed Conditions of Certification **BIO-1** through **BIO-8**, which apply to protection of desert tortoise, Mohave ground squirrel and other biological resources. Staff's proposed Condition of Certification **BIO-12** requires verification that all desert tortoise and Mohave ground squirrel avoidance, minimization, and compensation measures have been implemented.

SUMMARY AND CONCLUSIONS

Pipeline installation along the southern 23 miles of the 39.61-mile Rosamond Alternative pipeline alignment would occur almost entirely within the existing road bed and shoulder. Direct impacts to native plant communities due to pipeline construction would total 16.2 acres, including 4.29 acres of undisturbed Mohave creosote scrub and 6.91 acres of undisturbed saltbush scrub. All but 1.89 acres of these impacts would be temporary. Pipeline construction would not directly or indirectly impact sensitive plant communities, rare plants, or wetlands, but would result in temporary direct impacts to 872 ft^2 of waters of the state within Cache Creek (two forks) and three smaller, unnamed ephemeral washes. Impacts to native plant communities and drainages would be temporary, but vegetation recovery within desert plant communities can take decades, and revegetation success is variable. Introduction and spread of noxious weeds is another potential impact of pipeline construction on native plant communities.

Potential impacts to native plant communities and drainages would be avoided or minimized through implementation of staff's proposed Conditions of Certification **BIO-8**, **BIO-20** and **BIO-21**. These conditions include measures to establish and protect Joshua trees and drainages as Environmentally Sensitive Areas, recommendations to enhance revegetation success and measures to avoid spread of noxious weeds. Implementation of staff's proposed Condition of Certification **BIO-18** and **Soil&Water-5** would minimize impacts to water quality during construction within ephemeral drainages.

No state- or federal-listed plant species will be affected by pipeline construction. Other special-status plant species are unlikely to occur within the construction footprint because construction is confined largely to the road or road shoulder and heavily disturbed area. Pre-construction floristic surveys will be conducted in spring 2010 in accordance with guidelines described in staff's proposed Condition of Certification **BIO-20** to determine whether special-status plants occur within areas that might be directly or indirectly impacted by pipeline construction. In the unlikely event that special-status plant species are detected during the surveys, staff has concluded that direct and indirect impacts to such occurrences can be avoided with measures described in **BIO-20**.

Native vegetation within and near the Rosamond Alternative pipeline provides foraging, cover, and/or breeding habitat for migratory birds, including a number of special-status bird species likely to be present at the site. Burrowing owls, loggerhead shrike, LeConte's thrasher, and California horned lark are special-status species likely to breed and forage in plant communities near the pipeline alignment. Implementation of Staff's proposed Conditions of Certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-15** (Pre-Construction Nest Surveys would avoid direct impacts to nests, eggs, or young of migratory birds and would avoid or minimize the impacts of construction disturbance to nesting birds. To avoid potential impacts to burrowing owls staff's proposed Condition of Certification **BIO-17** requires pre-construction surveys of the pipeline route for burrowing owls. If burrowing owls are detected within 500 feet of proposed construction activities, implementing the measures described in **BIO-17** would avoid direct and indirect impacts associated with pipeline construction.

Construction of the Rosamond pipeline would temporarily impact 11.2 acres of desert tortoise and Mohave ground squirrel habitat. Construction activities could also result in direct mortality, injury, or harassment of individuals as a result of encounters with vehicles or heavy equipment. Other direct effects could include individual tortoise being crushed or entombed in their burrows, collection or vandalism, disruption of desert tortoise or Mohave ground squirrel behavior during construction of the pipeline, and disturbance by noise or vibrations from the heavy equipment.

To compensate for temporary loss of 11.2 acres of desert tortoise and Mohave ground squirrel habitat, staff's proposed Condition of Certification **BIO-21** specifies acquisition of 33.6 acres of habitat suitable for these species. Staff has recommended avoidance and minimization measures to reduce potential construction impacts to desert tortoise, including requirements to have a qualified biologist present at all times in the immediate vicinity of construction activities that would disturb soil, vegetation, and wildlife; worker training programs; speed limits for construction vehicles, and other measures. These are described in staff's proposed Conditions of Certification **BIO-1** through **BIO-8**, which apply to protection of desert tortoise, Mohave ground squirrel and other biological resources. Staff's proposed Condition of Certification **BIO-12** requires verification that all desert tortoise and Mohave ground squirrel avoidance, minimization, and compensation measures have been implemented.

With implementation of staff's proposed conditions of certification, construction of the Rosamond Alternative water pipeline would comply with all federal, state, and local laws, ordinances, regulations, and standards relating to biological resources and would mitigate potential impacts to biological resources to less-than-significant levels.

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Note: The tn: 00000 in the references below indicates the transaction number under which the item is catalogued in the Energy Commission's Docket Unit. The transaction number allows for quicker search and retrieval of individual items docketed for a case or used for ease of reference and retrieval of exhibits cited in briefs and used at Evidentiary Hearings.

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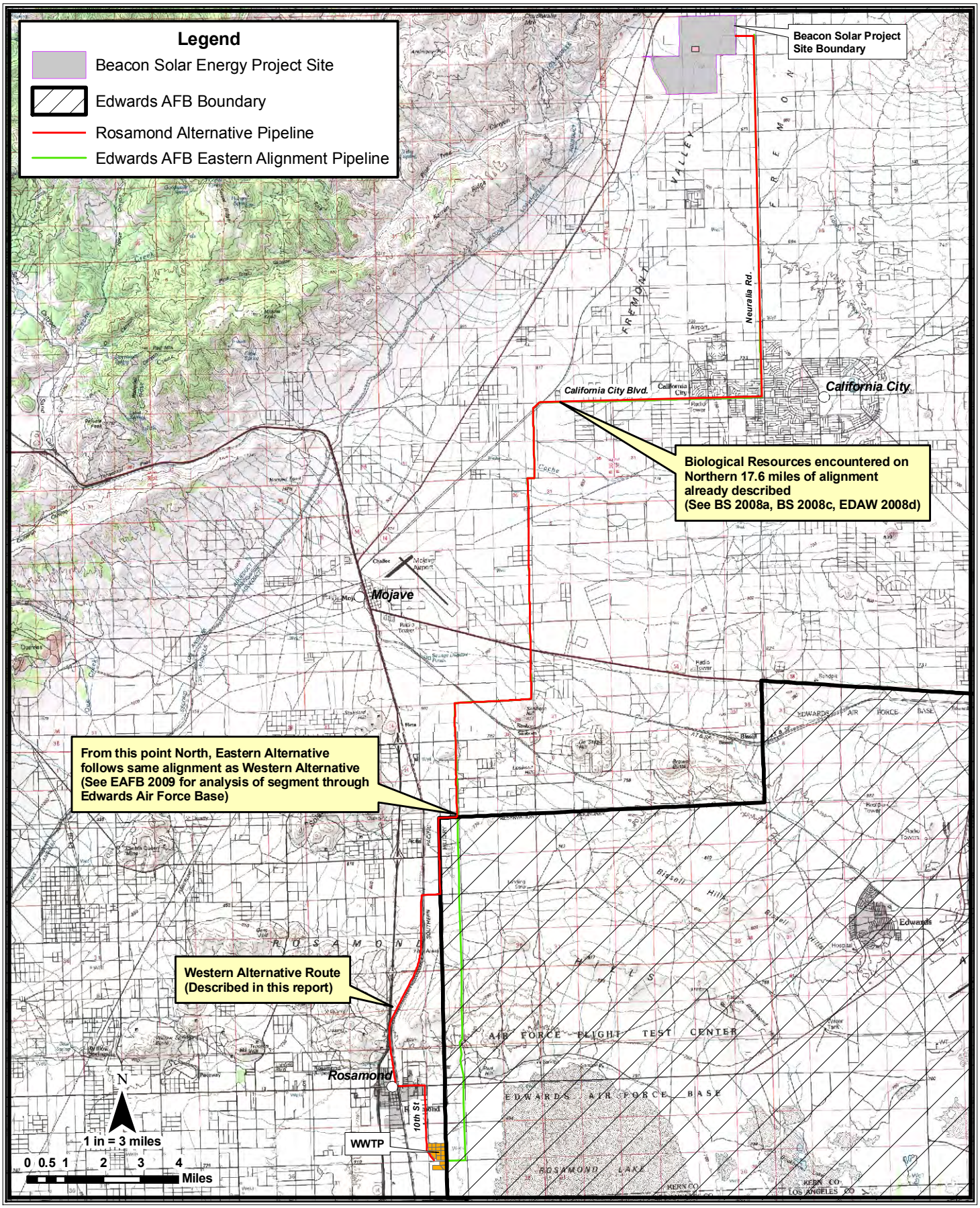
LaMoreaux, Dennis. Assistant General Manager/District Engineer, Rosamond Community Services District. July 19, 2009 field review with botanist Carolyn Chainey-Davis and wildlife biologist Richard L. Anderson of proposed Rosamond water pipeline alignment, staging areas, booster stations, jack and bore sites, and point of delivery at wastewater treatment ponds to discuss project footprint, construction techniques, and strategies for avoiding and minimizing impacts to sensitive biological resources. Discussion included minimum and maximum trench width and work area, minimum work area required for jack and bore sites, pipe and pipe joint flexibility, flexibility within the road right-of-way, moving or adjusting staging areas to confine work to already disturbed areas, and additional mitigation measures for avoiding sensitive biological resources. Additional email correspondence with Carolyn Chainey-Davis on July 23 – 30, 2009 to discuss construction details and techniques for avoiding biological resources.

LIST OF BIOLOGICAL RESOURCES APPENDIX A - FIGURES

Figure 1:	Vicinity Map
Figures 2a -l:	Plant Communities
Figures 3a, b	Photos of Study Area
Figure 4:	Wildlife Habitat Values in Study Area
Figures 5a, b:	Drainages and Other Waters
Figure 6a, b	CNDDB occurrences

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 1

Beacon Solar Energy Project - Vicinity Map

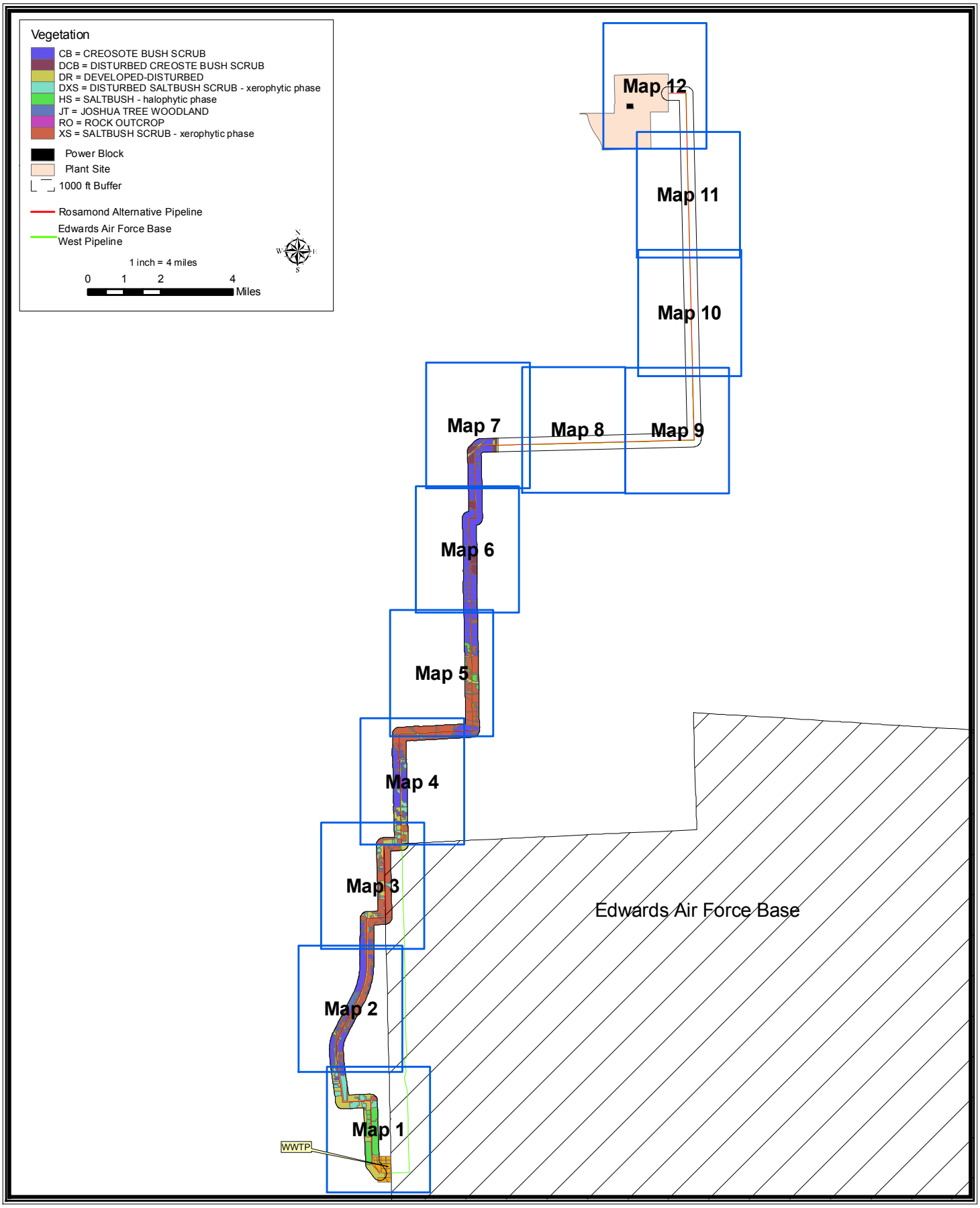


CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION,SEPTEMBER 2009

SOURCE: California Energy Commission - TOPO Map - 7. 5 minute USGS quadrangles:
Rosamond, Soledad Mtn, Bissell, Sanborn and Mohave NE

BIOLOGICAL RESOURCES APPEDIX A - FIGURE 2a-l Index Map

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

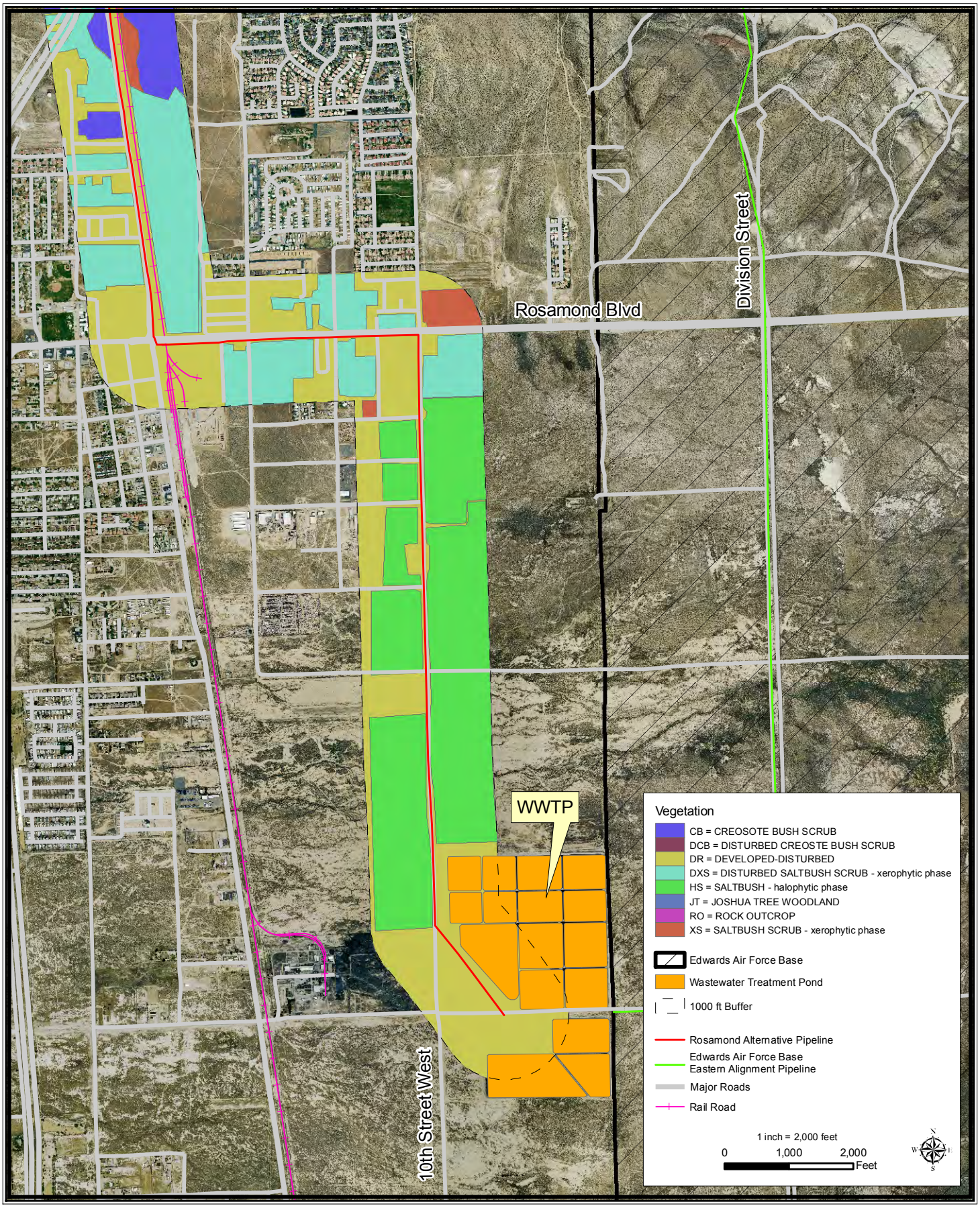


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2a Map 1 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

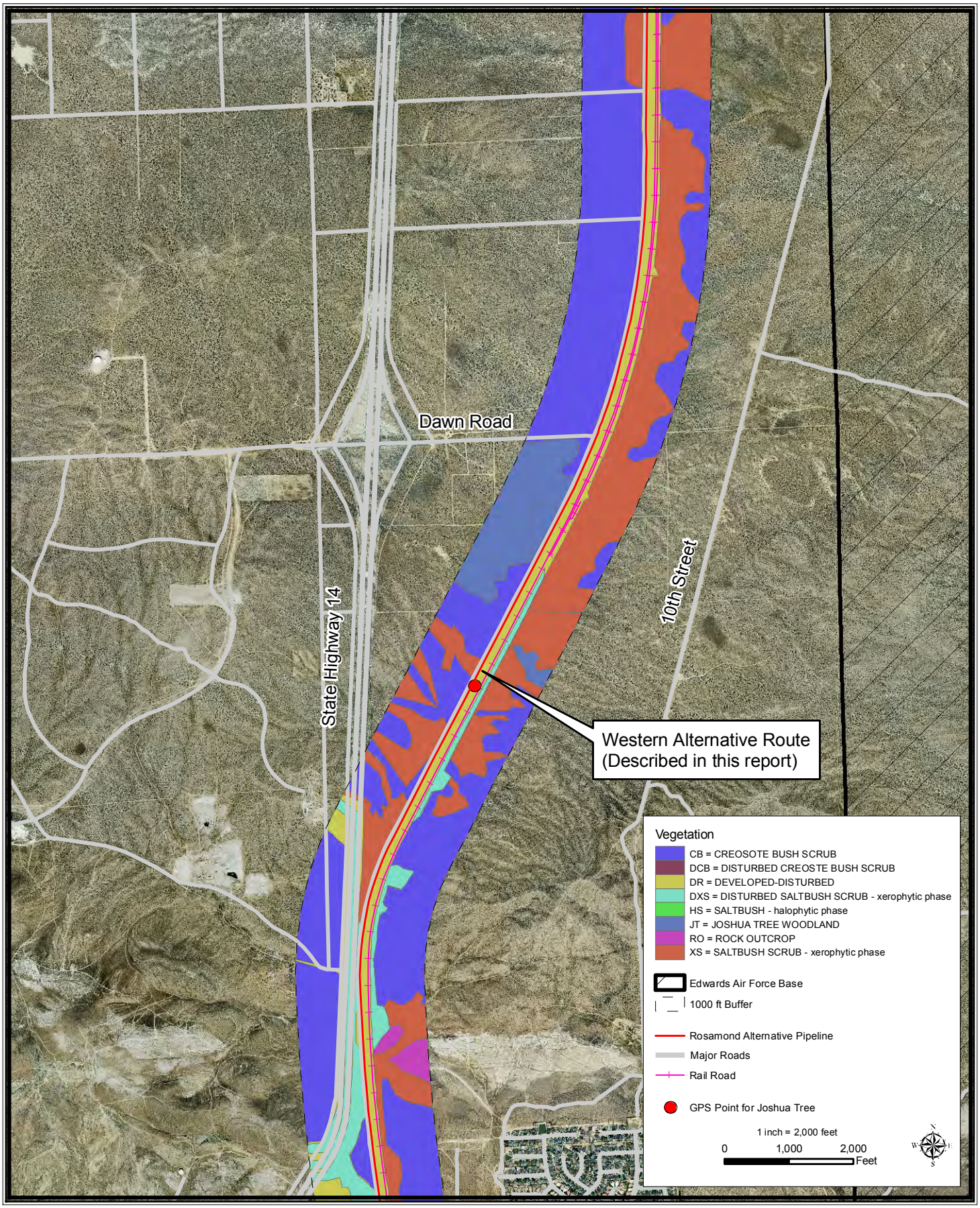


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2b Map 2 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

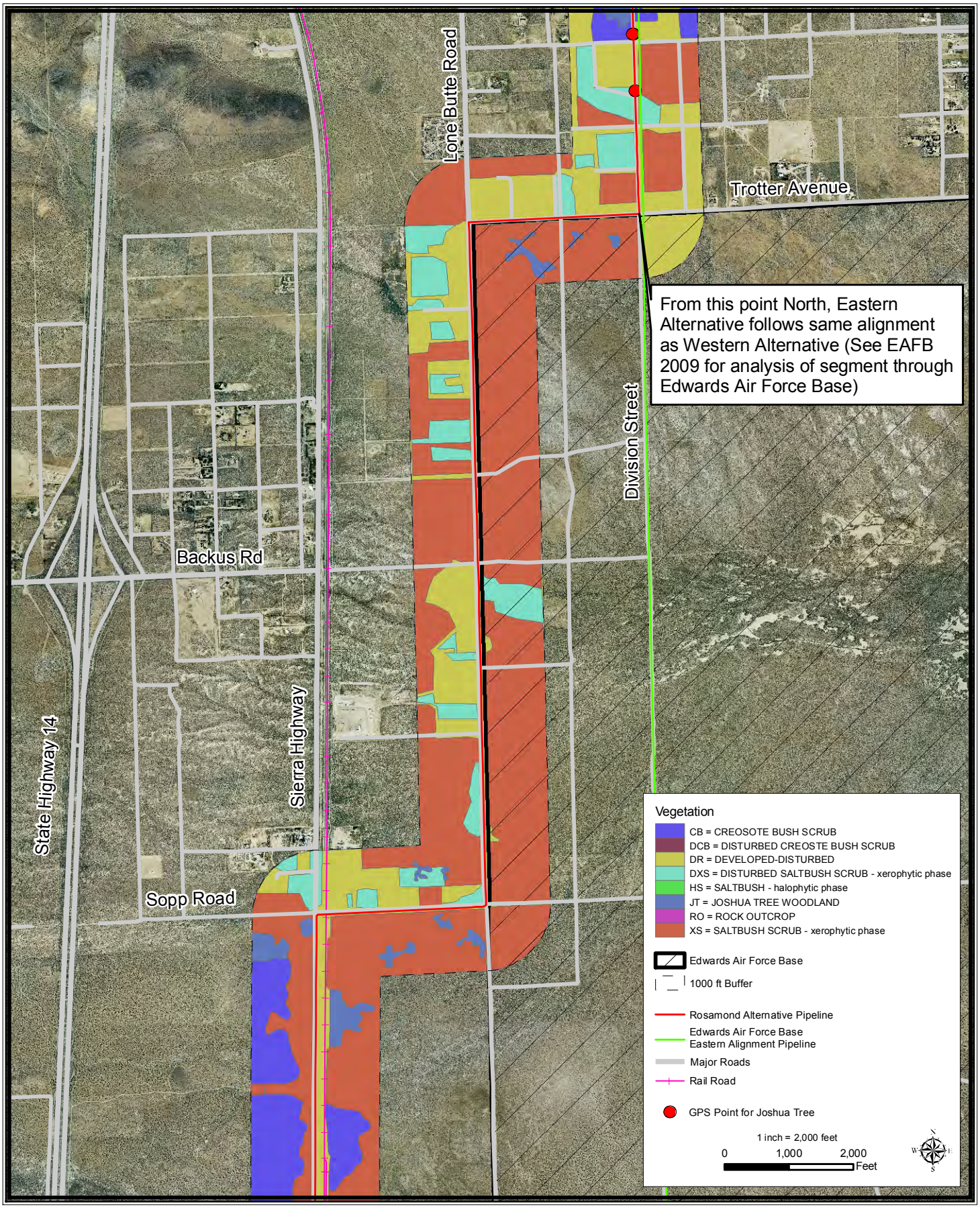


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2c Map 3 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

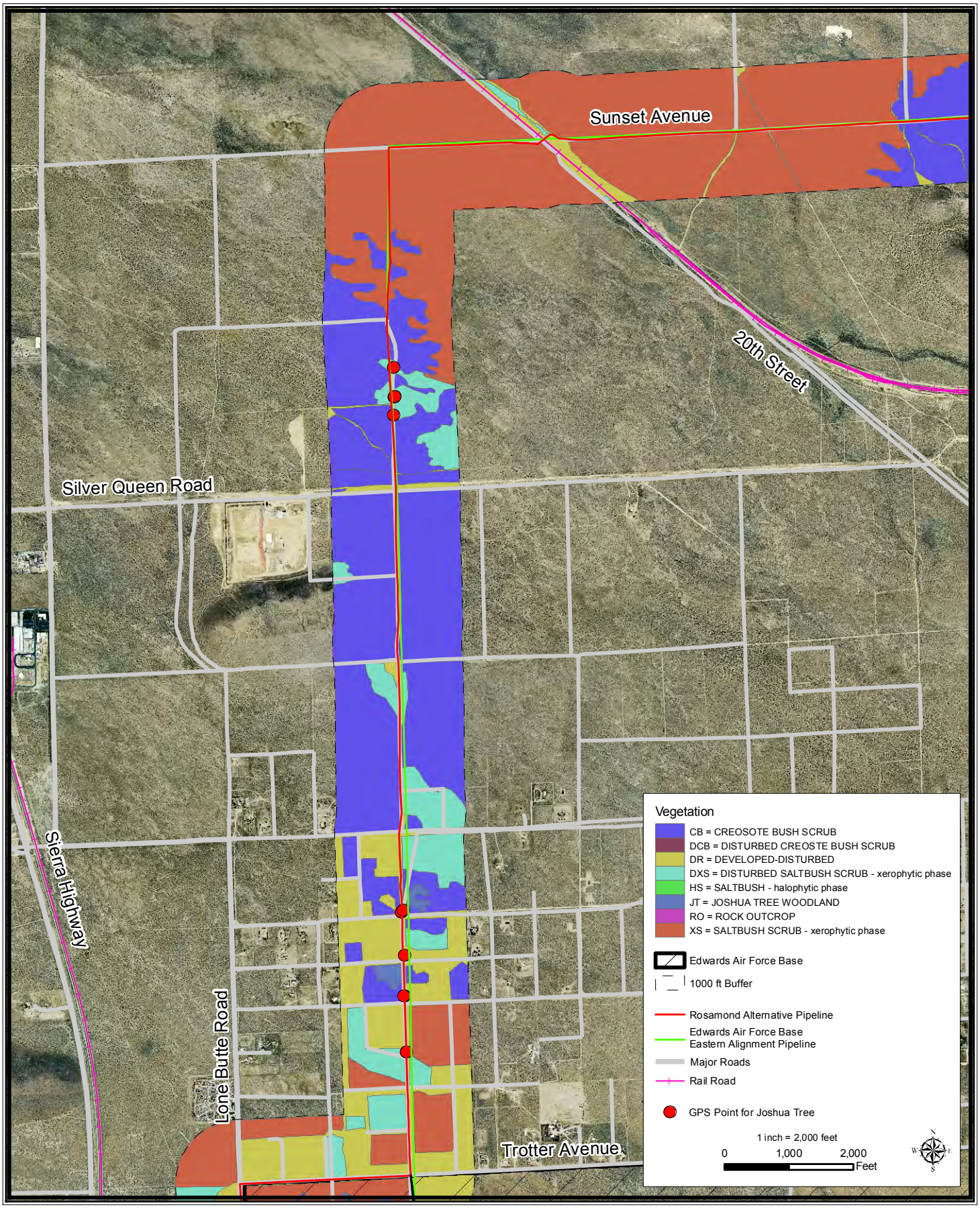


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2d Map 4 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

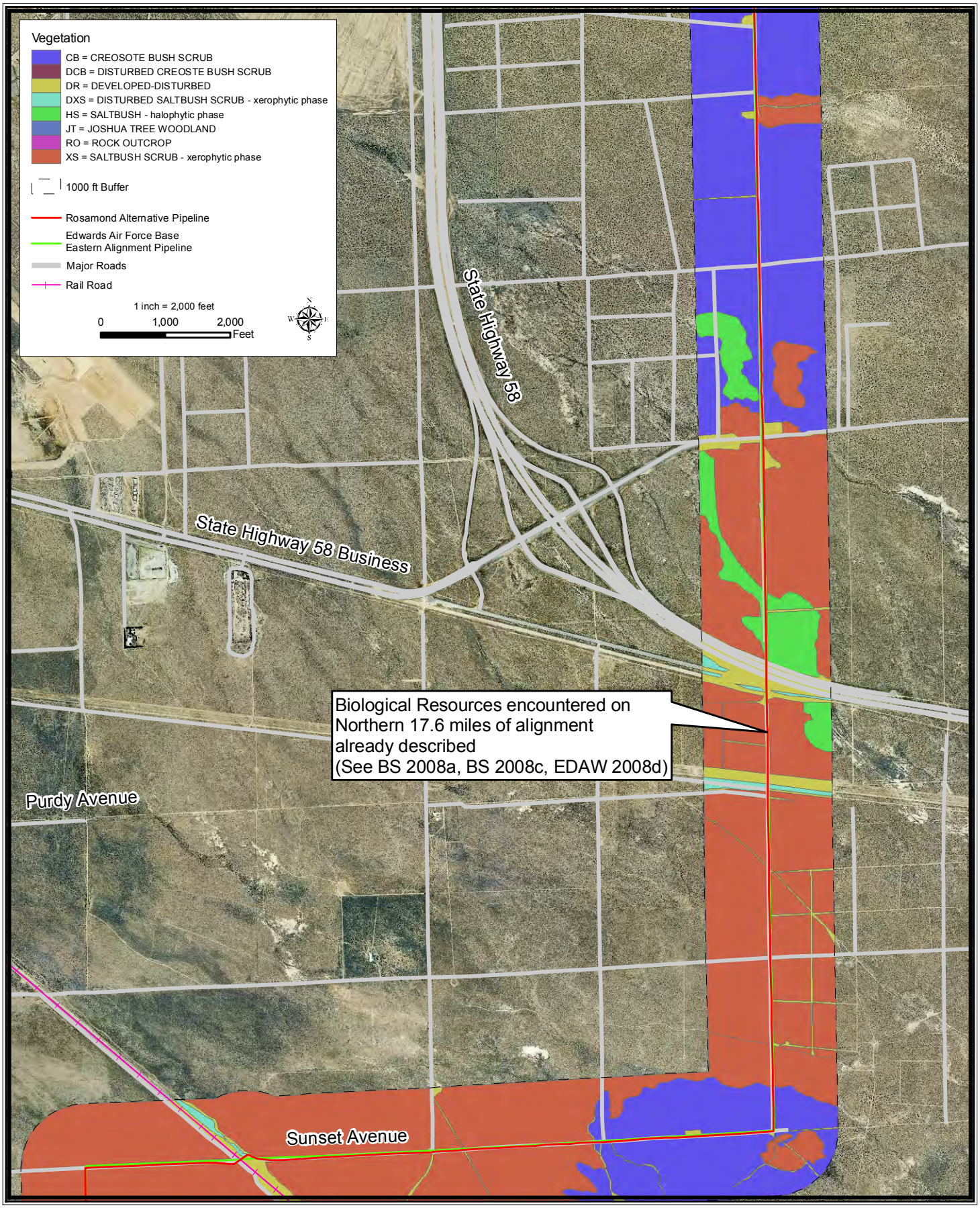


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2e Map 5 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

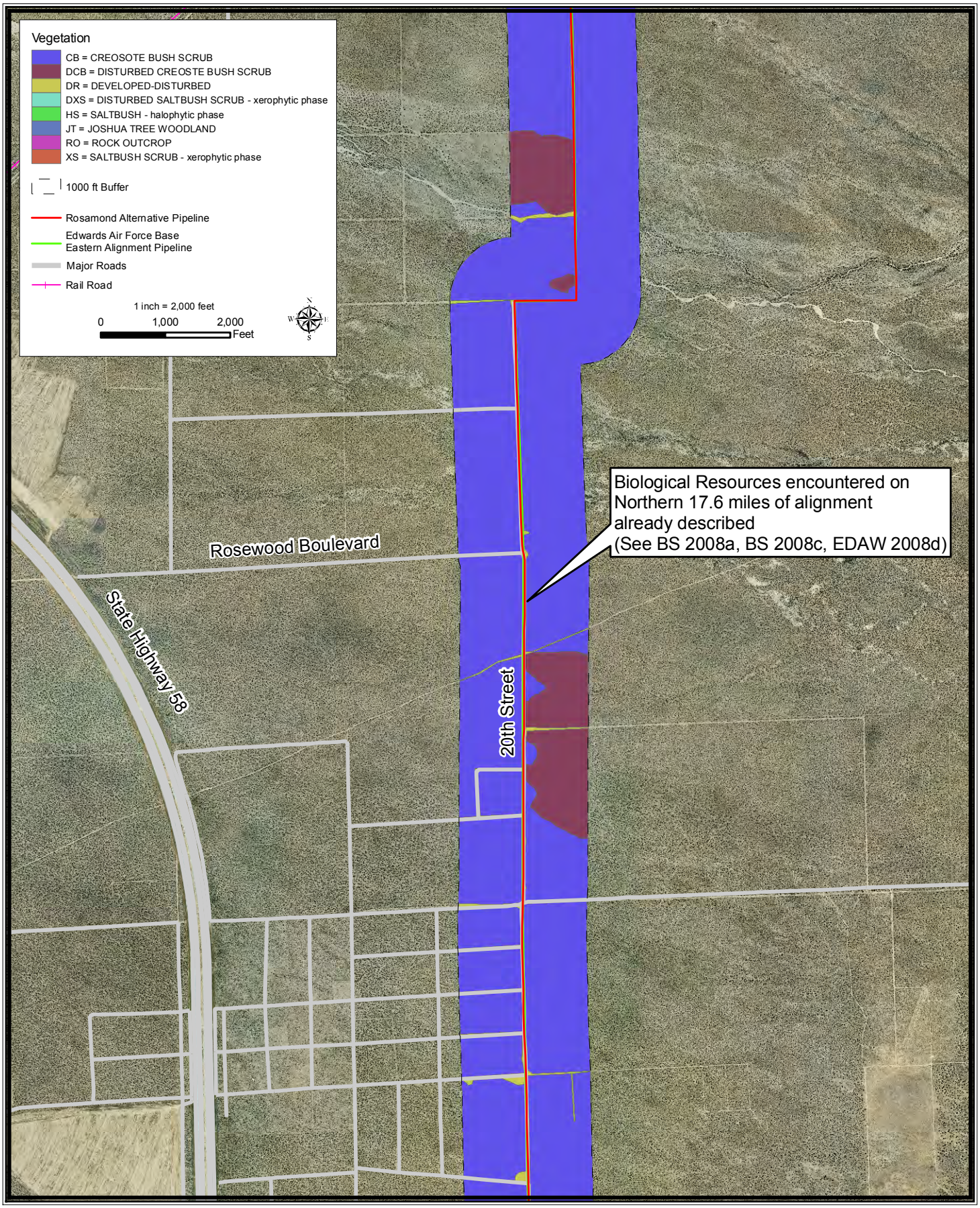


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2f Map 6 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

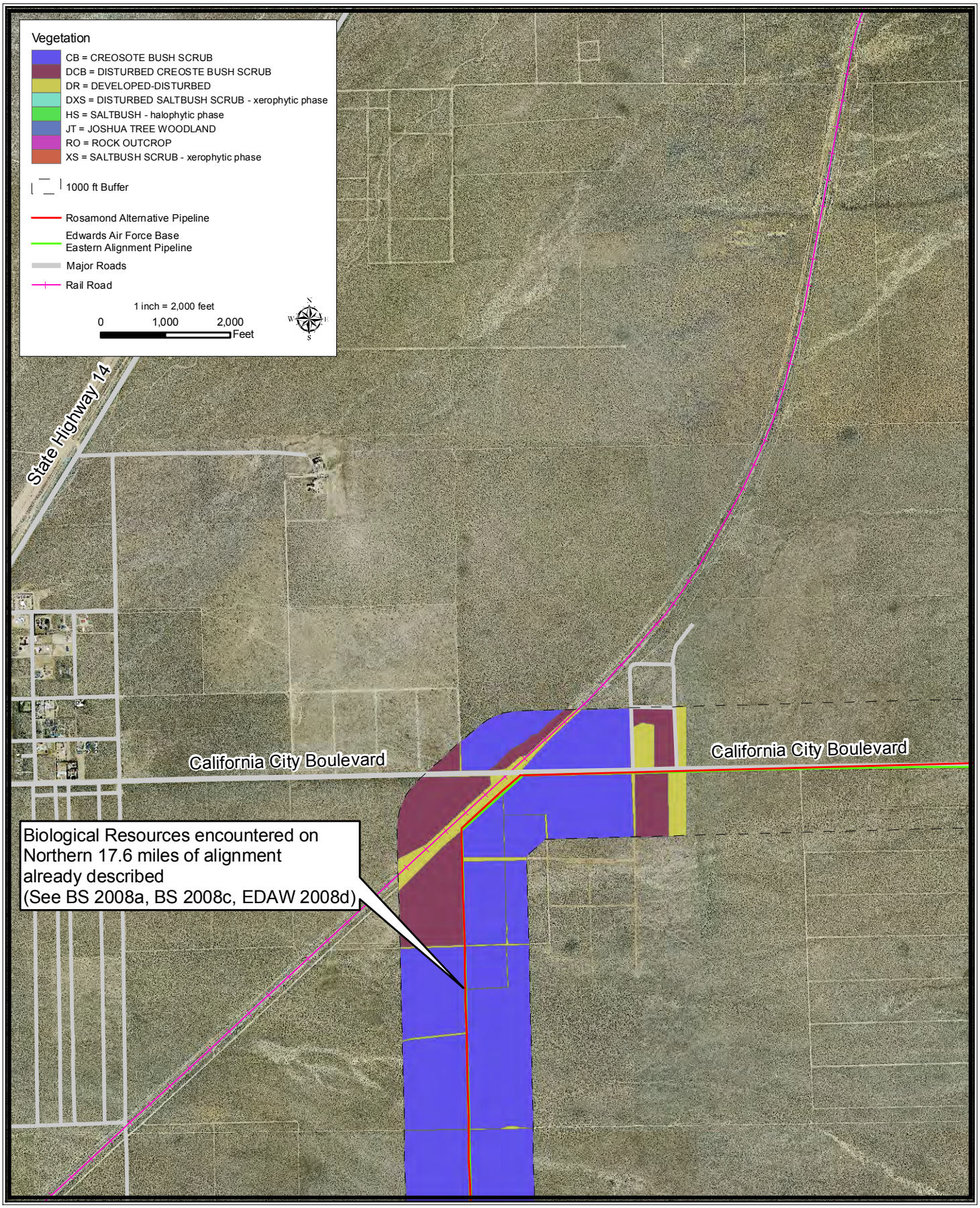


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2g Map 7 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2h Map 8 of 12

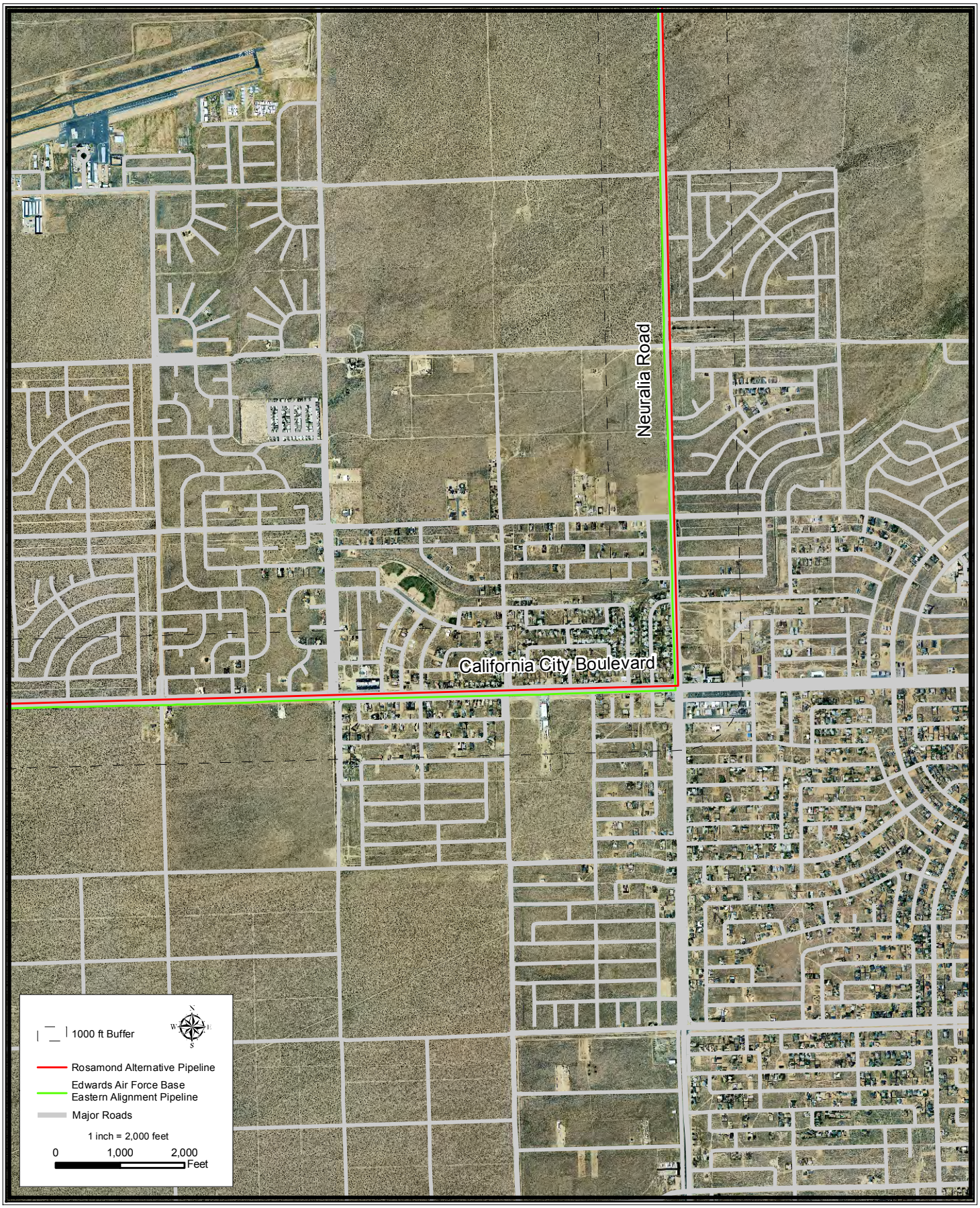
Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2i Map 9 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2j Map 10 of 12

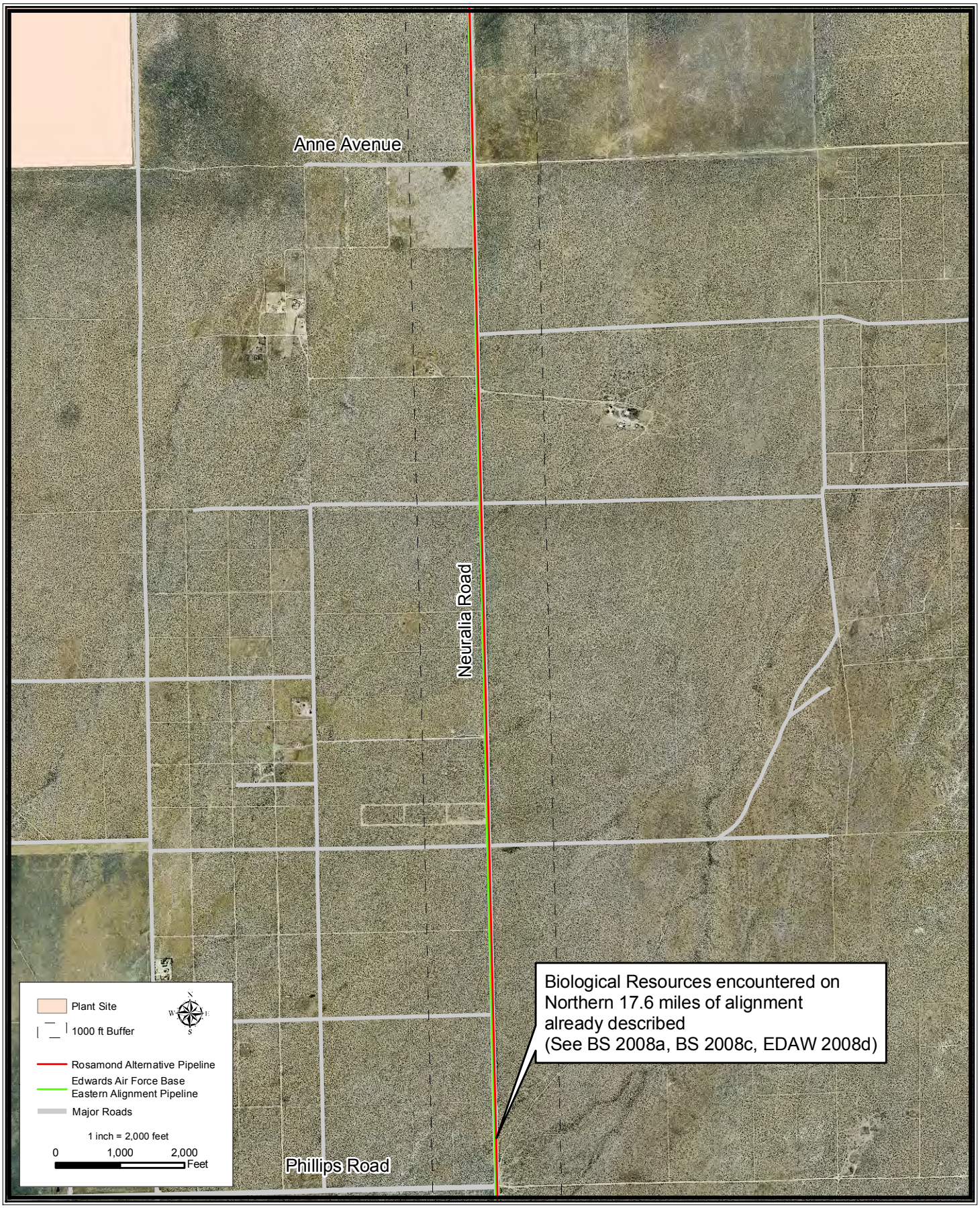
Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2k Map 11 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative

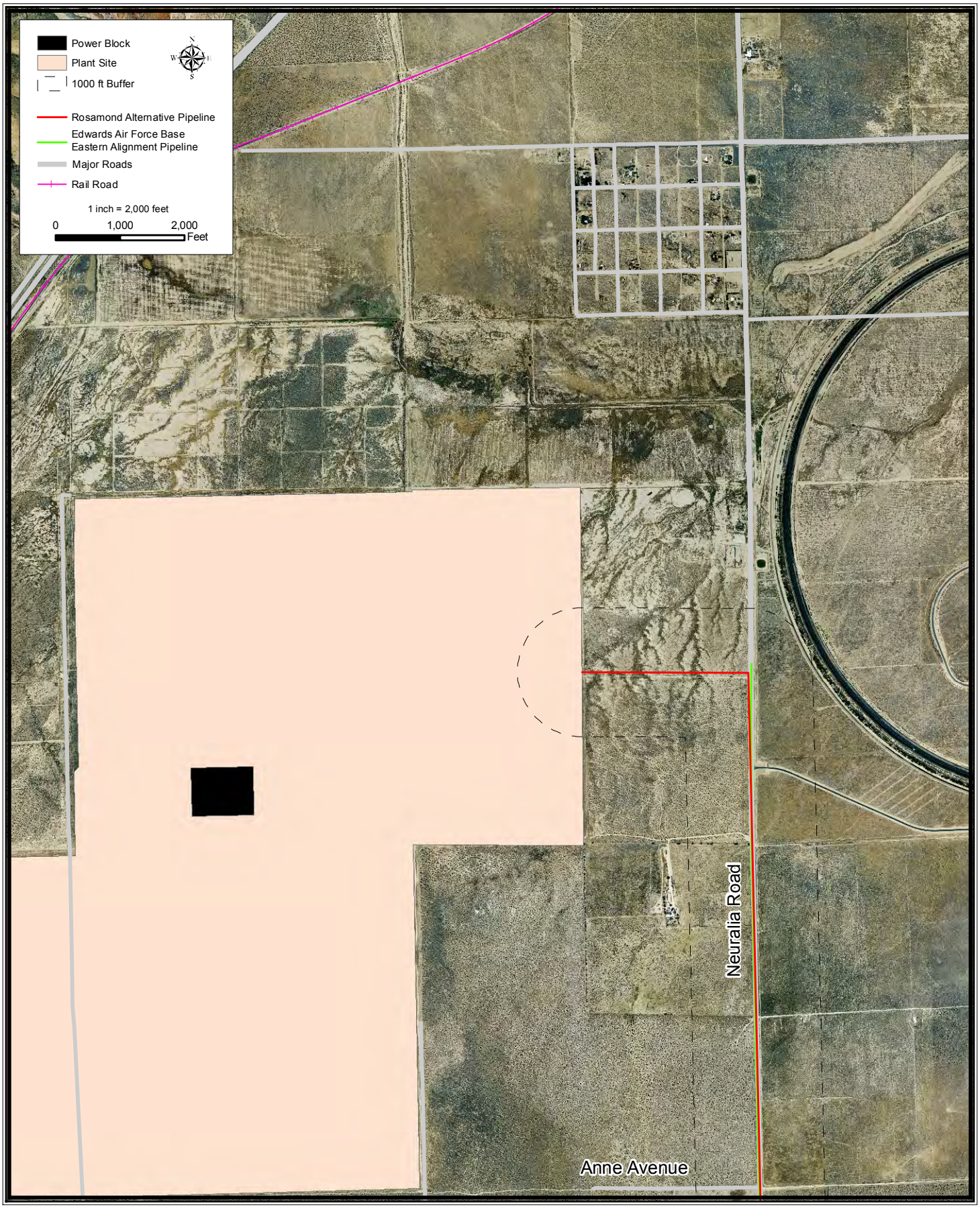


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 2I Map 12 of 12

Beacon Solar Energy Project - Plant Communities - Rosamond Alternative



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - DigtialGlobe - MrSID ENSR & Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 3a
Beacon Solar Energy Project - Photos of Study Area

(Above left) Cache Creek (south fork). Top photo is a view of the road washout (20th St) and pipeline alignment. Photos below show the channel upstream and downstream. The channel width is approximately 12-14 ft wide and 3-4 ft deep at bank-full position. Vegetation along the channel is not compositionally different from the surrounding upland beyond a few very widely scattered scale-broom shrubs. The channel banks and channel bottom are both used by off-road vehicles and bank erosion from tire tracks is apparent on portions of the bank.

(Above right) Cache Creek (north fork). Top photo is a view of the road washout (22nd St) and pipeline alignment. Photos below show the channel upstream and downstream. The channel width is approximately 15 ft wide and 3-4 ft deep at bank-full position. Like the south fork, the channel lacks any desert wash vegetation beyond a few widely scattered cheesebush and scale-broom shrubs. The channel banks and channel bottom are both used by off-road vehicles.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009
SOURCE: Carolyn Chainey-Davis

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 3b
Beacon Solar Energy Project - Photos of Study Area

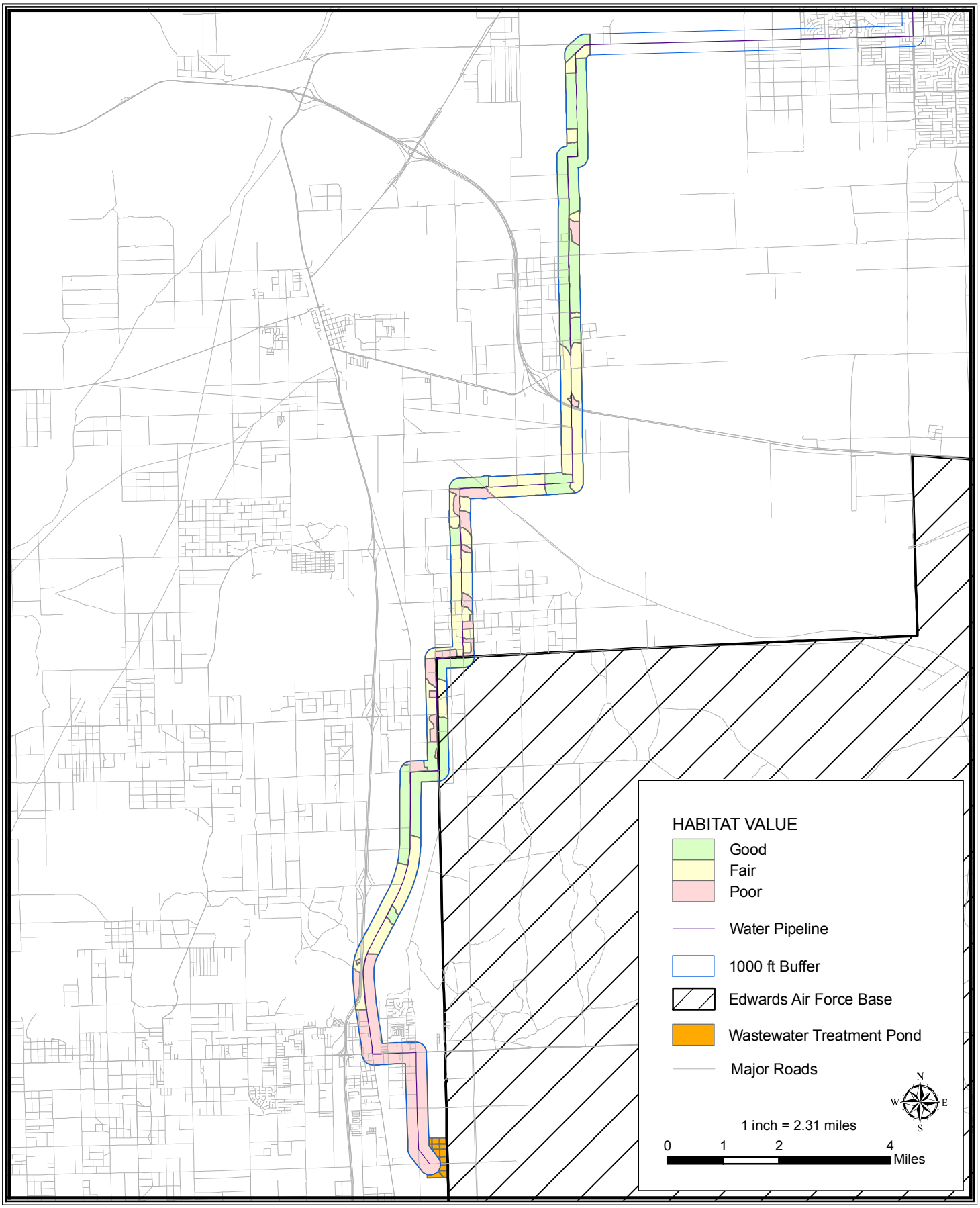
(Above) Rosamond Alternative pipeline alignment between Sierra Highway and the railroad tracks just north of Rosamond Blvd. Disturbed desert scrubs (creosote bush and saltbush) and weedy or developed/disturbed areas (paved and unpaved roads, railroad tracks) characterize this segment.

(Above) Sheep-grazed creosote bush scrub along narrow segment of Division Street, north of Silver Queen Rd. (Below) Saltbush scrub (xerophytic phase) along the narrow reach of Sunset Road near Sanborn Hill.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009
SOURCE: Carolyn Chainey-Davis

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 4

Beacon Solar Energy Project - Habitat Values within 1000 ft Buffer from Center of Water Pipeline

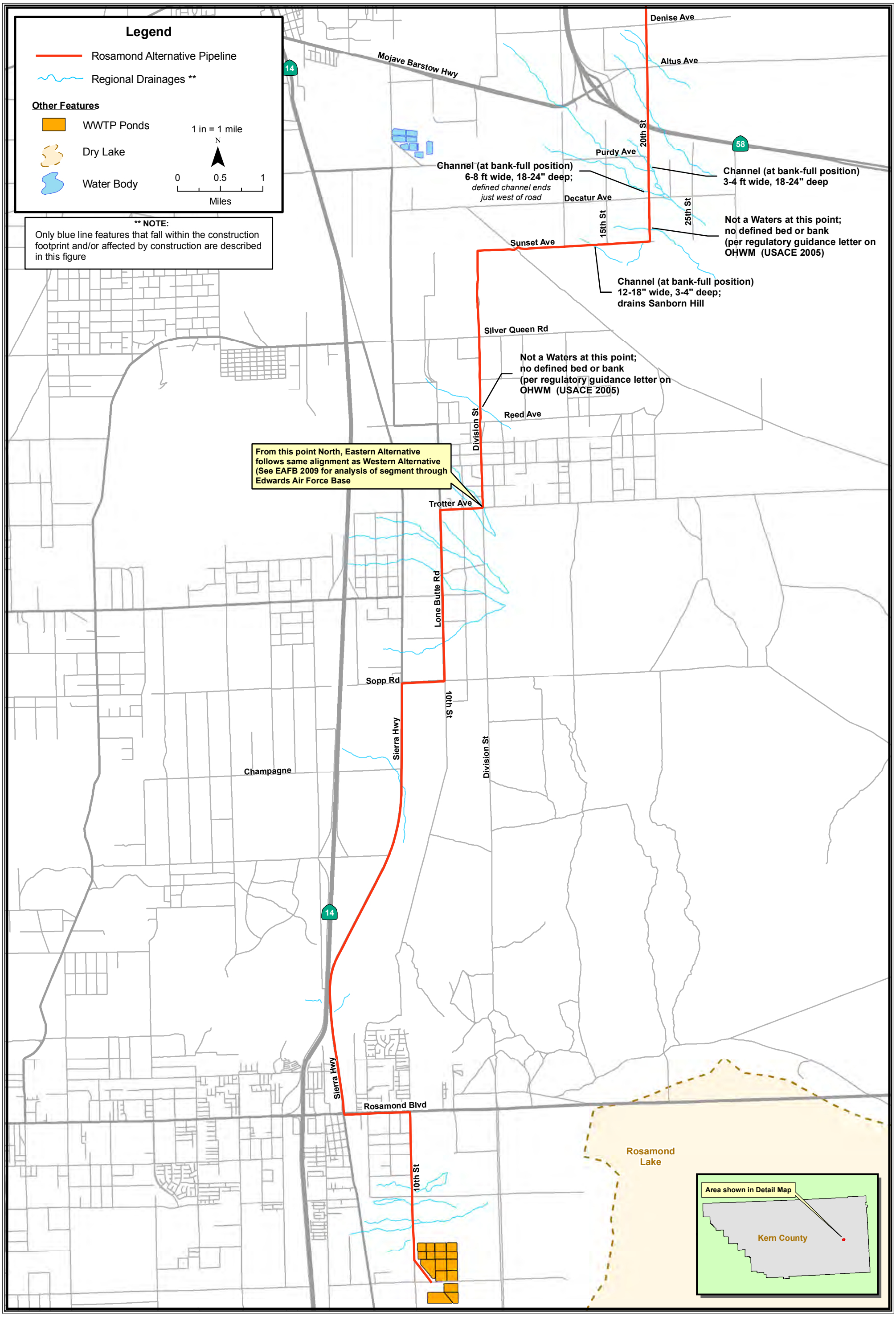


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 5a - Map 1 of 2

Beacon Solar Energy Project - Drainages and Other Waters

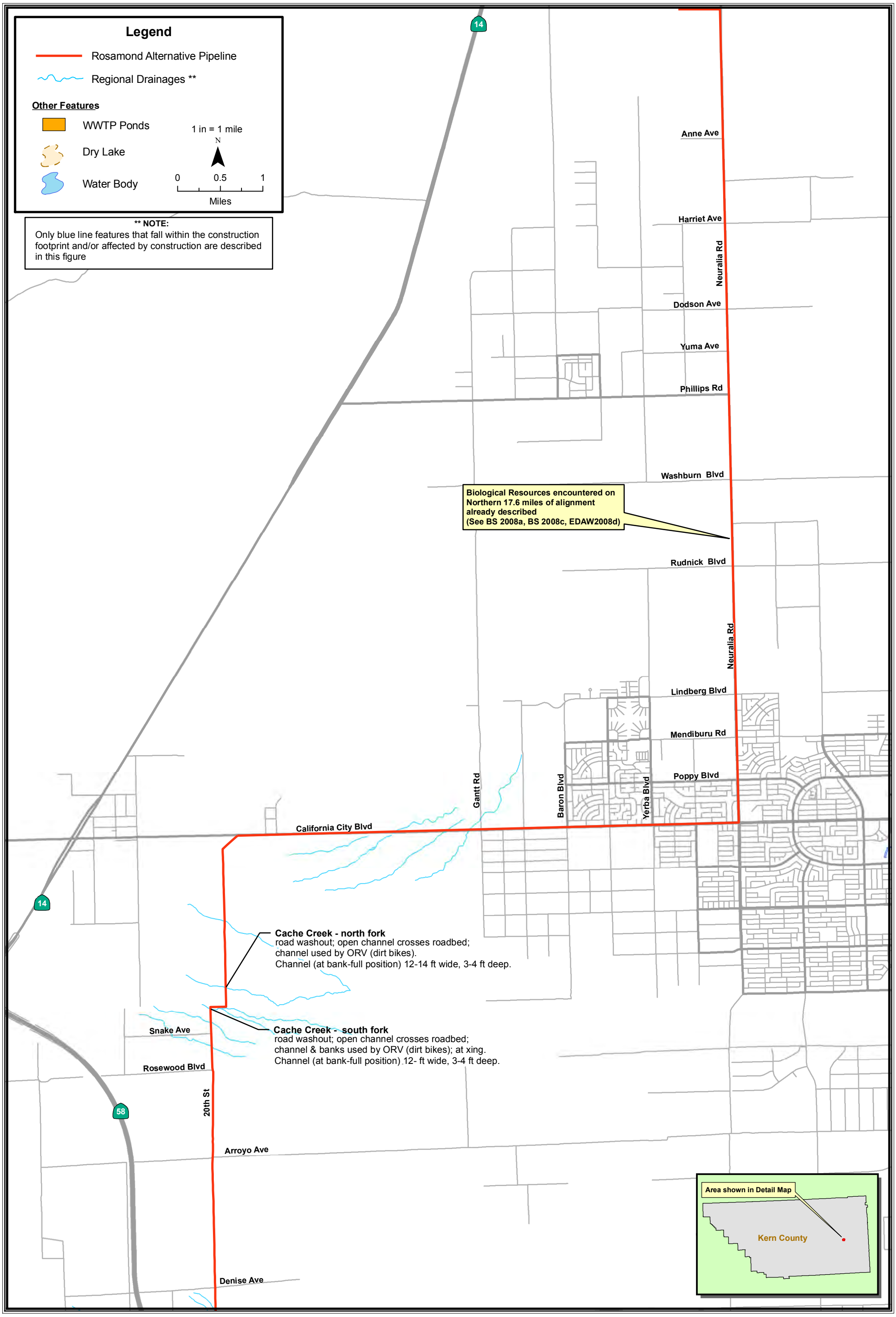


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 5b - Map 2 of 2

Beacon Solar Energy Project - Drainages and Other Waters

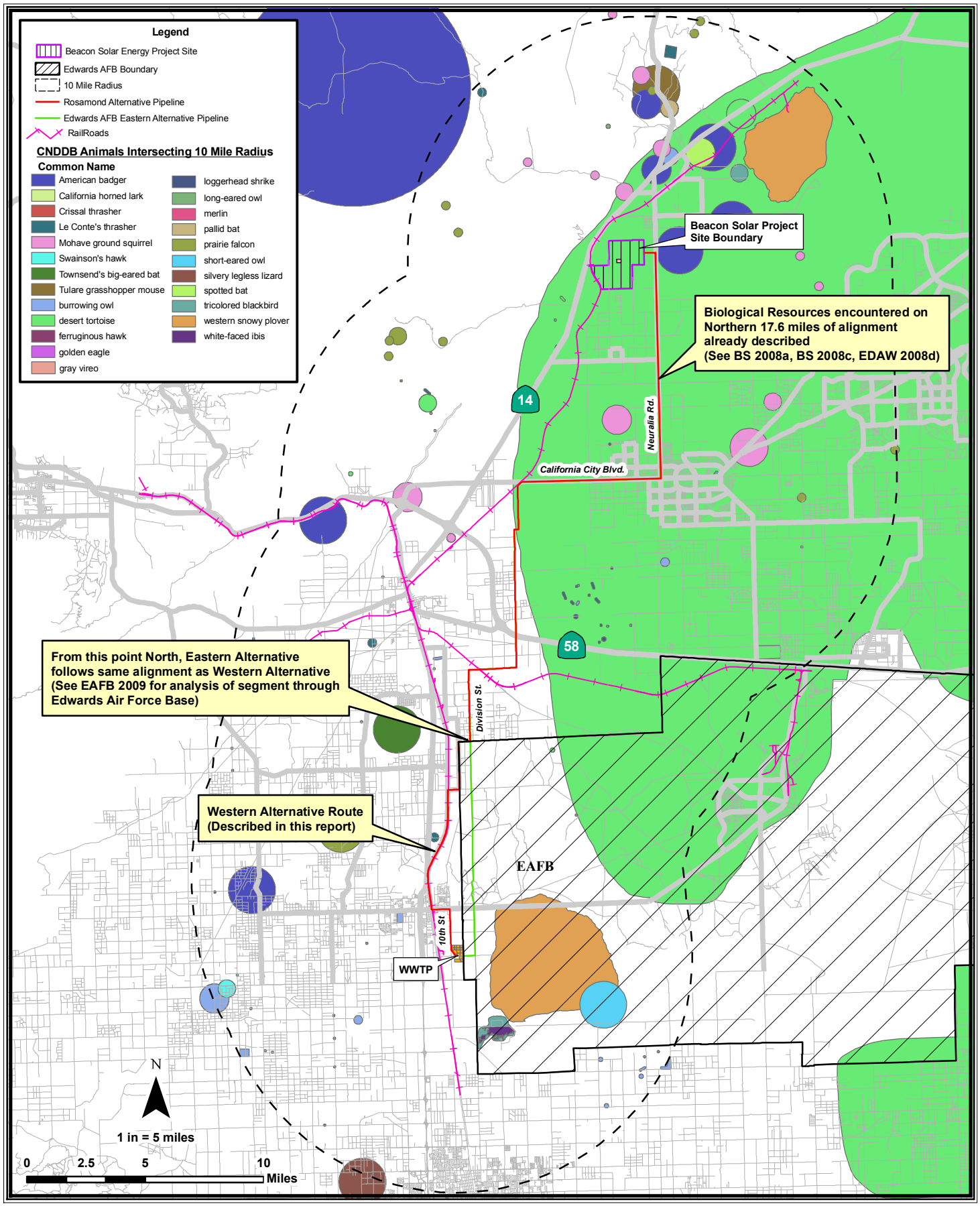


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 6a

Beacon Solar Energy Project - CNDDB Occurrences - Animals

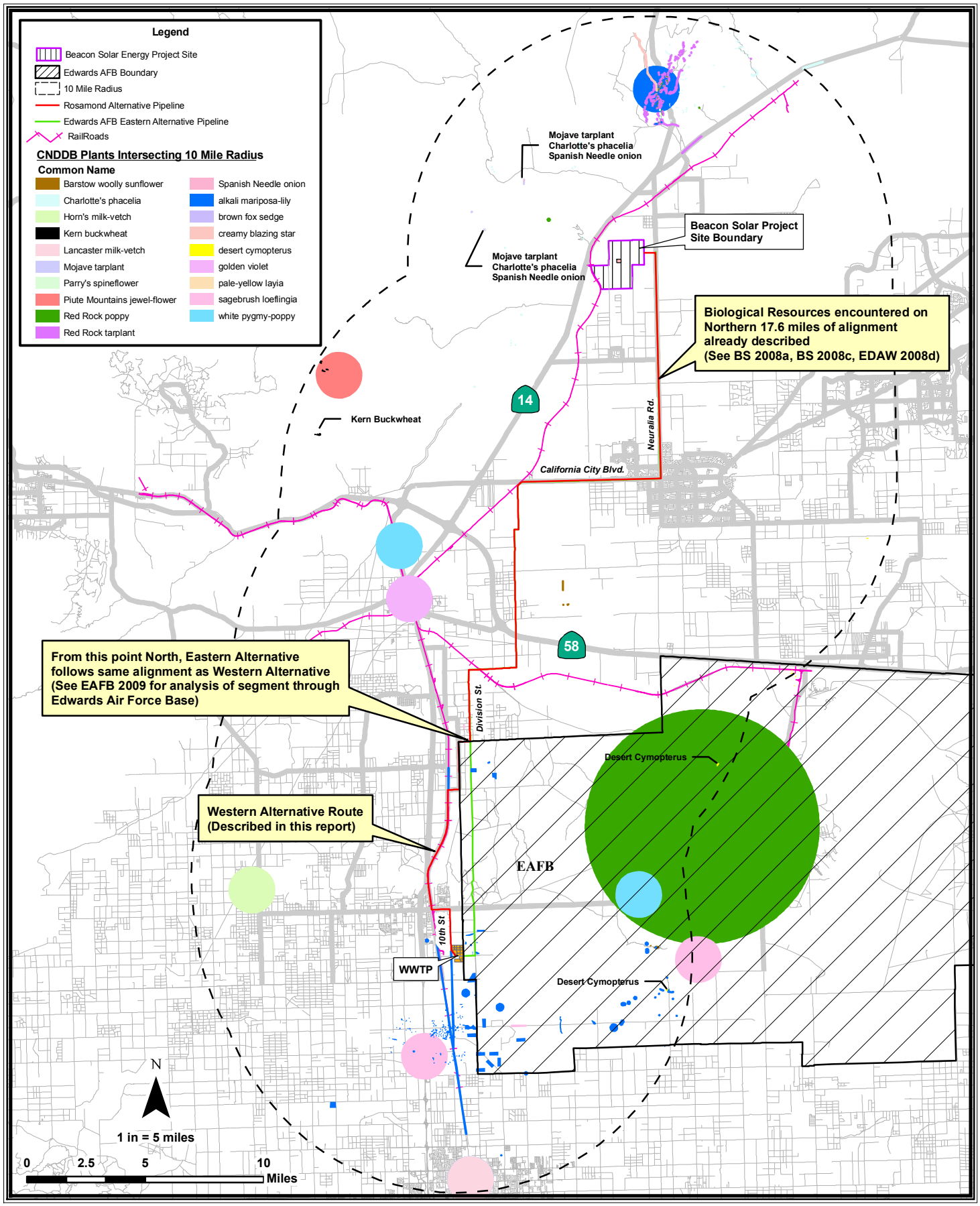


CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION,SEPTEMBER 2009

SOURCE: California Energy Commission - CA Natural Diversity Database July 09 - ENSR and Tele Atlas

BIOLOGICAL RESOURCES APPENDIX A - FIGURE 6b

Beacon Solar Energy Project - CNDDB Occurrences - Plants



CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION,SEPTEMBER 2009

SOURCE: California Energy Commission - CA Natural Diversity Database July 09 - ENSR and Tele Atlas

CULTURAL RESOURCES

Testimony of Michael D. McGuirt, Amanda Blosser, and Beverly E. Bastian

SUMMARY OF CONCLUSIONS

Staff concludes that the Beacon Solar Energy Project (BSEP) would have a significant direct impact on one historically significant prehistoric to historic-period Native American archaeological district, referred to herein as "Archaeological Zone 1" or "Zone," and has the potential to have a further significant direct impact on an individual prehistoric archaeological site, referred to herein as "Site 17." The respective adoption and implementation of Conditions of Certification **CUL-6** and **CUL-5** would reduce the potential impacts of the proposed project on these resources to less than significant.

Conditions of Certification **CUL-1** through **CUL-4** and **CUL-7** through **CUL-10** take into account the extensive and thorough field investigations that Beacon Solar, LLC (applicant) undertook for the present analysis and underwrites the recommendation of staff that the applicant be given partial relief from routine monitoring requirements. The adoption and implementation of Conditions of Certification **CUL-1** through **CUL-4** and **CUL-7** through **CUL-10** ensure that the applicant would be able to respond quickly and effectively in the event that further archaeological sites are found on the surface of the project area or when buried archaeological deposits are found beneath it during construction-related ground disturbance.

INTRODUCTION

This cultural resources assessment identifies the potential impacts of the BSEP to cultural resources. Cultural resources are defined under state law as buildings, sites, structures, objects, and historic districts. Four kinds of cultural resources are considered in this assessment, prehistoric and historical archaeological sites, ethnographic resources, and built-environment resources.

Prehistoric archaeological sites are associated with the Native American occupation and use of California prior to prolonged European contact. They typically include deposits of artifacts and organic debris, constructed features used to prepare, store, and discard the implements and food resources that helped to sustain daily life, structural ruins, rock art, trails, and other traces of Native American behavior. For the purpose of the present analysis, Energy Commission staff marks the onset of the prehistoric period at approximately 12,000 years ago, the most widely agreed upon date among scholars of the early prehistory of the Western Hemisphere. The prehistoric period in California extends through 1769, when the Spanish established the first missions in the region.

Ethnographic resources represent the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, or Asian immigrants. They may include traditional resource-collecting areas, ceremonial sites, value-imbued landscape features, cemeteries, shrines, or ethnic neighborhoods and structures.

Historical archaeological sites and built-environment resources are typically associated with the non-Native American exploration and settlement of California and the beginning

of a written historical record for the state. They may include archaeological deposits, sites, structures, traveled ways, artifacts, or other evidence of human activity. Under federal and state statute and regulation, cultural resources must be greater than fifty years old to be considered of potential historical significance. A resource less than fifty years of age may be historically significant if the resource possesses exceptional values.

For the BSEP, staff provides an overview of the environmental setting and history of the project area, an inventory of the cultural resources identified in the project vicinity, and an analysis of the potential impacts from the proposed project using criteria from the California Environmental Quality Act (CEQA). The primary concern is to ensure that all potential impacts are identified and that conditions are set forth that ensure that potentially significant impacts are appropriately mitigated.

If cultural resources are identified, staff determines whether there may be a project-related impact to them. If the cultural resources cannot be avoided, staff determines whether any of the affected resources are eligible for the California Register of Historical Resources (CRHR). If affected resources are eligible for the register, staff recommends mitigation measures that ensure that impacts to the identified cultural resources are reduced to less-than-significant levels.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Projects licensed by the Energy Commission are reviewed to ensure compliance with all applicable laws. For the present analysis the applicable laws are primarily state laws. Although the Energy Commission has exclusive permitting authority over BSEP, it typically ensures compliance with all applicable laws, ordinances, regulations, standards, plans, and policies.

CULTURAL RESOURCES TABLE 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
State	
Public Resources Code 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 reinter the remains elsewhere on the property in a location not subject to further disturbance.
California Health and Safety Code, Section 7050.5	This code makes it a misdemeanor to disturb or remove human remains found outside a cemetery. This code also requires a project owner to halt construction if human remains are discovered and to contact the county coroner.
Local	
Kern County General Plan, 2007 Land Use, Open Space, and Conservation Element: Policy 25 and Implementation Measures K–L, N–O	1.10.3: Archaeological, Paleontological, Cultural, and Historical Preservation Policy 25: The County will promote the preservation of cultural and historic resources which provide ties with the past and constitute a heritage value to residents and visitors. Implementation Measure K: Coordinate with the California State University, Bakersfield's Archaeology Inventory Center. Implementation Measure L: The County shall address archaeological and historical resources for discretionary projects in accordance with the California Environmental Quality Act (CEQA). Implementation Measure N: The County shall develop a list of Native American organizations and individuals who desire to be notified of proposed discretionary projects. This notification will be accomplished through the established procedures for discretionary projects and CEQA documents. Implementation Measure O: On a project-specific basis, the County Planning Department shall evaluate the necessity for the involvement of a qualified Native American monitor for grading or other construction activities on discretionary projects that are subject to a CEQA document.

SETTING

Information provided regarding the setting of the proposed project places it in its geographical and geological contexts and specifies the technical description of the

project. Additionally, the archaeological, ethnographic, and historical backgrounds provide the contexts for the evaluation of the historical significance of any identified cultural resources within the project area of analysis.

REGIONAL SETTING

The proposed BSEP project area is located in eastern Kern County within the northern Fremont Valley. The valley is surrounded by the El Paso Mountains to the north, the Rand Mountains to the east, the southern Sierra Nevada and Tehachapi Mountains to the west, and the Rosamond Hills and Antelope Valley to the south (Apple and Glenny 2008). The site is situated within a closed basin, with Koehn Dry Lake located approximately 6 miles to the east-northeast. Cottonwood and Cache Creeks, and an unnamed wash are the three major drainages that flow into this basin. The nearest seismic features are the Garlock Fault to the north and the San Andreas Fault to the west (Apple and Glenny 2008). The predominant vegetation type on the floor of Fremont Valley is Mojave creosote bush scrub (BS 2008a, p. 5.4-6).

PROJECT, SITE, AND VICINITY DESCRIPTION

The proposed BSEP is a concentrated solar electric generating facility (BS 2008a, p. 1-1). It would have a nominal electrical output of 250 megawatts (MW). Of the 2,012-acre proposed plant site parcel or project site, the power block area and the solar thermal field would occupy approximately 1,240 acres, with the rest of the support facilities occupying the remaining approximately 770 acres. The proposed project site is within a region that is primarily undeveloped, but, as late as the mid-1980s, it was used for agricultural purposes and, as a result, has been heavily disturbed (BS 2008a, pp. 1-3; 2-3).

The proposed facility would be located in eastern Kern County, within the western Mojave Desert, approximately 4 miles north-northwest of California City, approximately 15 miles north of the City of Mojave, and approximately 24 miles northeast of the City of Tehachapi (BS 2008a, p. 1-2). Red Rock Canyon State Park is approximately 4 miles to the north, and Koehn Dry Lake is located approximately 6 miles to the east-northeast. The proposed facility would be accessed from State Route 14 (SR 14).

The proposed project site is relatively flat, with the current elevation ranging from approximately 2,025 to 2,220 feet above mean sea level (amsl) (BS 2008a, p. 1-3). The preparation of the project site for facility construction would entail extensive earthwork to grade the site and to realign Pine Tree Wash, an intermittent stream that presently runs south-southwest to north-northeast through the project site. During the proposed grading at the project site, cuts would range from a few feet to as deep as 9.7 feet below the present ground surface (DB 2008d, Response to Data Request No. 33). The total soil volume to be moved to level the site would be approximately 5,160,000 cubic yards (BS 2008a, p. 2-26). The stream realignment would involve the creation of approximately 14,000 linear feet of new stream channel that would average 8 feet in depth and vary from 345 to 2,900 feet in width (approximately 1,400,000 cubic yards of earthwork for average channel depth and 345-foot channel width) (BS 2008a, p. 2-25 and CEC 2008bb, p. 14). The final elevation across the project site is anticipated to range from approximately 2,050 to 2,250 feet amsl (BS 2008a, p. 2-26).

The BSEP, as proposed, would consist of a number of components: a power block area (solar steam generator heat exchangers, steam turbine generator and condenser, 230-kV on-site switchyard, wet-cooling tower, natural gas-fired auxiliary boilers, and water storage tanks); a solar collector field; a new 3.5-mile-long 230-kV transmission line, for which two routing options are proposed; three 2.0- or 2.7-acre evaporation ponds, dependent upon which of two proposed water supply and discharge configurations the applicant chooses; a control room and warehouse; an administration building; bioremediation/landfarm areas; existing groundwater wells for water supply; the stream realignment; and primary and emergency access roads extending, respectively, from SR 14 to the western side of the project site and east from the northern edge of the project site to Neuralia Road (BS 2008a, pp. 2-4–2-5; DB 2009r, pp. 2-2–2-4, and 3-2). Foundation excavation for the above project components would range in depth from 3 to 25 feet below the present ground surface.

To tie into the Los Angeles Department of Water and Power's (LADWP) Barren Ridge Switching Station, the applicant has proposed two 230-kV transmission line routing options, Options 1 and 2. Both routes are about the same length and exit the project site along the plant access road. From that point, Option 1 takes a jogging southwesterly course, crossing the existing Union Pacific railroad and SR 14, to reach the right-of-way (ROW) of LADWP's Inyo-Barren Ridge 230-kV transmission line, next to which it runs southwest (parallel on the east side of the ROW) to connect into Barren Ridge Switching Station. Option 2 also takes a southwesterly course from the plant access road, but turns directly west, crossing the existing Union Pacific railroad and SR 14, until it reaches the Inyo-Barren Ridge 230 kV transmission line's ROW at a more northerly point than Option 1. At that intersection, a new switching station would be built, and the Option 2 transmission line would terminate there. An additional new 230-kV transmission line would be constructed from the new switching station to LADWP's Barren Ridge Switching Station (BS 2008a, pp. 2-29–2-30).

One important aspect of the BSEP that remains a focus of discussion is the source of the water that would be necessary to operate the facility. The applicant proposes to use potable water drawn from extant groundwater wells on the project site. As one counterproposal, staff, in the Preliminary Staff Assessment (PSA), analyzed the use of offsite brackish water as an alternate water source (CEC 2009n, pp. 6-15–6-23). Staff develops further, more feasible counterproposals in the "Alternatives" section here for the use of treated wastewater from two local sources, the Rosamond Community Services District and the City of California City. The use of treated wastewater from the Rosamond Community Services District would require the construction of a12-inch-diameter pipeline approximately 38.7 miles long, the northern approximately 17.6 miles of which would be coincident with the entire 17.6 mile length of the natural gas pipeline route that was a project component in the PSA. The use of treated wastewater from the City of California City would require the construction of a 14-inch-diameter pipeline approximately 12.2 miles long, the northern approximately 9.4 miles of which would be coincident with the northern approximately 9.4 miles of the same 17.6-mile-long natural gas pipeline route. As the selection of one of these wastewater sources has the potential to affect cultural resources, those effects are included in the present analysis. The analyses of the effects of the use of both treated wastewater sources employ the cultural resources data in the PSA for the former natural gas pipeline route.

Environmental Setting

The core of the proposed project area is a roughly 2,012-acre expanse of what is today an arid bajada[1]. The environment of the bajada has changed through time causing concomitant shifts in the mosaic of natural resources available on it and adjacent landforms. Human use of the proposed project area over the past several thousand years may partly reflect local changes in the natural resource base. To more reliably assess the likelihood that archaeological deposits representing such use may be present, 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 bajada and its ecology.

Regional Climatic and Environmental History

The proposed BSEP site is located in the western Mojave Desert, within the Fremont Valley of Kern County, near the southern end of the Sierra Nevada mountain range, which rises just to the west of the project area. It is within the rain shadow of this range, only averaging three inches of rainfall per year. Koehn Lake is approximately six miles to the northeast of the project site, and is dry, except in the aftermath of the occasional storm. An intermittent stream, Pine Tree Wash, extends through the project area (Apple and Glenny 2008, pp. 11–14).

During prehistory, this region fluctuated between cool-and-moist and warm-and-arid periods of climate. During the Pleistocene (25,000–10,000 B.P.), the climate was relatively cool and moist, with the region covered with pluvial lakes and associated lacustrine[2] resources. Toward the terminal Pleistocene, the climate resembled that of today. At the beginning of the Holocene, conditions became warmer in the desert valleys, with less precipitation occurring in the adjacent mountains. The early Holocene (10,000–8,000 B.P.) witnessed this rise in temperature and aridity; however, the climate was still slightly cooler and moister than the present (Sutton 1996, p. 231). During the middle Holocene (8,000–3,000 B.P.), the climate became much warmer and drier, with an even lower incidence of precipitation. Finally, with the late Holocene (3,000–present), it became moderately cooler and wetter, with marked episodes of drought.

Prehistoric Setting

The prehistory of the western Mojave Desert is the narrative of how human populations have adapted to marked fluctuations in the local environment over the course of at least the last 12,000 years. The archaeological remains of the region's prehistory are relatively scarce. Sparse scatters of stone tools and chipped stone tool manufacturing debris, and isolated artifacts, resources that typically yield information of marginal value, account for 40 to 60 percent of the archaeological remains found in the Mojave and Colorado Deserts. A relative paucity of intact buried archaeological deposits contributes further to the dearth of information on the prehistory of the region (Lyneis and Macko 1986, p. 52). The availability of water and the location of high-value resource patches in otherwise unproductive habitats appear to influence the distribution of the archaeological sites that are on the desert landscape (Lyneis and Macko 1986, p. 57;

[1] An alluvial plain formed as a result of lateral growth of adjacent alluvial fans until they finally coalesce to form a continuous inclined deposit along a mountain front.

[2] Of or relating to lakes.

Sutton, et al., 2007, p. 230). The broad trajectory of cultural development in the Mojave Desert appears to be a steady decline in residential mobility as local populations come to occupy increasingly larger valley or basin-bottom base camps, in a few preferred locations, over longer periods of time, rather than working out of temporary camps in particularly productive environmental zones (Bamforth 1990, p. 74).

Over the past seven decades, Mojave Desert archaeologists have developed and refined a broad sequence of approximately six artifact groups or assemblages, each with distinctive types of stone projectiles, that represent the material record of the peoples who once lived in the proposed project area (Bamforth 1990, p. 72; Campbell 1936; Lyneis 1982; Rogers 1939; Sutton, et al., 2007; Warren 1984; Warren and Crabtree 1986).

Terminal Pleistocene Period (Prior to 10,000 B.C.)

Evidence for a Paleo-Indian occupation in the western Mojave Desert has come in the form of fluted points, generally considered to represent the Clovis complex (Sutton, et al., 2007, pp. 233–234). It should be noted, however, that not every fluted point can necessarily be attributed to Clovis, and that the western Mojave Desert finds could be associated with later cultures using a similar technology. Work in the China Lake basin drainage, located in Indian Wells Valley to the north; and in the Lake Thompson basin drainage, located in the Antelope Valley to the south, have yielded these points. Glennan discovered an obsidian isolate on the slope of the El Paso Mountains, described as “a lanceolate-shaped point with a concave base.” He noted, however, that he considered the point to be “a Folsom-like type” (Glennan 1987; Rondeau, et al., 2007). At present, no evidence of the Clovis complex has been discovered within the Fremont Valley**.**

During this period, it has been suggested that highly mobile groups relied considerably upon lacustrine resources (Apple and Glenny 2008, p. 15). These patterns of subsistence and settlement have been collectively described as the Western Pluvial Lakes Tradition (WPLT) (Moratto 1984, pp. 90–103). This pattern has also been demonstrated throughout the western Great Basin, continuing briefly into the Early Holocene.

Early Holocene

The Lake Mojave complex is the pattern characteristic of this period, dating from approximately 8,000–6,000 cal (calibrated radiocarbon years) B.C. (Sutton, et al., 2007, p. 234). This complex is marked by projectile points of the Lake Mojave and Silver Lake types. The assemblages can also generally contain bifaces, steep-edged unifaces, and crescents in quantity, with some cobble-core tools and ground stone tools also represented.

During the Early Holocene, the pluvial lakes began to slowly recede, with groups adapting to the changing environment (Sutton, et al., 2007). Archaeological evidence indicates that lacustrine resources around these lake basins continued to be exploited, but evidence of groups obtaining other resources from beyond the lake basins, such as the procurement of lagomorphs, rodents, and certain reptiles, has also been reported from work at Fort Irwin (Sutton, et al., 2007; Basgall 1993; Douglas, et al., 1988).

Middle Holocene

For the Middle Holocene, the Pinto complex has become the widely accepted cultural complex for this region (Sutton, et al., 2007, p. 238). Archaeologists have generally accepted that the Pinto complex began just after the Lake Mojave complex and ended at approximately 3,000 cal B.C. Some, however, argue that the Lake Mojave and the Pinto complexes overlap, with the Pinto complex being introduced toward the end of the Early Holocene.

Artifacts identified with this complex include stemmed, indented-base Pinto series projectile points, probably used as thrusting spears rather than darts (Sutton, et al., 2007, p. 238). There is a dramatic increase in the presence of ground stone tools during this time period, with evidence of these implements in almost every Pinto site that has been identified. The procurement of faunal resources appears to be much the same in the Middle Holocene as in the Early Holocene, with a slight increase in small fauna, and with artiodactyls (deer and mountain sheep) decreasing (Sutton, et al., 2007, p. 238).

Pinto complex sites have been found in varying topographic and environmental zones, including pluvial lake basins, springs/seeps, streams, and within upland areas (Sutton, et al., 2007, p. 238). The dramatic increase in ground stone implements suggests that access to plant foodstuffs was probably of high importance for the selection of habitation.

The scarcity of sites in the western Mojave Desert representing the period ca. 3,000–2,000 cal B.C. indicates that there may have been “an occupational hiatus” at this time (Sutton, et al., 2007, p. 241), or that population density in the region was low. This may have been due to the climate being much hotter and drier towards the end of the Middle Holocene.

Late Holocene

The Gypsum complex appeared during the earliest part of this period, from 2,000 cal B.C.–cal A.D. 200 (Sutton, et al., 2007, p. 241). During this time, the climate became wetter and cooler than during the previous period. Artifacts from the Gypsum complex are represented by Elko series corner-notched points; Humboldt series, concave base points; and well-shouldered, contracting-stemmed, Gypsum series points (Sutton, et al., 2007, p. 241).

The Rose Spring complex followed the Gypsum complex, appearing in the period cal A.D. 200–1100, the time during which the bow and arrow were introduced. Archaeological evidence from this complex suggests demonstrates a drastic change in artifact assemblages and suggests a dramatic increase in the population, evidenced by more substantial middens (Sutton, et al., 2007, p. 241). Artifacts from this complex include Eastgate and Rose Spring series projectile points, drills, bone awls, milling implements, marine shell and other ornaments, and evidence the heavy exploitation of obsidian during this period.

According to Sutton (1996) and Gardner (2006), circumstantial evidence suggests that the lake levels at Koehn Lake may have increased after cal A.D. 1 (Sutton, et al., 2007, p. 241). Evidence from the Koehn Lake Site (CA-KER-875) in the form of burned juniper

may imply that a juniper woodland habitat may have been in the area. The Medieval Climatic Anomaly (MCA) occurred sometime within the middle of the Rose Spring complex (Sutton, et al., 2007, p. 242). Lakes began to desiccate, with settlement patterns changing, as a result.

The Late Prehistoric began in 1000 A.D. and ended at European contact. During this period, populations decreased; however, new technologies were developing and several new cultural complexes appeared, most likely developing into the ethnographic groups of the region (Sutton, et al., 2007, p. 242). The marker artifacts of this period include Desert series projectile points (Desert Side-notched and Cottonwood points), ceramics, shell beads, and mortars and pestles (Warren and Crabtree, 1986; Apple and Glenny 2008, p. 17; Sutton 1991, p. 19). The prolific use of obsidian, seen during the Rose Spring complex, declined in this period (Sutton, et al., 2007, p. 242).

Ethnographic Setting

The Kawaiisu were the Native American group known ethnographically to have occupied the project area. According to Sutton, Kawaiisu territory was composed of a big portion of the western Mojave Desert, with their territory also branching into the Tehachapi Mountains near the Tehachapi Pass and extending north into the southern Sierra Nevada near the Kern River (Sutton 1991, p. 11). It should be noted, however, that during historic times, the Kawaiisu occupied the desert floor only ephemerally, spending most of the year in the higher elevations. The Kitanemuk may have frequented the Fremont Valley, as well, since the southern Tehachapi Mountains and the Antelope Valley, just to the south of the Fremont Valley, were part of the territory they traditionally claimed (Sutton 1991, pp. 11, 15).

The Kawaiisu language is part of the Southern Numic branch of the Northern Uto-Aztecan family (Sutton 1991, p. 11), making it related linguistically to many groups in the Basin and Range region. Their population at the time of contact with the Spanish has been estimated at 500 (Kroeber 1925, p. 605).

The Kawaiisu were hunter-gatherers who did not practice agriculture, but, did, however, prune tobacco plants to refine them. They also burned wild seed fields to increase plant production. The Kawaiisu exploited at least 233 plant taxa, including acorns (*Quercus* spp.), piñon (*Pinus monophylla*), and yucca, among others (Sutton 1991, p. 13). Faunal resources included deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), chuckwalla (*Sauromalus obesus*), and rabbits (most likely *Lepus californicus*), which they took by means of communal drives. The Kawaiisu also procured rodents, some birds, such as quail (cf. *Oreortyx pictus*), and some insects (Sutton 1991, p. 14).

Funerary practices among the Kawaiisu were initiated by burning the deceased individual's house and possessions (Sutton 1988, p. 19). Then the body, "wrapped in a tule mat, was usually placed in a rock cleft, covered with a split burden basket, and heaped over with rocks" (Zigmond 1986, p. 404).

Historic Setting

The earliest European account of the Fremont Valley dates to the eighteenth century. A Franciscan missionary, Francisco Garcés, while exploring overland routes between the

southern California missions and those in New Mexico, camped at Castle Butte in what is now California City in the Fremont Valley in the summer of 1776, as recorded in his diary. The American army officer, John C. Frémont, would explore the valley in 1844, resulting in it being named for him (BS 2008a, p. 5.4-9; Feller n.d.a; Feller n.d.b; californiacity-ca.us 2009).

With the Gold Rush attracting prospectors from all over the world to California, it is not surprising that mining was what brought the earliest Euro-American settlement to the Fremont Valley. North of the BSEP, in the El Paso Mountains, gold and silver mining began in the early 1860s at the Manzanillo Mine in the El Paso Mining District on Laurel Mountain, but the murder, in August, 1864, of the mine superintendant by bandits or Indians frightened the miners into leaving this remote and dangerous area. The depression of the early 1890s, however, brought prospectors back to the El Pasos, with the result that the peak mining period in this area was in the 1890s. One of the more productive areas in the El Pasos was the Goler Mining District. In the winter of 1893-1894 placer gold was discovered in Goler Gulch, and within two years more than $500,000 worth of gold was recovered. Charlie Koehn[3] was a local homesteader who was one of the first to profit from the Goler strike. Expecting to take advantage of miners going between Tehachapi and the Panamint Range, Koehn had already established a way station at Kane Springs, only 12 miles from Goler Gulch, when the Goler gold discovery occurred. Koehn sold supplies and hauled freight into the mountains. He added a post office to his station on September 22, 1893 (Vredenburgh, et al., 1981, pp. 184–5; Vredenburgh, n.d.).

Early trails through the Fremont Valley were located between water sources where topography favored the easiest travel. Water sources influenced where early Euro-American settlements were established. As mining in the region proved profitable in the mid-nineteenth century, roads developed connecting the mines to the sources of needed goods and services, and the roads encouraged further settlement along them. The Owens River Road tied the silver and lead mines at Cerro Gordo to Los Angeles, passing through the Fremont Valley en route. Over this freight road, in the 1870s, a French Canadian named Remi Nadeau used 14–20-mule teams pulling three heavily loaded wagons to haul supplies from Los Angles north to the mine and to return with bullion for shipment by boat from San Pedro to San Francisco. Nadeau established wagon stops at 13–20 mile intervals—a day's haul, and had two pairs of teams, one pair going south and one pair going north, plodding back and forth between the same two stations, each day hitched to a new set of wagons. Thus he had 48–52 teams each day hauling freight or bullion, with additional teams hauling feed for his animals (McManus 1987, p. 5; Nadeau 1949b, pp. 8–9). Rail transport supplanted the mule teams in 1882, but the freight road alignment is today very closely followed by SR 14 (McManus 1987, p. 5).

In 1895, Eugene Garlock chose the crossroads location of Cow Wells to set up a steam-driven, eight-stamp ore-crushing mill, hauled from Tehachapi. Garlock chose Cow Wells because of the water supply, needed for ore processing, the existing roads, and its central location among the mining districts. Named for the mill owner, the tent, frame,

[3] "Koehn" is pronounced "Kane." Koehn Dry Lake is named for this early settler in the region.

and adobe settlement of Garlock prospered, eventually boasting of two bars, two hotels, a stage depot, a laundry, a school, and a doctor's/dentist's office. Demand for ore processing was such that other stamp mills were soon set up nearby. The Randsburg Railway, completed in 1898, however, deprived Garlock of its primary business by hauling ore off to more efficient mills elsewhere. The town quickly declined. Most of Garlock's population had moved to Randsburg by 1900. Garlock experienced a short-lived resurgence in the 1920s in response to the salt production on Koehn Dry Lake and renewed interest in area gold mines. The Garlock post office closed forever on June 30, 1926 (Vredenburgh, et al., 1981, p. 186).

The railroads came to the region beginning in 1882. The first railroad through the Mojave Desert was built by the Southern Pacific between the towns of Mojave and Needles. Construction began in Mojave on February 20, 1882, and had reached Waterman (Barstow) by October 23, 1882. The line was completed to Needles on April 19, 1883 (Myrick 1992, pp. 765–766). In October, 1884, the line was purchased by the Atlantic and Pacific Railroad (A&P) and subsequently was acquired by the Atchison, Topeka, and Santa Fe Railroad (ATSF) in 1890. The ATSF, now known as the Burlington Northern Santa Fe Railroad, continues to operate the line up to the present (Myrick 1992, pp. 766, 788). In 1885 the California Southern Railroad was extended to the Mojave-Needles line through the Cajon Pass from San Bernardino. This new line, which also was soon acquired by ATSF, connected Los Angeles to the East and gave the interior region of southern California access to coastal ports (Myrick 1992).

To facilitate the construction of the first Los Angeles Aqueduct, between 1908 and 1910, the Southern Pacific Railroad Company (SP) built what came to be referred to as its "Jawbone Branch." This section ran north from Mojave to Olancha, passing just to the west of the proposed BSEP project site (Apple and Glenny 2008, p. 24). Estimating project-required freight-hauling at 14 million tons, the engineers designing and planning the new aqueduct for the City of Los Angeles considered rail transportation the most cost-effective way to transport men and materials (LADWP n.d.). So the City approached several railroads about building a line parallel to the route of the aqueduct, but only SP responded. On April 10, 1908, SP and the City signed a contract for SP to build the standard-gauge railroad branch line that came to be known as the Jawbone, taking this name from the section of the aqueduct the rail branch was intended to serve, which traversed very rough, mountainous terrain. Cantil, just southwest of the proposed BSEP project site, was one of the stations on the Jawbone branch. With the completion of the aqueduct, the Jawbone branch eventually was extended to Owenyo in the Owens Valley, joining the Carson and Colorado Railroad to establish through service to the East. The branch was absorbed into the SP system in 1913 (Speer 1985, p. 2), and is now part of the Union Pacific system.

The first Los Angeles Aqueduct, which captured the Owens River to provide an abundant and reliable water source for the growing City of Los Angeles, is located just to the west of the project area. It was constructed between 1907 and 1913. The 1916 final report for the project provides these statistics: "Included in this work were 215 miles of road, 230 miles of pipe line, 218 miles of power transmission line, and 377 miles of telegraph and telephone line. Fifty-seven camps were established along the line of work, most of them in the mountains, and good roads made to reach them" (LADWP n.d.).

The laborers numbered 3,900 at their peak force. They blasted and drilled 142 tunnels totaling more than 43 miles in length and installed 12 miles of steel siphon. They built 34 miles of open, unlined channel, 39 miles of concrete-lined channel, and 98 miles of covered conduit which was cast in place. Some of the conduit was large enough to drive a car through (LADWP n.d.).

Concrete was the most prevalent construction material for the aqueduct. For efficiency, the project acquired resources and construction raw materials near the aqueduct and railroad routes. The City purchased 4,300 acres of land covering limestone quarries, clay deposits, and deposits of tufa (used for making concrete), and built the Monolith Mill at Cuddleback Ranch, five miles east of Tehachapi on SP's main line, where the materials for making 1,000 barrels of Portland cement a day were assembled. The City additionally imported 200,000 barrels of cement from other sources (LADWP n.d.).

The aqueduct's Jawbone Division headquarters was at Cinco, two miles southwest of Cantil on the Jawbone Branch railroad. There the Division engineer supervised 1,203 day laborers (the most workers on any of the aqueduct's divisions), who lived in six permanent camps along the aqueduct route. The camps consisted of portable wood-floored, canvas-walled-and-roofed bunkhouses and mess halls (all with furniture) and wood-frame warehouses and a store. The camps were connected to Cinco by roads, water pipelines, and electrical and telephone lines (Speer 1985, p. 3).

The rail station at Saltdale was established to service salt-mining operations at the north end of Koehn Dry Lake. The Diamond Salt Company began development activities on the lake in 1911 and 1912, but the Consolidated Salt Company was the first to begin salt production in 1914. The early salt-mining companies depended on rainfall and storm runoff to flood the dry lake and dissolve the salts in the soil, and on the sun to evaporate the brine, leaving a crust of harvestable salt. Consequently, in some dry years, no salt harvesting could be done. Later on, companies pumped ground water from wells and used ditches and flumes to flood the lake, thereby assuring reliable salt production. The Long Beach Salt Company was still producing salt in this way at Koehn Dry Lake in 1980 (Vredenburgh, et al., 1981, pp. 188–9).

Little historical information on the rural Cantil community was readily available. The rail station, established in 1908, may have been the start of Cantil, which today apparently includes the area within and around the proposed BSEP project site and consists of approximately 35 to 40 scattered single-family residences and mobile homes on 2.5-acre to 10-acre parcels. No community facilities, such as schools, stores, or recreational facilities, are present (BS 2008a, p. 5.7-10).

The nearest developed area with a full range of community services is California City, whose northern boundary is approximately four miles south of the BSEP project site (BS 2008a, p. 5.7-10). California City had its origins in 1958 when real estate developer and sociology professor Nat Mendelsohn purchased 80,000 acres of Mojave Desert land with the hope of master-planning California's next great city. He designed his model city around a central park with a 26-acre artificial lake. Mendelsohn's dream city, which he hoped would one day rival Los Angeles (californiacity-ca.us 2009), was established on December 10, 1965 (californiacity.com 2009). Today California City is the third largest city, in area, in California, encompassing 204 square miles (californiacity.com). The

estimated population in July, 2006, was 12,659, supported by employment at Edwards Air Force Base, which is located just to the south of the city, California City Correctional Center, and U.S. Borax (californiacity-ca.us 2009).

For most of the twentieth century, the proposed BSEP project site was undeveloped desert. The 2,273-acre Fremont Valley Ranch was established in that location in 1977 to grow alfalfa for a cattle-fattening operation on the ranch. The BSEP is now proposed to occupy some 2,012 acres of the former ranch. Alfalfa farming at the Fremont Valley Ranch was abandoned in approximately 1988 (ENSR 2007, p. I; p. 4-1), leaving no traces in the form of enhanced agricultural soils or surface water delivery systems. With only ground water available to support agriculture, it is considered an unsustainable industry in this location (BS 2008a, p. 5.7-10).

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 (CRHR-eligible) cultural resources and would therefore, under CEQA, have an 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 (see "Determining the Historical Significance of Cultural Resources," below) for any cultural resources that are identified.

This subsection describes the research methods used by the applicant and Energy Commission staff for each phase and provides the results of the research, including literature and records searches (California Historical Resources Information System (CHRIS) and local records), Native American consultation, and field investigations. Staff provides a description of each identified cultural resource, its historical significance, and the basis for its significance evaluation. Assessments of the project's impacts on historically significant cultural resources, potential impacts on previously unidentified, buried archaeological resources, and proposed mitigation measures for all significant impacts are presented in a separate subsection below.

Staff's Area of Analysis

The inventorying of cultural resources within what staff defines as the appropriate area for the analysis of a project's potential impacts is the first step in the assessment of whether the proposed project may cause a significant impact to a CRHR-eligible cultural resource and therefore have an adverse effect on the environment. The area that staff considers when identifying and assessing impacts to historical resources, called the "area of analysis" for the project, is usually defined as the area within and surrounding

the project site and associated linear facility corridors. The area varies in extent depending on whether the cultural resource is an archaeological, ethnographic, or built-environment resource:

- For archaeological resources, the area of analysis is minimally defined as the proposed project site footprint, plus a buffer of 200 feet, and the proposed project linear facilities routes, plus 50 feet to either side of the routes. For this project the archaeological area of analysis includes the proposed project site footprint and its 200-foot buffer, referred to as the "project site," and the proposed ancillary linear facilities and their respective buffers, referred to collectively, including the project site, as the "project area."
- For ethnographic resources, the area of analysis is expanded to take into account traditional use areas and traditional cultural places which may be further afield than the project site or the project area. The area of analysis for ethnographic resources may include viewscapes that contribute to the historical integrity of a subject resource. Ethnographic resources are often identified in consultation with Native Americans as well as other ethnic or cultural communities, and issues that are raised by these communities may define the area of analysis. For this project the ethnographic area of analysis is the geographic area around and including the proposed project where the project has the potential to physically or visually degrade ethnographic resources.
- For built-environment resources, the area of analysis is minimally defined as one parcel deep from the project site footprint in urban areas, but in rural areas is expanded to include a half-mile buffer from the project site, and from any above-ground linear facilities, to encompass resources whose setting could be adversely affected by industrial development. For this project, the built-environment area of analysis is that minimum.
- For a historic district or a cultural landscape, Energy Commission staff defines the area of analysis based on the particulars of each siting case.

Determining the Historical Significance of Cultural Resources

CEQA requires the Energy Commission, as a lead agency, to 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 eligible for listing in the CRHR, and such a cultural resource is referred to as a "historical resource," which is a "resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the CRHR", 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 which 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)). The term, "historical resource," therefore, indicates a cultural resource that is historically significant and eligible for the CRHR.

Consequently, under the CEQA Guidelines, to be historically significant, 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 Historical Places (NRHP). In addition to being at least 50 years old, 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, is associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion 2, is associated with the lives of persons significant in our past;
- Criterion 3, 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, 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 No. 770 and up are automatically listed in the CRHR and are therefore also historical resources (Pub. Resources Code, § 5024.1(d)). 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 (Pub. Resources Code, § 21084.1).

Background Research

The background research for the present analysis consists of information on known cultural resources that the applicant and Energy Commission staff gathered from literature and record searches, from local government databases and local historical and archaeological societies, and information that the applicant gathered through consultation with local Native American groups. For the applicant, the purpose of the background information is to initiate the compilation of the cultural resources inventory for the project area of analysis, to identify information gaps, and to inform the design and the interpretation of the field research that will serve to complete the inventory.

Literature and Records Search

The literature and records search portion of the background research attempts to gather and interpret documentary evidence of the known cultural resources in the broader project area of analysis. The primary source for the present effort is the Southern San Joaquin Valley Archeological Information Center (SSJVAIC) of the California Historical Resources Information System (CHRIS) at California State University, Bakersfield. The applicant also conducted additional archival research at a number of other regional repositories (see “Additional Archival Research” subsection, below). Energy Commission staff supplemented the primary record search with a brief review of the

available archaeological literature in the region just beyond the project area of analysis (see “Literature Search on Buried Archaeological Deposits near the Project Area” subsection, below).

CHRIS Search

Methods

The archaeologists for the applicant had the staff of the SSJVIC conduct a literature and records search of the BSEP project area and vicinity (Apple and Glenny 2008, p. 21). The search took place in two phases. The original literature and records search covered the areas proposed for many of the project components and a 0.5-mile buffer zone around them. A subsequent, supplemental search expanded the buffer zone out to 1.0 miles and added a 0.5-mile buffer (0.25-mile on either side) for the former natural gas pipeline route. The search ultimately brought together the records for known archaeological sites and built-environment resources, as well as the available cultural resources survey and excavation reports for previous investigations. Additionally, SSJVIC staff searched the following sources:

- National Register of Historic Places (NHRP);
- California Register of Historical Resources (CRHR);
- California State Historic Landmarks;
- California Points of Historical Interest; and
- California Inventory of Historic Resources.

Results

The CHRIS literature and records search identified 22 previous cultural resources investigations within the search area (Cultural Resources Table 2). Part of one investigation (SSJVAIC Document No. KE-02118) took place on the project site. The investigation was a linear pedestrian survey that covered approximately 75 acres or 4 percent of the project site, which left approximately 96 percent of the project site unsurveyed prior to the planning effort for the proposed project. Five previous linear pedestrian surveys for highway improvement projects along SR 14 (SSJVAIC Document Nos. KE-00649, -01967–01969, and -02135) crossed the proposed RsOW for electric transmission line Options 1 and 2. The surveys covered a total of roughly 6 acres.

A total of 10 cultural resources are known for the CHRIS literature and records search area (Cultural Resources Table 3). Only 2 of the 10 resources fall in the project area. Both are on the project site. One resource is the historic Jawbone Branch of the Southern Pacific Railroad (CA-KER-3366H), which delimits the southwestern boundary of the project site, and the other is a late nineteenth- to early twentieth-century refuse deposit (CA-KER-5264), which was found in the northwestern portion of the project site.

CULTURAL RESOURCES TABLE 2
Previous Cultural Resources Investigations in the Records Search Area

SSJVAIC Document No.	Author and Date of Investigation	Title	Type of Investigation
Investigations on or adjacent to Project Site			
KE-01108	Robert A. Schiffman 1985	*Archaeological Investigation of Solar World's Proposed Wind Farm near Cantil, Kern County, CA*	Records search and pedestrian survey of a 160-acre parcel
KE-02118	Brian F. Smith and Shelly Raven-Jennings 1997	*An Archaeological Survey of the Fremont Valley Pipeline Project, Mojave, California*	Records search and pedestrian survey along proposed alignment for a water pipeline
Investigations on or adjacent to Former Natural Gas Pipeline			
KE-00029	Robert S. White 1996	*An Archaeological Assessment of the United Tire Recycling Corporation Project: A 102-Acre Parcel Located adjacent to California City Blvd., near California City, Kern County*	Records search and pedestrian survey of a parcel
KE-00030	Robert S. White 1996	*An Archaeological Assessment of the Cornell Corrections California City Prison Site: A 39.09-Acre Parcel Located adjacent to Neuralia Road in California City, Kern County*	Records search and pedestrian survey of a parcel
KE-01594	Mark Q. Sutton 1987	*An Archaeological Assessment of the Six Sections in Fremont Valley, Kern County, California*	Investigation further than 0.25 miles beyond survey area for present project
KE-01595	Robert A. Schiffman 1987	*Archaeological Investigation for Six Sections of Land in Fremont Valley, Kern County, California*	Investigation further than 0.25 miles beyond survey area for present project
KE-01706	Jim Uli 1984	*Archaeological Investigation of Solar World's Proposed 40 Acre Wind Turbine Generator Farm near Cantil, Kern County, CA*	Investigation further than 0.25 miles beyond survey area for present project
KE-01932	Mark Q. Sutton 1991	*Archaeological Investigations at Cantil, Fremont Valley, Western Mojave Desert, California*	Investigation further than 0.25 miles beyond survey area for present project
KE-01961	Mark Q. Sutton 1989	*The Archaeology of the Cantil Test Track, Fremont Valley, Western Mojave Desert, California*	Investigation further than 0.25 miles beyond survey area for present project
Investigations on or adjacent to Electric Transmission Infrastructure			
KE-00649	James McManus 1987	*Archaeological Survey Report for 9-KER-14*	Records search and pedestrian survey along

SSJVAIC Document No.	Author and Date of Investigation	Title	Type of Investigation
			SR 14, supplement to investigation of KE-2135
KE-01967	Michael V. Speer 1985	*Historical Resource Evaluation Report for a Widening Project on 9-KER-14, near Cinco, Kern County*	Background research and pedestrian survey of First Los Angeles Aqueduct Jawbone Division, No. 7 headquarters
KE-01968	Martha Proctor 1987	*Historic Property Survey Report, Jawbone Canyon Expressway Project*	Summary cultural resources report for improvements to SR 14, including results of KE-00649, -01967, and -01969
KE-01969	Denise O'Connor 1987	*Historical Architectural Survey Report for a Proposed Highway Project on Route 14 in Kern County, California*	Map and aerial review Site visits
KE-02135	James McManus 1985	*Negative Archaeological Survey Report* (Caltrans)	Records search and pedestrian survey along SR 14
KE-03276	Stacy Jordan and Michael Wise 2006	*Archaeological Survey Report for the Southern California Edison Company, LADWP Rule 15 Line Extension, Private Inholding, Kern County, California*	Records search and pedestrian survey along proposed alignment for an electric transmission line extension
Investigations outside of Project Area			
KE-00051	Don Laylander 1995	*Negative Archaeological Survey Report* (Caltrans)	Records search and pedestrian survey of parcels along SR 14
KE-00634	Michael E. Macko and Jill Weisbord 1985	*Sylmar Expansion Project, Cultural Resources Inventory and Significance Evaluation, Final Report, Volume 1*	Investigation further than 0.25 miles beyond survey area for present project
KE-01763	Author unknown (Caltrans, District 9 1977)	*Archaeological Reconnaissance Survey for Minor Construction Projects, Maintenance Projects and Material Sites*	Pedestrian reconnaissance survey along SR 14
KE-2680	Russell W. Bevill, Michael S. Kelly, and Lisa Westwood 2001	*Cultural Resources Investigation of Selected Portions of the First and Second Los Angeles Aqueducts, Inyo and Kern Counties, California and Addendum*	Investigation further than 0.25 miles beyond survey area for present project
KE-02879	Catherine L. Pruett 2003	*A Cultural Resources Assessment for the Rancho Seco Inc. Water System Rehabilitation Project, Near* [sic] *Cantil, Kern County,*	Investigation further than 0.25 miles beyond survey area for present project

SSJVAIC Document No.	Author and Date of Investigation	Title	Type of Investigation
		California	
KE-2888	William T. Eckhardt 2003	*Cultural Resource Survey of Work Stations on the Sheep 12 kV (#325719S) and Greasewood 12 kV (#1924243E) Circuits, Southern California Edison Deteriorated Pole Replacement Program (2003), Kern County, California*	Records search and pedestrian survey for electric transmission line pole replacement
KE-3534	Elena Nilsson, Russell Bevill, and Michael S. Kelly 2006	*Archaeological Inventory of the First and Second Los Angeles Aqueducts and Selected Access Roads, Kern, Inyo, and Los Angeles Counties, California*	Investigation further than 0.25 miles beyond survey area for present project

CULTURAL RESOURCES TABLE 3
Previously Recorded Cultural Resources in the Records Search Area

CHRIS Trinomial and Primary (P) Nos.	Approximate Resource Age	Resource Description	Approximate Location in or near the Project Area
Cultural Resources in the Project Area			
CA-KER-3366H	1908	Jawbone Branch of the Southern Pacific Railroad	Delimits southwestern project site boundary
CA-KER-5264H (P-15-006415, see "CA-KER-5264H" in "Archaeological Resources Evaluations" subsection, below)	1890–1920	Historic refuse deposit of manganese-decolorized, aqua, and brown glass sherds, ceramic sherds, wire nails, metal fragments, and a glove	W 1/2, Sec. 4, project site
Cultural Resources outside of the Project Area			
CA-KER-2142/H (Site 40, see "Cultural Resources Table 6" and "Site 59" in "Archaeological Resources Evaluations" subsection, below)	Prehistoric, and late nineteenth to early twentieth centuries	Large archaeological site, prehistoric component includes three surface fire features, discolored sediment area, and low frequency chipped stone artifact assemblage and historic component includes 4 architectural ruins, 2 historic refuse deposits, and historic sheet refuse	1.5 miles SW of project site
CA-KER-3549H	1908–1940	First and Second Los Angeles Aqueducts	0.9 miles W of project site

CA-KER-3826	Site record not available	Site record not available	0.25 miles E of former natural gas pipeline route, 2.0 miles N of Mendiburu Road
CA-KER-5573H (P-15-008781)	1908–1912	First Los Angeles Aqueduct Jawbone Division, No. 7 headquarters	0.8 miles W of project site
CA-KER-5945/H (P-15-010089)	1880–1920	Mining site with adit and blacksmith area, scatter of chert flakes and millingstone fragment	0.8 miles WNW of project site
CA-KER-7125 (P-15-012666)	Prehistoric	Rock shelter with midden deposit, and ground and chipped stone artifacts	0.8 miles NW of project site
CA-KER-7194 (P-15-012737)	Prehistoric	Sparse lithic scatter with chert, chalcedony, and obsidian debitage, a chalcedony core, and a jasper hammerstone	2.5 miles WSW of project site
P-15-012429	Prehistoric	Small lithic scatter of rhyolite debitage and tested andesite cobbles	1.0 miles W of project site

Additional Archival Research

The archaeologists for the applicant conducted additional archival research on the history of the BSEP project area of analysis at a number of repositories.

Methods

The research included a review of historic maps, aerial photographs, and information on the history of the region, seeking information on the location and age of potential historic-period resources on or near the project area. Records on the age of buildings were checked at the Kern County Assessor's and Recorder's Office. Historic maps were sought at Stiern Library at California State University, Bakersfield; the Kern County Library; University of California, Riverside, Library; University of California, Los Angeles, Library; the Los Angeles Public Library; the County of Los Angeles Library; and the San Diego State University Library. On-line historic map databases, including the California Historic Topographical Map Collection, at California State University, Chico, and the Historical Map Archive at the University of Alabama, were accessed. Historic aerial photographs were sought at the Kern County Department of Planning, at the U. S. Department of Agriculture Aerial Photography Field Office, and in the U. S. Geological Survey (USGS) EarthExplorer Aerial photography database (Hirsch 2008, p. 17).

Results

Results from the consultant's archival research were primarily data for the historical background subsection of the cultural resources section of the AFC and historical maps showing potential historic-period resources that the field surveys would ground truth (Hirsch 2008, p. 17).

Literature Search on Buried Archaeological Deposits near the Project Area

A brief literature search by Energy Commission staff found that recent investigations near the project site may indicate a broad, local level of sensitivity for buried archaeological deposits. The results of investigations by Sutton (1991) at archaeological site CA-KER-2211 on the Honda Test Track project, approximately one half mile east of the BSEP project site, are similar to those obtained by the applicant on the project site (see "Evaluation Phase (Phase II) Investigation of Prehistoric and Historical Archaeological Resources" subsection, below). The 1991 study found eight hearths, four of which were well-defined, a house floor, seven other archaeological features, and a cache of large obsidian flakes. The four well-defined hearths ranged in depth from 1 to 2 feet below the ground surface and from 150 to 940 years of age. The house floor was approximately 2 feet deep and 940 to 1,300 years of age. The apparent context for the features was a zone of man-made sediments, or midden, beneath a disturbed plow zone and above a layer or stratum of sterile yellow sand. In another study conducted west of the project site at CA-KER-3939 (Gardner, McGill, and Sutton 2002), three hearth features, buried between 4 and 15 feet below the present ground surface, were dated by radiocarbon assay to be between approximately 5,600 and 7,000 years old.

Native American Consultation

To obtain information on known cultural resources and to learn of any concerns Native Americans may have about the BSEP, the archaeologists for the applicant undertook to consult with Native American groups that may have an interest in the project area.

Methods

The applicant contacted the Native American Heritage Commission (NAHC) by facsimile on November 5, 2007, to request information about traditional cultural properties (for example, cemeteries and sacred places) in and around the project area and to request a list of Native Americans who have heritage ties to Kern County and want to be informed about new development projects there (Apple and Glenny 2008, p. 26). The NAHC responded on November 8, 2007 (BS 2008c, att. 3), with the information that their database had yielded no known Native American cultural resources on or near the proposed BSEP site, and a list of the names and contact information for seven Native Americans individuals or groups interested in development projects in Kern County (see Cultural Resources Table 4). The applicant sent a letter to each of the seven on November 20, 2007, asking for their input and asking about any concerns they may have about the project.

CULTURAL RESOURCES TABLE 4
Native American Contacts

Native American Contact	Group Affiliation	Contact Location	Contact Dates
Neil Peyron, Chairperson	Tule River Indian Tribe (Yokuts)	Porterville, Tulare County	November 20, 2007 July 1, 2008
Ron Wermuth	Tubatulabal, Kawaiisu, Koso, Yokuts	Kernville, Kern County	November 20, 2007 July 1, 2008
Delia Dominguez	Kitanemuk and Yowlumne Tejon Indians	Covina, Los Angeles County	November 20, 2007 July 1, 2008
Kathy Morgan, Chairperson	Tejon Indian Tribe (Yowlumne, Kitanemuk)	Wasco, Kern County	November 20, 2007
Robert L. Gomez, Jr.	Paiute, Yokuts, Tubatulabal	Bakersfield, Kern County	November 20, 2007 July 1, 2008
Robert Robinson, Historic Preservation Officer	Kern Valley Indian Council (Tubatulabal, Kawaiisu, Koso, Yokuts)	Weldon, Kern County	November 20, 2007 July 1, 2008
Donna Begay, Tribal Chairwoman	Tubatulabals of Kern Valley	Lake Isabella, Kern County	November 20, 2007 July 1, 2008
John Valenzuela, Chairman	San Fernando Band of Mission Indians	Irvine, Orange County	July 1, 2008 July 2, 2008 July 8, 2008

Results

No responses had been received by the time the cultural resources technical report was published in March, 2008 (Apple and Glenny 2008, p. 26). On July 1, 2008, however, telephone calls appear to have been placed to six of the seven original representatives and to John Valenzuela of the San Fernando Band of Mission Indians. Voicemail messages were left with four (Peyron, Robinson, Dominguez, and Begay) of those seven, but the archaeologists for the applicant were able to speak with the remaining two representatives, John Valenzuela, of the San Fernando Band of Mission Indians, and Robert Wermuth, affiliated with the Tubatulabel, Kawaiisu, Koso, and Yokuts groups (DB 2008d, att. DR-26; Apple and Glenny 2008, p. 27). The consultant informed Mr. Valenzuela about the sites discovered during the survey and those sites proposed for testing. Mr. Valenzuela mentioned that the 7-Feathers Corporation would be willing to provide monitors during the testing phase of the project. He also indicated that he wanted to obtain as much information as possible about the project and sites before any of the project work began. He also stated that there were important traditional sites around the project area, but requested another map in order to indicate where these sites were located. On July 2, 2008, the applicant sent another map to Mr. Valenzuela. On July 8, 2008, the applicant left a voice message inquiring about the 7-Feathers Corporation providing monitors for the testing phase of the project (DB 2008d, att. DR-26).

On July 1, 2008, the archaeologists for the applicant informed Ron Wermuth about the sites discovered during the survey and those sites proposed for testing. Mr. Wermuth mentioned that he would be interested in volunteering for monitoring during the testing phase of the project. He also mentioned that traditional use areas, including rock art sites, may be within the area, but also requested another map in order to indicate where these sites were located. An email with a map was sent to him on that same day.

Neither Mr. Valenzuela nor Mr. Wermuth has responded further, nor have any of the other Native Americans contacted. Therefore, at this time Native Americans have identified no ethnographic sites or additional known prehistoric archaeological sites.

Consultation with Others

California counties and cities may recognize particular cultural resources as locally historically important by ordinance, in general plans, or by maintaining specific lists. The Energy Commission's Data Regulations require applicants to acquire information on locally recognized cultural resources specific to the vicinity of their project by consulting local planning agencies and local historical and archaeological societies.

Inquiry to Kern County

Methods

On November 29, 2007, the archaeologists for the applicant initiated contact with Kern County to request any information that the county had on this area (Apple and Glenny 2008, p. 27).

Results

In its County Land Ordinance 18.05, in its Building Regulations, and in its General Plan, Kern County recognizes important historical resources listed as State Landmarks and in the CRHR and NRHP, but the County does not maintain a separate list of local historical resources. Thus no additional information on known cultural resources was obtained from this source (BS 2008c).

Inquiries to Local Historical Societies and Museums

Methods

In November, 2007, the applicant sent letters inquiring about locally recognized historical resources to the following organizations:

- Kern County Historical Society
- East Kern Historical Society
- Historical Society of the Upper Mojave Desert
- Kern Antelope Historical Society
- Boron Twenty Mule Team Museum
- Kern Valley Museum
- Maturango Museum of the Indian Wells Valley

Results

John Di Pol, of the Historical Society of the Upper Mojave Desert, provided pertinent information on December 7, 2007. Mr. Di Pol called attention to the nineteenth-century mining-associated roads that traversed the project area, to the Los Angeles Aqueduct construction camp called "Cinco," to the "R.R. siding" of Cantil as the junction of the aqueduct's Red Rock spur railroad and the Jawbone Branch, and to Desert Springs as an important waterhole for the stage and freight lines of the 1860s (Apple and Glenny 2008, att. 3).

Field Inventory Investigations

The archaeologists for the applicant are employing three phases of fieldwork to inventory the cultural resources in the project area of analysis, a geoarchaeology study and two intensive pedestrian surveys (Cultural Resources Table 5). The results have been the identification of 73 new cultural resources in the project area of analysis, not including the discovery of 59 isolate resources, the apparent re-recordation of one previously known cultural resource (CA-KER-2142/H or Site 40), and the observation of the loss of another previously known cultural resource (CA-KER-5264H) (Cultural Resources Table 6). The present cumulative cultural resources inventory for the project area of analysis includes 58 archaeological resources, no ethnographic resources, and 16 built-environment resources.

CULTURAL RESOURCES TABLE 5
Cultural Resources Inventory Investigations for the Present Analysis

Investigation Type	Results	Report Reference
Geoarchaeology Study	Documentation of stratigraphy of the 5 different landforms that compose the project site, discovery of buried archaeological deposit, assessment of landform archaeological sensitivity	Young 2009b
Intensive Pedestrian Cultural Resources Survey	Re-recordation of 3 known cultural resources, identification of 70 new cultural resources, and identification of 59 isolate cultural resources	Apple and Glenny 2008
Intensive Pedestrian Cultural Resources Survey	No cultural resources found	Tennyson 2009

CULTURAL RESOURCES TABLE 6
Cultural Resources Inventory for the Project Area of Analysis

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
Archaeological Resources				
Prehistoric Archaeological Resources				
FWARG-01 (2009)	Earthen pit feature of oxidized and burned sediments with partial fill of ash and charcoal	Project site, landform Hf2	Potentially eligible	Young 2009b
Site 2[4] (2007)	Lithic scatter of 6 cryptocrystalline silicate[5] (CCS) flakes and 1 core	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 8 (2007)	Two fire-affected rock (FAR) concentrations composed of 150 subangular granitic rocks	Project site	Potentially eligible	Apple and Glenny 2008
Site 9 (2007)	Small FAR scatter; possibly represents remnants of a hearth	Project site	Potentially eligible	Apple and Glenny 2008
Site 10 (2007)	Lithic scatter of 50 CCS flakes, a core, a mano fragment, two bifaces, and a scraper.	Project site	Potentially eligible	Apple and Glenny 2008
Site 11 (2007)	Concentration of 25 pieces of subangular granitic FAR, representing a disturbed hearth	Project site	Potentially eligible	Apple and Glenny 2008
Site 12 (2007)	FAR scatter composed of 150 pieces of subangular granitic rock, and a mano fragment	Project site	Potentially eligible	Apple and Glenny 2008

[4] Temporary Field Designation No.

[5] Cryptocrystalline silicates are rocks such as flint, chert, chalcedony, or jasper that contain a high percentage of silica (SiO^2), the primary compound that composes quartz.

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
Site 13 (2007)	Small FAR scatter composed of 25 pieces of granitic rock	Project site	Potentially eligible	Apple and Glenny 2008
Site 14 (2007)	Minimum of 4 FAR concentrations representing hearths and including a metate fragment, a mano fragment, and 4 pieces of debitage	Adjacent to project site	Potentially eligible	Apple and Glenny 2008
Site 17 (2007)	Lithic scatter of 2 flakes, 1 bifacial tool, and 1 utilized flake	Project site	Not eligible	Apple and Glenny 2008
Site 18 (2007)	Lithic scatter of 1 core chopper, 1 core fragment, and 4 CCS flakes	Project site	Not eligible	Apple and Glenny 2008
Site 19 (2007)	Lithic scatter of 6 CCS flakes	Project site	Not eligible	Apple and Glenny 2008
Site 20 (2007)	Lithic scatter of 2 CCS flakes and 1 bifacial tool	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 21 (2007)	Lithic scatter of 1 scraper, 2 core fragments, and 1 flake	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 22 (2007)	Lithic scatter of 1 biface fragment, 1 utilized flake, and 2 pieces of debitage	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 23 (2007)	Lithic scatter of 3 cores and 6 flakes, all composed of CCS	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 24 (2007)	Lithic scatter of 2 CCS cores and 4 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 26 (2007)	Lithic scatter of 1 scraper, 1 core, and 3 flakes, all composed of CCS	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 27 (2007)	Lithic scatter of 1 core, 2 CCS flakes, and 1 metate fragment	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
Site 29 (2007)	Lithic scatter of 1 core and 2 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 30 (2007)	Lithic scatter of 1 CCS core and pieces of CCS debitage	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 39 (2007)	Lithic scatter of 6 flakes and 1 core	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 41 (2007)	Lithic scatter of 2 CCS cores and 2 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 42 (2007)	Lithic scatter of 3 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 43 (2007)	Lithic scatter of 10 CCS flakes and 1 CCS core	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 44 (2007)	Lithic scatter of 4 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 46 (2007)	Lithic scatter of 4 CCS cores and 8 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 47 (2007)	Lithic scatter of 5 flakes, 1 core, and 1 tool	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 48 (2007)	Lithic scatter of 2 cores, 6 pieces of debitage, and 1 scraper	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 50 (2007)	Lithic scatter of 8 CCS flakes, 1 obsidian flake, 2 cores, and 1 scraper	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008
Site 51 (2007)	Lithic scatter of 18 CCS flakes	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008
Site 52 (2007)	Lithic scatter of 4 pieces of debitage and 1 utilized flake	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 54 (2007)	Lithic scatter of 10 flakes, 1 modified flake, and 1 core, all composed of CCS	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
Site 55 (2007)	Lithic scatter of 4 pieces of CCS debitage	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 56 (2007)	Lithic scatter of 3 CCS cores and 2 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 57 (2007)	Lithic scatter of 4 CCS flakes	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 58 (2007)	Lithic scatter of 2 CCS flakes and 1 CCS core	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 59 (2007)	Trail measuring 30 to 35 cm wide, and extending north ~2 km crossing through Site 40 and electric transmission line Option 1	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008
Historical Archaeological Resources				
BSPL-H-01 (2007)[6]	Deposit of cans, glass, and some indeterminate metal fragments; includes white ceramics, window glass, tobacco cans, green aqua glass, and some hole-in-top cans	Former natural gas pipeline route	Not eligible	Apple and Glenny 2008
BSPL-H-02 (2007)	Concrete foundation with associated cistern, and refuse scatter of purple glass, hole-in-top cans, and barbed wire	Former natural gas pipeline route	Potentially eligible	Apple and Glenny 2008
CA-KER-5264H[7] (1997)	Deposit containing glass fragments, ceramics, round nails, a glove, and indeterminate metal	Project site	Not relocated	Smith and Raven-Jennings 1997

[6] [Temporary Field Designation No.]

[7] CHRIS Trinomial No.

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
Site 16 (2007)	Deposit of historic and recent refuse including historic aqua, green, and brown glass, and ceramics, and recent indeterminate metal fragments, auto parts, and a can opener	Project site	Not eligible	Apple and Glenny 2008
Site 31 (2007)	Deposit of food cans (~250 cans), glass fragments, one assay crucible, tobacco cans, ceramics, car parts, and indeterminate metal debris	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008
Site 32 (2007)	Dense refuse concentration including mattress springs, galvanized metal, green and brown glass fragments, and some indeterminate metal	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 33 (2007)	Deposit of ~25 cans, fragments of a 50-gallon drum, and corrugated sheet metal	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 34 (2007)	Deposit of cans, glass, ceramic fragments, and a purple cork top bottle fragment	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 35 (2007)	Deposit of glass, ceramics, non-diagnostic metal, and more recent debris	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 36 (2007)	Deposit of over 200 historic cans, colorless and brown glass fragments, a tea cup fragment, and more recent debris	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
Site 37 (2007)	Deposit of melted glass, hole-in-top cans, a framework of a cot, milled lumber, and non-diagnostic metal	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 45 (2007)	Deposit with 2 loci, Locus 1 has milled wood and porcelain and Locus 2 has mattress springs, tin cans, and glass fragments	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 53 (2007)	Deposit of 25 cans (matchstick filler), a lantern base, and a one gallon oil can	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Multiple-Component Archaeological Resources				
Site 1 (2007)	Lithic scatter of 6 CCS flakes, and a refuse concentration of a kerosene can, aqua glass sherds of a Mason jar, four matchstick filler cans, a wire handle, remnants of a 55-gallon drum, and several more recent cans	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 3 (2007)	Two refuse scatters of a metal lock, a ceramic sherd with polychrome flower pattern on edge, a aqua glass bottle base, a Prince Albert tobacco tin, an embossed aqua glass fragment, a square bolt, a brown cork-top bottle neck, a curved tobacco can, and	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
	earthenware ceramic sherds			
Site 6 (2007)	Lithic scatter of 8 CCS flakes, 5 CCS cores, a projectile point fragment, and a utilized flake in combination with a refuse scatter of ceramics and several aqua-colored glass fragments	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008
Site 25 (2007)	Lithic scatter of 1 scraper, 1 core fragment, 4 pieces of debitage, and 1 glass bottle-neck	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 28 (2007)	Lithic scatter of 1 CCS core and 1 CCS flake in combination with a refuse concentration of wood, pull-top cans, 1 polychrome flower print plate, a toothpaste can, colorless glass fragments, and indeterminate metal fragments	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 38 (2007)	Deposit of purple glass fragments, 2 flakes, and 2 cores	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Site 40 (2007) (CA-KER-2142/H (1986), see “Cultural Resources Table 3, above” and also “Site 59” in “Archaeological Resources Evaluations” subsection, below)	Several partially buried hearths, > 70 CCS flakes, 1 obsidian core, 1 mano fragment, and 1 metate fragment in combination with a refuse scatter of apparent fish, oil, meat, and spice tins, manganese-decolorized, aqua, and brown bottle	Vicinity of transmission lines	Potentially eligible	Apple and Glenny 2008

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
	glass fragments, a partial embossed mark on an aqua panel bottle fragment, and barrel hoops, and with Site 59 (a prehistoric trail) extending through site			
Site 49 (2007)	Lithic scatter of 1 CCS core and 10 CCS flakes in combination with a refuse deposit of 1 tobacco tin, fragments of purple glass, and 1 hole-in-top can	Vicinity of transmission lines	Not eligible	Apple and Glenny 2008
Ethnographic Resources	None presently known			
Built-Environment Resources				
7696 Neuralia Road, California City (2007)	Rancho Cantil	Project site	Potentially eligible	BS 2008a
21257 79th Street, California City (2007)	Built in 1964	Former natural gas pipeline route	Not eligible	BS 2008a
21225 Neuralia Road, California City (2007)	Built in 1964	Former natural gas pipeline route	Not eligible	BS 2008a
21209 Neuralia Road, California City (2007)	Built in 1964	Former natural gas pipeline route	Not eligible	BS 2008a
21125 Neuralia Road, California City (2007)	Built in 1964	Former natural gas pipeline route	Not eligible	BS 2008a
21101 Neuralia Road, California City (2007)	Built in 1964	Former natural gas pipeline route	Not eligible	BS 2008a
21049 Neuralia Road, California City (2007)	Built in 1964	Former natural gas pipeline route	Not eligible	BS 2008a
21041 Neuralia Road, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a

Cultural Resource Type and Designation (Year of Initial Recordation)	Description	Project Area Location	Preliminary California Register of Historical Resources (CRHR) Eligibility	Siting Case Report Reference
21033 Neuralia Road, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a
21025 Neuralia Road, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a
21017 Neuralia Road, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a
21009 Neuralia Road, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a
21001 Neuralia Road, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a
21000 79th Street, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a
21001 79th Street, California City (2007)	Built in 1963	Former natural gas pipeline route	Not eligible	BS 2008a
CA-KER-3366H (1992)	A section of the Southern Pacific Railroad, "Jawbone Branch"	Project site	Potentially eligible	BS 2008a

This subsection discusses the three field inventory phases and provides a raw summary of the resultant cultural resources inventory for the project area of analysis. Thorough descriptions of the cultural resources in the inventory that may be subject to impacts from the proposed project, evaluations of the eligibility of those resources for listing in the CRHR, assessments of project impacts on each determined historical resource, consideration of potential impacts on archaeological resources that may lie buried in the project site, and proposed mitigation measures for significant impacts may be found in the "California Register of Historical Resources Evaluations" and "Assessment of Impacts and Discussion of Mitigation" subsections, below.

Geoarchaeology[8] Study

Staff made a request to the applicant in June, 2008 (Data Request No. 34) to provide information that would facilitate the assessment of the potential for the project to encounter buried archaeological deposits during its construction, operation, and

[8] Geoarchaeology is a subdiscipline of archaeology that uses the techniques and approaches of earth sciences, such as geology, geomorphology, sedimentology, pedology, and stratigraphy, to identify, investigate, and interpret the history of the human use of present and former landscapes.

maintenance. The request sought a discussion of the historical development of the landforms that compose the project site, the basis for which was to be an appropriate combination of extant literature and primary field research (CEC 2008bb). The August, 2008 response from the applicant (BS 2008g) was a letter report that summarizes the geomorphology of the project area on the basis of extant geologic and soil science data for the region and on the basis of the applicant's consultant's previous geotechnical investigations of the project site. The letter report concludes that recent (1,000 to 8,000 year old) alluvial fan deposits that cover approximately 80 percent of the project site, and the alluvial stream deposits that cover the floors of the drainages that have cut channels into those fan deposits and into older (15,000 to 19,000 year old) alluvial fan deposits above and to the west of the former deposits, have the potential for buried archaeological deposits that would date from the present to 12,000 years ago. The letter report also states that the recent (present to 8,700 year old) deposits of lake sediments that cover approximately 20 percent of the project site along its northern boundary are an unlikely place to find archaeological deposits.

The results of an October, 2008 study to evaluate the historical significance of eight archaeological sites in the project area (Apple, Cleland, and Glenny 2008) documents the presence of significant intact buried prehistoric archaeological deposits beneath the surface of the project site (see "Evaluation Phase (Phase II) Investigation of Prehistoric and Historical Archaeological Resources" subsection, below). The investigation of, among others, five archaeological sites that are surface concentrations of fire-affected rock revealed the presence of six, intact buried fire features or hearths that range in age from approximately 150 to 580 or 655 years before the year 1950. The tops of the hearths were found at depths from approximately 13 to 70 centimeters below the present surface of the project site, and were apparently not evident from that surface. It is of note that four of the five subject sites were found in the lake sediment deposits in the northern portion of the project site, where the August, 2008 letter report states such archaeological deposits are unlikely to be present.

The results of the October, 2008 evaluation study and articles on the archaeology of the project vicinity (see "Literature Search on Buried Archaeological Deposits Near the Project Site" subsection, above), demonstrate that buried archaeological deposits are present on the project site, in both of the major geologic contexts that the August, 2008 letter report identifies, and indicate that these deposits may be present to the maximum depth of ground disturbance anticipated for the construction of the proposed project. This evidence did not ultimately prove to be a sufficient basis for the substantive analysis and mitigation of the impacts that the construction of the proposed project may have on cultural resources, because staff had little information on the extent to which buried archaeological deposits are present beneath the surface of the proposed BSEP project site.

To develop a factual approximation of both the number of buried archaeological deposits that are beneath the surface of the proposed project site and the potential scope of the impacts that the project would have on them, information necessary to facilitating the development of effective mitigation measures, staff presented the applicant with Supplement to Data Request 34 on December 16, 2008 (CEC 2008bbb). The supplemental data request asks for information to help assess the potential distribution patterns of buried archaeological deposits beneath the project site, the

geologic deposits with which known and as yet unknown buried archaeological deposits are and may be associated, and the approximate ages and types of archaeological sites that the latter deposits may represent. More specifically, the data request supplement asks that the applicant augment the results of the August, 2008 letter report with a geoarchaeology study that would map the landforms and major landform features of the project site, conduct primary field research to document the stratigraphy of the project site, analyze the records from the field effort and the material culture that may be found, and prepare a conclusory archaeological assessment of the project site.

The applicant agreed on or about January 6, 2009 to conduct the protocol for the geoarchaeology study set out in Supplement to Data Request 34. The applicant sought clarification of the protocol in a teleconference of December 17, 2008 among Energy Commission staff, the applicant, and the archaeologists for the applicant, and in subsequent emails of December 19, 2008 and January 6, 2009. Staff provided clarifications to the protocol in an email of December 22, 2008 (CEC 2008aaa) and in a January 6, 2009 mark-up of the January 6, 2009 email transmittal by the applicant of "CEC Geoarchaeological SOW [Scope of Work] Clarifications" (CEC 2009bb). The December 22 email and the January 6 mark-up clarify and amend Supplement to Data Request 34. Energy Commission staff and the applicant ultimately agreed that the applicant would implement the field protocol for the geoarchaeology study and provide staff with a preliminary field report of the results of that work at least 30 days prior to the publication of the FSA. A further agreement was that the applicant would provide a final technical report of the complete study after certification of the proposed project but prior to the development of the Historical Resources Management Plan (HRMP) that staff would propose as one condition of certification for the project.

The implementation of the field protocol for the geoarchaeology study was a two-phase process. The purpose of the first phase was to map the landforms and major landform features of the project site for use in designing the field sample and the field methods for the execution of the second phase of the study. The archaeologists for the applicant submitted the results of the first phase of the field protocol to staff on January 21, 2009 (Young 2009a) for review and comment. The second phase of the field protocol was the documentation of the stratigraphy of the project site from January 24–29, 2009. The archaeologists for the applicant submitted a preliminary field report of that work on February 6, 2009 (Young 2009b). The methods and the preliminary results of the geoarchaeology study, as related in the January 21 and February 6 reports, are presented below. The final technical report of the complete study is in preparation. Its submittal and approval by Energy Commission staff, as set out in **CUL-4** below, is proposed as a necessary precursor to the preparation of the HRMP. The results of the February 6 report are preliminary, and, while adequate for the conclusion of the present analysis, may change as a result of laboratory analyses and further analyses of field data that are presently underway.

Methods

Landform Mapping

The archaeologists for the applicant conducted a program of landform mapping in mid-January, 2009. The components of the program were background research into the

geology and the geomorphology of Fremont Valley and the vicinity of the project site, a site visit to prehistoric archaeological site CA-KER-3939 (see "Literature Search on Buried Archaeological Deposits near the Project Area" subsection, above), and a reconnaissance survey of the landforms that compose the project site.

Documentation of Stratigraphy

On the basis of the results of the landform mapping, the archaeologists for the applicant were able to develop a field sample appropriate to the geomorphology of the project site and to refine the field methods set out in Supplement to Data Request 34 and in the clarifications to that supplement. The initial sample design in the January 21 report sought the excavation of a minimum of 17 backhoe trenches to a depth of 20 feet across the five distinct landforms found on the project site. A minimum of three trenches were to be dug in each landform, and the face of one trench wall in each landform was to be documented according to the agreed-upon field protocol.

The archaeologists for the applicant documented the stratigraphy of the project site from January 24–29, 2009. A total of 17 trenches were dug to depths of 16 to 20 feet in the five landforms of the project site. Each trench where a trench face would be documented, or a profile trench, was benched and shored to provide a safe working environment. Hydraulic shoring and ladders were placed in each profile trench after the excavation of the trench and adjacent benches. The profiles on both faces of each profile trench were cleaned with a pointing trowel, and one face was then selected for documentation. The selected profiles were each photographed and measured for illustration. Observations of sediment characteristics in the profiles, such as particle size and shape, sedimentary contacts, bedding geometry of sediments, and organic content, were made and noted. Unless discrete organic or charcoal deposits were found, major sedimentary deposits were defined for the purpose of collecting radiocarbon samples. Small sediment samples from the different sedimentary deposits in the profile trenches were sifted through hardware cloth to provide higher resolution data on the presence or absence of archaeological materials in the documented deposits. Subsequent to the documentation of a profile trench in each landform, additional trenches were dug into other locations on that landform to monitor and observe variations in landform stratigraphy.

Results

The geoarchaeology study for the proposed project documents five relatively distinct landforms on the project site (Cultural Resources Table 7 and Cultural Resources Figure 1 that represent a complex geomorphic system made up of the alluvial fans of Pine Tree Wash and Jawbone Canyon and alluvial deposits along the axis of Fremont Valley. The primary landform on the project site is the Pine Tree Wash alluvial fan, which emanates from the mouth of Pine Tree Canyon approximately 2.4 miles southwest of the project site. The distal[9] northeastern portion of the fan appears to interfinger, in the northern portion of the project site, with the distal southern portion of the Jawbone Canyon alluvial fan, which emanates from the mouth of that canyon approximately 2.0 miles to the north of the project site. The Cantil Valley fault, part of

[9] Distal, in the context of geomorphology, describes the portion of a landform opposite the point of origin of that landform.

the Garlock fault zone, cuts through the Pine Tree Wash alluvial fan from southwest to northeast through the middle of the project site and creates a discontinuous scarp that reaches a maximum height of approximately 3 to 4 meters. The displacement along the fault results in the landforms to the north of the fault being lower than the landforms to the south of it. One of the ephemeral stream channels that serve to drain precipitation along the south-southwest to north-northeast axis of Fremont Valley now captures the flow of Pine Tree Wash and directs the flow over the Cantil Valley fault scarp, in the middle of the project site, down onto the landforms to the north of the fault.

The displacement of Pine Tree Wash alluvial fan deposits by the Cantil Valley fault define different depositional regimes for the landforms that are above and to the south of the fault and those that are below and to the north of it. The older landforms on the project site are those above and to the south of the Cantil Valley fault. Landforms Hf1[10] and Hf1d are primarily the product of alluvial deposition during the Holocene epoch along the axis of Fremont Valley resulting from surface water moving toward Koehn Lake approximately 6 miles to the east-northeast of the project site, and older cycles of late Pleistocene and early Holocene deposition on the Pine Tree Wash fan. The present surface of these landforms represents a relatively shallow (< 1 m) cap of more recent eolian[11] and alluvial deposition.

The younger landforms on the project site are those below and to the north of the Cantil Valley fault. Landforms Hf2, Hf3, and Hf4 (originally Hf3p) are each distinct zones of deposition that have aggraded subsequent to and as the result of displacement along the fault. As landforms Hf1 and Hf1d progressively rose south of the Cantil Valley fault, the resulting fault scarp came to constrain and redirect the flow of Pine Tree Wash distributaries[12] out across the northern and western portions of the project site resulting in the deposition of the Hf2 and Hf3 landforms, apparently primarily during the Holocene epoch. Subsequent to the change of course of Pine Tree Wash into the Fremont Valley axial channel through which it now flows, landform Hf4 is presently aggrading over the slightly older Hf2 and Hf3 landforms.

More specific information on the investigation of each landform, on observations about the physical and processual character and the apparent chronology of each landform, and the preliminary assessment of the archaeological sensitivity of each landform are set out below.

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[10] Landform designations follow a relatively simple nomenclature where “H” refers to the Holocene epoch, “f” refers to an alluvial fan landform, sequential Arabic numerals denote order of deposition, and final subscripts such as “p” and “d” refer to landform features such as post-faulting deposits and distributaries, respectively.

[11] Eolian refers to sedimentary deposits or landforms that are the result of wind action.

[12] A distributary is a branch of a stream that flows away from the primary stream channel and does not rejoin it.

CULTURAL RESOURCES TABLE 7
Preliminary Description of Project Area Landforms and Archaeological Deposit Sensitivity*

Landform Designation**	Physical Description	Approximate Age	Archaeological Deposit Sensitivity
Hf1	Uplifted alluvial fan, Holocene alluvial fan and desert wash deposits resting on Pleistocene alluvial fan 2 m below the present ground surface	Holocene to paleosol at a depth of approximately 2 m, radiocarbon assay on paleosol humates yielded date of 9,550±50 radiocarbon years, Pleistocene below paleosol	Moderate
Hf1d	Uplifted alluvial fan, Holocene alluvial fan and distributary system deposits resting on Pleistocene alluvial fan 2 m below the present ground surface	Holocene to a depth of approximately 2 m, Pleistocene below 2 m	Moderate
Hf2	Distal alluvial fan intersection of Pine Tree Wash and Jawbone Canyon alluvial fans, Holocene distal alluvial fan deposits from the present ground surface to a depth exceeding 4 m	Early through recent Holocene	High
Hf3	Active alluvial fan midslope environment, moderate- to high-energy alluvial fan channels and slopewash	Recent Holocene	Low
Hf4 (Originally Hf3p)	Ongoing Holocene deposition of Pine Tree Wash alluvium		Moderate

* see Cultural Resources Figure 1, above

** Landform designations follow a relatively simple nomenclature where “H” refers to the Holocene epoch, “f” refers to an alluvial fan landform, sequential Arabic numerals denote order of deposition, and final subscripts such as “p” and “d” refer to landform features such as post-faulting deposits and distributaries, respectively.

Project Area Landforms

Hf1

The stratigraphy of the Hf1 landform was exposed in a series of three trenches toward the southeastern boundary of the project site. The portion of the landform seen in the trenches has three basic sedimentary components. The upper portion of the landform is a shallow cap of alluvium and eolian deposits. Beneath the cap is a thick sequence of fine sands and silts that encase a paleosol[13]. The paleosol is approximately 2 meters below the present surface of the project site. It represents a former land surface where the profile of the soil took several thousand years to develop. A radiocarbon assay of organic material from the preserved A horizon of the paleosol indicates that it was the surface of the project site as recently as approximately 9,550 years ago. As this age represents a minimum age for the paleosol, the paleosol was probably developing during the transition from the Pleistocene to the Holocene epoch, approximately 10,000 years ago. The balance of the sequence of the fine sands and silts beneath the paleosol, and the deposits of coarse to fine gravel from the Pine Tree Wash alluvial fan which underlie that sequence are Pleistocene in age, largely predating the commonly acknowledged presence of humans in North America.

The preliminary assessment of archaeological sensitivity for landform Hf1 is that the upper 2 meters of the landform, down to the surface of the paleosol, has a moderate potential for containing buried archaeological deposits. The relatively low-energy deposits above the paleosol would have been conducive to the preservation of archaeological materials and the spatial associations among them. The spatial associations reflect the behavior of the people who are responsible for the manufacture, use, and discard of archaeological materials and are critical to the reconstruction of local prehistory. The potential presence of artifacts in deposits below the paleosol, in consideration of the apparent Pleistocene age of those deposits, would reasonably be concluded to be slight.

Hf1d

The stratigraphy of the Hf1d landform was exposed in a series of three trenches in the southwestern portion of the project site, west of Pine Tree Wash. The portion of the landform seen in the trenches represents three primary phases of sedimentary deposition. The upper approximately 1 meter of the deposits that compose the landform is predominantly made up of Holocene alluvial fan deposits that encase coppice dunes[14] and sand sheets. The deposits from approximately 1 to 2 meters below the present ground surface become a sequence of fine sands and silts that indicate deposition on the distal portion of an alluvial fan similar to, although much older than, the deposits of the Hf2 landform. Below a depth of 2 meters, the stratigraphy changes abruptly to deposits where pebbles and cobbles predominate, indicating deposition in high-energy flood and wash events, probably in the Pleistocene epoch.

The preliminary assessment of archaeological sensitivity for landform Hf1d is that the upper 2 meters of the landform, down to the apparent Pleistocene-age deposits of

[13] A paleosol is a fossil soil buried beneath rock formations or sedimentary deposits.

[14] Coppice dunes are sand dunes that form around vegetation.

pebbles and cobbles, has a moderate potential for containing buried archaeological deposits. The relatively low-energy deposits above the pebbles and cobbles would have been conducive to the preservation of archaeological materials and the spatial associations among them. Any archaeological materials found in the lower, high-energy deposits of the landform would most likely not retain their original spatial associations. Artifacts found in the predominately pebble and cobble matrix of those deposits would most likely have been washed down from a higher elevation and would have simply become another part of the rock matrix of the deposits. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory. As the lower deposits are also thought to date to the Pleistocene epoch, largely predating the commonly acknowledged presence of humans in North America, the potential presence of artifacts in the deposits would reasonably be concluded to be slight.

Hf2

The stratigraphy of the Hf2 landform was exposed in a series of four trenches in the northwestern and northeastern portions of the project site. The portion of the landform seen in the trenches represents two basic phases of sedimentary deposition. The upper portion of the deposits, which reach to a depth of approximately 4 meters below the present surface, indicates relatively repetitive sequences of particularly low-energy sheetwash and flood events that have taken place over thousands of years, up to the present day. Evidence for each event is found in a fining-upward sequence that begins in a deposit of fine sand and grades progressively upward into silt. Each sequence represents a flood event that brought water and sediment out to the distal reaches of either the Pine Tree Wash or Jawbone Canyon alluvial fans where the water pooled and then slowly dried out leaving behind a typical playa surface with polygonal cracks and clay films. The fining-upward sequences and the sedimentary features such as the polygonal cracks and the clay films are well-preserved throughout the upper 4 meters of the landform. Some portions of the upper stratigraphy of the landform evidence more than 16 such sequences per meter of depth. The higher fining-upward sequences nearer the surface of the landform are thicker than those further down. The near-surface sequences vary from 20 to 30 centimeters in thickness and are thought to indicate prolonged surface flows of water and more long-term pooling. The initial pulse of water from these sheetwash and flood events often scoured the local landscape of charcoal from recent natural wildfires, and the charcoal became incorporated into the fine sands at the base of each fining-upward sequence. A radiocarbon assay of the charcoal from one such sequence, approximately 2.8 meters below the present surface, dates the onset of one sheetwash and flood event to approximately 4,250 years ago and demonstrates that these events have been occurring throughout the middle and late Holocene. The lower portion of the deposits of the Hf2 landform evidences a dramatic difference in the earlier depositional regime of the landform. The structure and content of the deposits point to a high-energy flood and a subsequent, prolonged period of drying that may represent the early Holocene climate of the region.

The archaeological sensitivity of landform Hf2 for intact buried archaeological deposits is not preliminary. It is known, on the basis of the archaeological resources evaluation program for the project area (see “Evaluation Phase (Phase II) Investigation of Prehistoric and Historical Archaeological Resources” subsection, below) and the results

of the present geoarchaeology study, to be high. The evaluation of four archaeological sites on the Hf2 landform (Sites 9, 11, 12, and 13) that are surface concentrations of fire-affected rock revealed the presence of five, intact buried fire features or hearths that range in age from approximately 150 to 580 or 655 years before the year 1950. The tops of the hearths were found at depths from approximately 13 to 36.5 centimeters below the present surface of the project site, and were apparently not evident from that surface (see “Prehistoric Archaeological Resources” subsection, below). A sixth hearth was found in the Hf2 landform (FWARG-01) during the excavation of the trenches into the landform for the geoarchaeology study. The top of that feature is approximately 80 centimeters below the present surface. The presence of the hearth was also not apparent from the surface (see “Prehistoric Archaeological Resources” subsection, below). Intact buried archaeological deposits in the form of prehistoric and early historic Native American hearths are clearly present as frequent components of the top 1 meter of the Hf2 landform. The particular character of the low-energy regime that is responsible for the deposition of the landform during the middle and late Holocene indicates that the preservation of such hearths and perhaps also the former land surfaces from which the hearths were constructed and used are likely to a depth of approximately 4 meters below the present surface of the project area.

Hf3

The stratigraphy of the Hf3 landform was exposed in a series of three trenches in the western portion of the project site. The portion of the landform seen in the trenches represents one basic regime of sedimentary deposition. The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan.

The preliminary assessment of archaeological sensitivity for landform Hf3 is that the potential for intact buried archaeological deposits is low. While occasional stone flakes, or debitage, are present to a depth of almost 4 meters below the present ground surface, archaeological materials on and in this part of the Pine Tree Wash alluvial fan most likely do not retain spatial associations that reflect the behavior of the people who made, used, or discarded such materials. Artifacts found on the surface of the alluvial fan or eroding out of the deposits of rock and sediment that form it have most likely been washed down from a higher elevation and have simply become another part of the rock matrix of the fan. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory.

Hf4

The stratigraphy of the Hf4 landform was exposed in a series of four trenches in the western and eastern portions of the project site. The portion of the landform seen in the trenches represents three phases of sedimentary deposition. The upper approximately 2 meters of the deposits that compose the landform are predominantly gravels and sands that form a relatively recent alluvial fan where Pine Tree Wash cuts north across the scarp of the Cantil Valley fault and down onto the surfaces of the Hf2 and Hf3 landforms. Sedimentary deposits of the Hf4 landform overlay and interfinger with the deposits of the latter landforms. The portion of the Hf4 landform from approximately 2 meters below the present ground surface to a depth of approximately 4 meters is a

sequence of sheetwash[15] and minor flood deposits similar in character to the deposits that characterize the Hf2 landform. The origin of the deposits may be the distal reaches of streams other than Pine Tree Wash. The portion of the landform greater than 4 meters in depth is similar in character to the deposits of the Hf3 landform and evidence relatively high-energy sheetwash and stream channel deposition.

The preliminary assessment of archaeological sensitivity for landform Hf4 is that the potential for intact buried archaeological deposits is moderate, despite the interpretation of the landform as being the product of moderate- to high-energy depositional regimes. Archaeological sensitivity is thought to be moderate on the landform, primarily across its eastern and northern portions, because the Hf2 landform, a landform known to be highly sensitive for buried archaeological deposits, may be shallowly buried there.

Intensive Pedestrian Cultural Resources Survey

The archaeologists for the applicant undertook two intensive pedestrian cultural resources surveys of the proposed project area to comply with the Energy Commission's siting regulations (Apple and Glenny 2008 and Tennyson 2009). The purpose of the surveys was to provide information on the location and the character of the cultural resources that may lie on the surface of the project area. The resulting information informs the present analysis of the project's potential effects on historical resources.

Primary Survey

Methods

The primary cultural resources survey of the BSEP project area was conducted from October through December, 2007 (Apple and Glenny 2008, p. 29). The survey included coverage of the entire proposed project site, plus a 200-foot buffer zone extending beyond the project site boundary. The pedestrian survey for the former natural gas pipeline route and the two alternate transmission line alignments covered the proposed route rights-of-way, plus 50 feet to either side of the centerline of the routes. Additionally, built-environment resources within one-half mile of the proposed project site, of both transmission line alternatives, and of the former natural gas pipeline route were inventoried (Hirsch 2008, pp. 20, 30).

The standard transect interval for the pedestrian survey was 20 meters in width (Apple and Glenny 2008, p. 30). Once survey personnel entered a portion of California City along the former natural gas pipeline route, however, transect spacing was slightly altered due to the presence of a four-lane road with a center divide. A hand-held Trimble GeoXT submeter GPS unit was used for recording site location data, and a sketch map was also produced. Photographs were taken of selected artifacts.

The applicant also sought to identify built-environment resources that could be impacted by the proposed BSEP. The applicant reviewed historic maps for structures 45 years of age or older and, in November and December of 2007, conducted an intensive survey

[15] Sheetwash refers to precipitation runoff that occurs in broad flows across the ground surface rather than in stream channels.

of the main plant site, or project site, the areas proposed for the two transmission line alternatives, and a 0.5-mile buffer zone around these components. For the former natural gas pipeline route, which traversed both urban and rural areas, parcels adjacent to the pipeline route in the urban areas and within a 0.5-mile buffer zone to either side of the route in the rural areas were surveyed, documenting and photographing all of the structures found (Hirsch 2008, p. 20).

Results

As a result of the intensive pedestrian cultural resources survey, 57 new archaeological sites and 59 archaeological isolates were found (Apple and Glenny 2008, pp. 31-32, 54). The new archaeological sites consisted of 38 prehistoric, 12 historical, and 7 multiple-component archaeological sites. The archaeological isolates consisted of 55 prehistoric, 3 historical, and 1 multiple-component resources. The prehistoric archaeological site types include lithic scatters of stone tools and stone tool manufacturing and maintenance debris, fire-affected rock scatters, potential campsites, and a trail. The historical archaeological site types consist principally of debris and refuse scatters. The multiple-component sites include a combination of lithic scatters and historic refuse scatters. The isolate types include prehistoric lithics and historic refuse, with one isolate representing both lithics and historic refuse. Cultural Resources Table 6 summarizes the previously known and newly identified archaeological sites.

The applicant also sought to identify standing structures that would be 45 years of age or older in 2010, ultimately recognizing 15 standing structures and one linear built-environment resource within the main plant site, or project site, along the transmission line alternatives, and along the former natural gas pipeline route (Hirsch 2008, p. 20).Of the 15 standing structures, only one structure was initially considered potentially significant and documented. This house was known historically as “Rancho Cantil” (Hirsch 2008, p. 20). The other 14 standing structures that were documented were located within one-half mile of the former natural gas pipeline route. The linear built-environment resource is the Jawbone Branch of the Southern Pacific Railroad, a segment of which forms the western boundary of the BSEP project site. Cultural Resources Table 6 summarizes the previously known and newly identified built-environment resources.

Supplemental Survey

Methods

The supplemental cultural resources survey for the route of the emergency access road was conducted on June 16, 2009 (Tenneyson 2009, p. 4). The pedestrian survey for the access road covered the 55-foot-wide, approximately 0.5-mile-long road corridor plus 50-foot buffer zones on either side of the corridor (survey area).

The standard transect interval for the survey was 20 meters in width. A hand-held Trimble GeoXT submeter GPS unit was used to track the progress of the survey. The surveyors report excellent ground visibility that ranged from 90 to 100 percent (Tenneyson 2009, p. 4).

Results

No cultural resources were found in the survey area (Tenneyson 2009, p. 4).

California Register of Historical Resources Evaluations

Evaluation Phase (Phase II) Investigation of Prehistoric and Historical Archaeological Resources

The applicant originally made the determination that the proposed project had the potential to impact 18 of the 59 archaeological sites that were found or the previously recorded locations for which were revisited during the intensive pedestrian cultural resources survey (Apple, Cleland, and Glenny 2008, p. v) (see also "Intensive Pedestrian Cultural Resources Survey" subsection, above). That accounting cast the Jawbone Branch of the Southern Pacific Railroad as an archaeological resource and CA-KER-5264H as an extant archaeological site. Both are here removed from the archaeological resource count to clarify the discussion below of the archaeology of the project area of analysis. The Jawbone Branch is a built-environment resource for the purpose of this FSA (see "Built Environment Resources Evaluations" subsection, below), and Energy Commission staff here proposes to drop further consideration of CA-KER-5264H as an archaeological resource, because the applicant was unable to relocate it. The adjusted archaeological resource count, then, indicates the applicant to anticipate the proposed project having the potential to impact 16 (BSPL-H-01, and BSPL-H-02, and Sites 3, 6, 8–13, 16–19, 54, and 59) of the 57 archaeological resources in the project area of analysis that were known and present as of the date of the report for the intensive survey (Apple, Cleland, and Glenny 2008).

The applicant, in consultation with Energy Commission staff (CEC 2008a), developed a program to evaluate the historical significance of each of the above 16 archaeological resources. The program provided for the evaluation of a subset of the subject resources on the basis of prior surface observations, where the applicant was able to use such observations to support defensible evaluation arguments. The applicant made recommendations on the historical significance of five (BSPL-H-01, and Sites 16–19) of the 16 archaeological sites in this manner. Subsequent to the applicant and Energy Commission staff consultation on the evaluation program, but prior to the implementation of the program, the applicant made the determination that the proposed project would avoid three additional archaeological sites (BSPL-H-02, and Sites 6 and 54). The balance of eight archaeological resources were each subject to additional surface documentation. One resource (Site 3) was subject to additional archival research, one (Site 59) was subject to close-interval survey, and six (Sites 8–13) were subject to limited excavation to gather the minimum amount of information necessary to conclude historical significance recommendations (Apple, Cleland, and Glenny 2008). Subsequent to the implementation of the evaluation program, the applicant made the further determination that the proposed project would avoid one (Site 8) of the eight archaeological resources that had been subject to additional fieldwork, leaving the total number of archaeological resources that the proposed project would impact at 12. The results of the evaluation program identify which of those 12 (BSPL-H-01, and Sites 3, 9–13, 16–19, 59) archaeological resources in the project area are historical resources under CEQA and require further consideration in the present analysis.

Methods

The archaeologists for the applicant conducted the field phase of the evaluation program from July 30 through August 14, 2008. Each of the eight archaeological resources that were part of the field investigation (Sites 3, 8–13, and 59) was first subject to a close-interval survey where survey intervals were approximately 3 meters in width. Surface artifacts and archaeological features were marked with pin flags to facilitate the refinement of the surface boundary that had been delimited for each resource during the intensive pedestrian cultural resources survey and to facilitate the mapping of intrasite artifact and feature distributions, of individual surface-collected artifacts, and of evaluation phase excavation units. Mapping data were gathered electronically with a hand-held Trimble GeoXT submeter GPS unit.

Upon completion of the additional surface documentation, excavation was conducted on six (Sites 8–13) of the eight archaeological resources that were part of the field investigation. Archaeological sites were subject to different hand and mechanical excavation methods depending on the degree of prior landscape disturbance on each site and on the character of the archaeological deposits. Mechanical excavation was used on most archaeological sites in former agricultural fields to efficiently gauge and remove displaced plow zone sediments, and to assess the potential presence of intact archaeological features beneath the plow zone. Mechanical excavation was also thought to be particularly useful and appropriate for sites where the primary constituent of the material culture assemblage is fire-affected rock. The applicant and Energy Commission staff thought that there was a high likelihood that buried, intact fire features were present on such sites, and mechanical excavation was seen as an efficient method to verify that supposition. Hand excavation was used on archaeological sites where no prior landscape disturbance was apparent in order to document the intact stratigraphy of part of the project site, or, where the surface frequency of artifacts is relatively low, to ascertain the approximate depth of an archaeological deposit and to verify that a subsurface assemblage of artifacts on a site is consistent with its surface assemblage.

The archaeologists for the applicant mechanically excavated a pair of cross-trenches on each of four archaeological sites (Sites 8, 9, 11, and 12). A backhoe was used to excavate each trench to a length of approximately 10 meters and a depth never greater than 1 meter. Trenches were placed to capture cross-sections where the frequency of fire-affected rock was greatest. One profile drawing and a photograph was made of at least one wall of each trench. A plan-view drawing and a photograph was made for each archaeological feature exposed in each trench.

Hand excavation was done on two archaeological sites (Sites 10 and 13) using two different types of excavation units. Shovel test pits (STP) were excavated through Site 10 along perpendicular axes. The STPs were approximately 30 centimeters in diameter, were excavated in 10-centimeter increments, and typically reached a depth of 30 to 40 centimeters below the present surface of the site. All of the excavated sediments were dry-screened through ⅛-inch mesh hardware cloth.

Test excavation units (TEU) were employed to investigate Site 13. Sixteen contiguous 0.5-x-1-meter TEUs were excavated in a cross-trench configuration through the site's

fire-affected rock concentration. One trench was 12 meters in length, and the other was 3.5 meters in length. One profile drawing and a photograph was made of at least one wall of each trench.

Results

The applicant argues, on the basis of archival research and prior surface observation, that 5 (BSPL-H-01, and Sites 16–19) of the original 13 archaeological resources, which the applicant had anticipated that the proposed project would impact, are not eligible for listing in the CRHR. Archival research and further field observation of Site 3 and further field observation of Site 59 led the applicant to recommend neither resource as being eligible for listing in the CRHR. The field investigation of five archaeological sites that include surface concentrations of fire-affected rock (Sites 8, 9, and 11–13) led to the discovery of six buried, intact hearth features, three of which were found, on the basis of radiocarbon assays, to range in age from 150 to 595 years old, and to the further discovery of charcoal-bearing deposits that are approximately 810 years old. The discovery of the intact hearth features and the charcoal-bearing deposits at Sites 8, 9, and 11–13 demonstrates the presence of buried archaeological deposits on the project site, and the absence of fire-affected rock on the present ground surface above many of the hearths indicates that buried archaeological deposits in the project area may often not manifest at the surface. These factors elevated staff concern about the extent of the distribution of buried archaeological deposits across the project area and was a significant factor in the development of Supplement to Data Request 34 (CEC 2008@). The known presence and potential presence of intact features at Sites 8, 9, and 11–13 make the deposits historically significant in the context of Mojave Desert prehistory and have led the applicant to recommend them as being eligible for listing in the CRHR. The field investigation of the final archaeological site, Site 10, led the applicant to recommend the resource as not being eligible for listing in the CRHR.

Archaeological Resources Evaluations

Energy Commission staff ultimately has come to the conclusion that the proposed project has the potential to impact 17 of 59 archaeological resources now known in the project area of analysis. Staff here proposes and adds one further archaeological resource to the cultural resource inventory for the project area of analysis, Archaeological Zone 1, thus making the total number of such resources 60. The 17 resources which would appear to be subject to potential impact include the 12 resources that the applicant had ultimately thought to be subject to such impact, Sites 8 and 54, the avoidance of which staff believes the applicant cannot ensure absent formal avoidance measures, Site 56, which appears to be on one of the alternate alignments for the electric transmission line, FWARG-01, the archaeological resource found in conjunction with the geoarchaeology study (see “Geoarchaeology Study” subsection, above), and Archaeological Zone 1. The 17 resources include 12 archaeological resources in the project area that would appear to be subject to physical impacts (Archaeological Zone 1, FWARG-01, and Sites 9–13, 16–19, and 59) and five further archaeological resources that the applicant may need to actively avoid (BSPL-H-01, and Sites 3, 8, 54, 56). Fourteen of the 17 subject resources are prehistoric to early historic Native American archaeological sites (Archaeological Zone 1, FWARG-01, and Sites 8–

13, 17–19, 54, 56, and 59), two are historical archaeological sites (BSPL-H-01, and Site 16), and one is a multiple component archaeological site (Site 3) that includes both prehistoric and historic components.

The evaluations of whether archaeological resources are eligible for listing in the CRHR and are, therefore, historical resources under CEQA include only the 17 resources that Energy Commission staff understands to be potentially subject to impacts from the proposed project (Cultural Resources Table 8). Staff has not evaluated the 42 archaeological resources that do not appear to be subject to such impacts. The discussions of three archaeological resources which staff does not evaluate are left below in the document to help the public follow the disposition of each resource that has been a topic of deliberation in the present siting case. Of the 17 archaeological resources subject to evaluation below, staff recommends that the Energy Commission determine that seven resources (Archaeological Zone 1, FWARG-01, and Sites 8, 9, and 11–13) are eligible for listing in the CRHR, that nine resources are not eligible for such listing (BSPL-H-01, and Sites 3, 10, 16, 18, 19, 54, 56, and 59), and that one resource (Site 17) be assumed eligible for listing in the CRHR.

CULTURAL RESOURCES TABLE 8
Cultural Resources Analyzed for Project Impacts

Archaeological Resource Designation	Project Area Location	Assessment of Project Impacts	Staff CRHR Recommendation
Archaeological Zone 1	Project site	Partial destruction	Eligible
BSPL-H-01	Former natural gas pipeline	Potential for partial destruction	Not eligible
BSPL-H-02	Former natural gas pipeline	Outside of project area	No recommendation
CA-KER-5264H	Project site	N/A	No recommendation
FWARG-01	Project site	Complete destruction	Eligible
Site 3	Vicinity of transmission lines	Potential for partial destruction	Not eligible
Site 6	Vicinity of transmission lines	Outside of project area	No recommendation
Site 8	Project site	Potential for partial destruction	Eligible
Site 9	Project site	Complete destruction	Eligible
Site 10	Project site	Complete destruction	Not eligible
Site 11	Project site	Complete destruction	Eligible
Site 12	Project site	Complete destruction	Eligible
Site 13	Project site	Complete destruction	Eligible
Site 16	Project site	Complete destruction	Not eligible
Site 17	Project site	Complete destruction	Assume eligible
Site 18	Project site	Complete destruction	Not eligible
Site 19	Project site	Complete destruction	Not eligible
Site 54	Vicinity of transmission lines	Potential for partial destruction	Not eligible
Site 56	Vicinity of transmission lines	Potential for partial destruction	Not eligible
Site 59	Vicinity of transmission lines	Partial destruction	Portion of resource in project area of analysis would not contribute to historical significance of whole resource

The descriptions and the evaluations of the historical significance of the 17 archaeological resources that the proposed project would or may impact are presented below. The information for the descriptions and the evaluations is drawn from a number of sources that include preliminary and final technical reports (Apple and Glenny 2008 and attachment 2 (DPR 523 series forms), Apple, Cleland, and Glenny 2008 and

attachment 4(DPR 523 series forms), Young 2009b), email correspondence (Apple 2009), and discussions that were held at the April 14, 2009 PSA workshop in California City.

Prehistoric Archaeological Resources

FWARG-01

FWARG-01 is a buried prehistoric fire feature found in the upper portion of the profile of a trench dug into the Hf2 landform during the geoarchaeology study in the northwestern portion of the project site (see “Geoarchaeology Study” subsection, above). The presence of the hearth was not apparent from the surface. The feature was clearly evident in profile as a charcoal lens underlain by and in direct contact with a layer of oxidized sediment and overlain by a thin lens of unaltered sediment. The feature is 2 to 4 centimeters thick and measures approximately 120 centimeters in cross-section. The top of the feature was found approximately 80 centimeters below the present surface of the project site. No fire-affected or other rock was found in association with the feature.

The hearth is in sedimentary layers that represent the upper approximately 4 meters of the Hf2 landform, layers which were laid down as relatively repetitive sequences of particularly low-energy sheetwash and flood events that have taken place throughout the middle and late Holocene. Each sequence represents a flood event that brought water and sediment out to the distal reaches of either the Pine Tree Wash or Jawbone Canyon alluvial fans where the water pooled and then slowly dried out leaving behind a typical playa surface with polygonal cracks and clay films. The sequences nearer the surface of the landform are thicker than those further down. The near-surface sequences, one or several of which encase the hearth, vary from 20 to 30 centimeters in thickness and are thought to indicate prolonged surface flows of water and more long-term pooling. Intact buried archaeological deposits in the form of prehistoric and early historic Native American hearths, such as the FWARG-01 hearth, are clearly present as frequent components of the top one meter of the Hf2 landform.

Staff recommends that FWARG-01 be determined eligible for listing in the CRHR. Intact fire features are important units of archaeological analysis, because they have the potential to preserve organic residues that may inform our understanding of prehistoric patterns of natural resource selection and use, because they inform our understanding of prehistoric resource preparation technology, and because they provide datable material that places such information in time. The investigation of such features may also offer the opportunity to identify and document the former land surfaces that once surrounded the features and the contemporary material assemblages that may be present on those surfaces, and thereby inform our understanding of the broader behavioral contexts of which the fire features are a part. The above considerations, in combination with the relative general scarcity of buried, intact archaeological deposits in the Mojave Desert, lead staff to recommend that FWARG-01 is eligible for listing in the CRHR under Criterion 4, because the resource has yielded and has the potential to yield information important to the prehistory of the western Mojave Desert.

Site 8

Site 8 is a prehistoric deposit of fire-affected rock that includes one subsurface fire feature. The fire-affected rock and the feature occur in both surface and subsurface contexts. The site is on the floor of Fremont Valley in the east-central portion of the project site in a former agricultural field, now devoid of vegetation, which appears to have been subject to plowing. The more particular physical context for Site 8 is landform designation Hf1 (see "Geoarchaeology Study" subsection, above).

The surface component of Site 8 measures approximately 32 meters from northwest to southeast and 19 meters from northeast to southwest, and includes two concentrations of what are reported to be fire-affected rock and one "volcanic" stone flake. The concentrations are reported to be round and subangular clasts[16] of granite and basalt that are predominantly of cobble and pebble size. Some of the stone is noted to be cracked. Concentration 1, in the western half of the site, consists of approximately 350 pieces of fire-affected rock and measures approximately 12 meters from north to south and 10 meters from east to west. Concentration 2, approximately 3 meters east of Concentration 1, consists of approximately 150 pieces of fire-affected rock and measures approximately 5 meters from north to south and 7 meters from east to west. The archaeologists for the applicant attribute the apparently rather diffuse distribution of the fire-affected rock to past agricultural plowing.

The sedimentary deposits beneath the present surface of the site were examined using a pair of mechanically-excavated cross-trenches through Concentration 1. There was a 10.25-meter-long, north-to-south trench through the concentration, and an 8.6-meter-long, east-to-west trench that intersected the first trench at a 90 degree angle in the approximate center of Concentration 1. The trenches were approximately 1 meter wide and 1 meter deep.

The subsurface component of the site, now known as a result of the excavation of the cross-trenches, includes a single, partially intact archaeological feature, an apparent hearth. Hearth 1, found in the eastern wall of the north-to-south trench through Concentration 1 and apparently later exposed in plan, was made up of 67 fire-affected rocks that measured 79 centimeters from north to south and 84 centimeters from east to west. The top of the feature was found 70 centimeters below the present surface of the project site, and the base of the feature was 85 centimeters below that surface. Charcoal fragments of unreported size were found in the sediments directly above the feature. Charcoal (3.9 grams) is reported to have been gathered from the feature. An assay of that sample yielded a calibrated radiocarbon date of approximately 595 years before present (1950).

The physical context for Hearth 1 is the upper portion of the Hf1 landform (see "Geoarchaeology Study" subsection, above). The archaeologists for the applicant report Hearth 1 to have been found in tan layers of silty sand and fine silty sand, apparently with no gravel, that they refer to respectively as "Root Zone" and "Lake Bed" deposits. The archaeologists believe that agricultural plowing destroyed the original top 10 centimeters of the feature, but the pit portion of the feature nonetheless appears to have

[16] Clasts are rock fragments produced by physical processes.

been originally dug from a former land surface now buried in the Root Zone deposits. The reported layers of silty sand and fine silty sand represent an approximately 2-meter-thick, Holocene-age sedimentary column that includes a sequence of fine sands and silts beneath a shallow cap of alluvium and eolian deposits. The sequence of fine sands and silts, which encases Hearth 1, appears to be the result of relatively low-energy distal fan and ephemeral stream deposition along the local axis of the Fremont Valley. Hearth 1 is the only archaeological feature to have been found buried in the Hf1 landform.

The archaeologists for the applicant recommend that Site 8 be found eligible for listing in the CRHR. The discovery of a buried, partially intact fire feature on the site and its association with the surface scatter of fire-affected rock make it likely that more such features are present at the site. Intact fire features are important units of archaeological analysis, because they have the potential to preserve organic residues that may inform our understanding of prehistoric patterns of natural resource selection and use, because they inform our understanding of prehistoric resource preparation technology, and because they provide datable material that places such information in time. The investigation of such features may also offer the opportunity to identify and document the former land surfaces that once surrounded the features and the contemporary material assemblages that may be present on those surfaces, and thereby inform our understanding of the broader behavioral contexts of which the fire features are a part. The above considerations, in combination with the relative general scarcity of buried, intact archaeological deposits in the Mojave Desert, lead staff to recommend that Site 8 is eligible for listing in the CRHR under Criterion 4, because the resource has yielded and has the potential to yield information important to the Late Prehistoric period prehistory of the western Mojave Desert.

Site 9

Site 9 is a prehistoric deposit of fire-affected rock that includes one subsurface fire feature. The fire-affected rock and the feature occur in both surface and subsurface contexts. The site is on the floor of Fremont Valley in the northeastern portion of the project site in a former agricultural field, now devoid of vegetation, which appears to have been subject to plowing. The more particular physical context for Site 9 is landform designation Hf2 (see “Geoarchaeology Study” subsection, above).

The surface component of Site 9, a scatter of fire-affected rock, measures approximately 10 meters from north to south and 10 meters from east to west. No other cultural material was found in or near the scatter. The fire-affected rock is reported to include approximately 150 rounded, subangular, and angular, fire-blackened clasts of granitic rock that range from large pebbles to small cobbles in size. The archaeologists for the applicant partially attribute the distribution of the fire-affected rock to past agricultural plowing, and partially to forces of erosion which appear to have transported some of the rock downslope and toward the north.

The sedimentary deposits beneath the present surface of the site were examined using a pair of mechanically-excavated cross-trenches through the approximate center of the

site. There was a 7.2-meter-long, north-to-south trench through the rock scatter, and an 8.2-meterlong, east-to-west trench that intersected the first trench at a 90 degree angle. The trenches were approximately 1 meter wide and 1 meter deep.

The subsurface component of the site, now known as a result of the excavation of the cross-trenches, includes a single archaeological feature, an apparent hearth. Hearth 1, found in the western wall of the north-to-south trench, is a shallow earthen pit the outline of which is made more apparent by a discontiguous band of charcoal-stained, pinkish, oxidized sediment. The interior of the pit is filled with a deposit of medium brown, charcoal-stained, silty sand. The top of the feature was found 25 centimeters below the present surface of the project site, and the base of the feature was 35 centimeters below that surface. The cross-section of the feature, in the trench wall, was 1.9 meters. No charcoal or flotation samples were taken from the feature or the feature fill.

The physical context for Hearth 1 is the upper portion of the Hf2 landform (see "Geoarchaeology Study" subsection, above). The archaeologists for the applicant report Hearth 1 to have been found in tan layers of silty sand, apparently with no gravel, that they refer to as "Plow Zone" and "Root Zone" deposits. The pit portion of the feature appears to have been originally dug from a former land surface now buried in the Plow Zone deposits, down into the upper portion of the Root Zone deposits. The reported layers of silty sand represent the upper approximately 4 meters of the Hf2 landform, layers which were laid down as relatively repetitive sequences of particularly low-energy sheetwash and flood events that have taken place throughout the middle and late Holocene. Each sequence represents a flood event that brought water and sediment out to the distal reaches of either the Pine Tree Wash or Jawbone Canyon alluvial fans where the water pooled and then slowly dried out leaving behind a typical playa surface with polygonal cracks and clay films. The sequences nearer the surface of the landform are thicker than those further down. The near-surface sequences, one or several of which encase Hearth 1, vary from 20 to 30 centimeters in thickness and are thought to indicate prolonged surface flows of water and more long-term pooling. Intact buried archaeological deposits in the form of prehistoric and early historic Native American hearths, such as Hearth 1, are clearly present as frequent components of the top one meter of the Hf2 landform.

The archaeologists for the applicant recommend that Site 9 be found eligible for listing in the CRHR. The discovery on the site of a buried fire feature that retains good integrity and its association with the surface scatter of fire-affected rock make it likely that more and potentially different types of fire features are present at the site. Intact fire features are important units of archaeological analysis, because they have the potential to preserve organic residues that may inform our understanding of prehistoric patterns of natural resource selection and use, because they inform our understanding of prehistoric resource preparation technology, and because they provide datable material that places such information in time. The investigation of such features may also offer the opportunity to identify and document the former land surfaces that once surrounded the features and the contemporary material assemblages that may be present on those surfaces, and thereby inform our understanding of the broader behavioral contexts of which the fire features are a part. The above considerations, in combination with the relative general scarcity of buried, intact archaeological deposits in the Mojave Desert,

lead staff to recommend that Site 9 is eligible for listing in the CRHR under Criterion 4, because the resource has yielded and has the potential to yield information important to the prehistory of the western Mojave Desert.

Site 10

Site 10 is a prehistoric lithic deposit that includes four partial bifaces[17], one utilized flake, one core, one handstone or mano fragment, and approximately 32 stone flakes. The lithic artifacts were found in both surface and subsurface contexts. The site is on the higher surface to the southeast of the Cantil Valley fault in the east-central portion of the project site. The present surface of the site is reported to have a shallow slope gradient that drops toward the north, and remnant plow furrows along that axis attest to the former use of the land for agriculture. The archaeologists for the applicant report that erosive forces have redistributed artifacts downslope. The site surface is said to be deflated and of a "sandy, clayey soil." The more particular physical context for Site 10 is landform designation Hf1 (see "Geoarchaeology Study" subsection, above). Almost no vegetation was apparent on the site in August, 2008.

The surface component of Site 10 is a sparse (about1 piece/62 square meters) scatter of prehistoric lithics, stone tools and stone tool manufacturing debris. The scatter measures approximately 60 meters from northeast to southwest and 38 meters from northwest to southeast.

The surface lithic assemblage on the site includes four partial bifaces, one utilized flake, one core, one handstone or mano fragment, and approximately 30 stone flakes or pieces of lithic debitage. The fragmentary bifaces are all of cryptocrystalline silicate[18] (CCS), three of the four fragments are reported to be yellow, and they appear to represent different stages of manufacture. The archaeologists for the applicant interpret three of the four bifaces to have been broken prior to completion and the fourth to have been broken during maintenance work on that piece. The fragments range in size from 2.5 to 5.7 centimeters in length. The debitage on the site surface is of CCS. The further character of the debitage is unreported. The character of the utilized flake, the core, and the mano fragment are unreported.

The sedimentary deposits beneath the present surface of the site were examined using two intersecting rows of 11 hand-excavated STPs through the approximate center of the site. Six STPs were excavated in a north-to-south row at 20-meter intervals and a row of four STPs were excavated in 20-meter intervals in an east-to-west row that intersected the approximate middle of the north-to-south row. An eleventh STP was excavated between two of the STPs along the north-to-south row. The STPs were approximately 30 centimeters in diameter, were excavated in 10 centimeter increments, and typically reached a depth of 30 to 40 centimeters below the present surface of the site.

The subsurface component of the site, now known as a result of the excavation of the STPs, includes two stone flakes. Both flakes came from the same STP in the

[17] A biface is a stone tool that exhibits two shaped surfaces.

[18] Cryptocrystalline silicates are rocks such as flint, chert, chalcedony, or jasper that contain a high percentage of silica (SiO^2), the primary compound that composes quartz.

approximate center of the site. One was found from 10 to 20 centimeters below the present surface, and the other was from 20 to 30 centimeters below the surface. The flakes are of CCS and of unreported color. The archaeologists for the applicant interpret both flakes to be biface thinning flakes.

The physical context for the two subsurface flakes is the upper portion of the Hf1 landform (see “Geoarchaeology Study” subsection, above). More precise stratigraphic contexts for the flakes were not reported, but the available field data would appear to indicate that they were found in either a shallow deposit of alluvium and eolian sediments that cap the landform or in the upper portion of the underlying Holocene-age sequence of fine sands and silts.

The archaeologists for the applicant recommend that Site 10, interpreted by the archaeologists to have been a campsite, be found ineligible for listing in the CRHR. The sparse character of the surface component of the site and the apparent relative absence of a subsurface component in combination with the apparent absence of cultural material that would facilitate the placement of the deposit in time indicates that the site does not have the potential to yield information important to prehistory. The above considerations lead staff to recommend that Site 10 is not eligible for listing in the CRHR.

Site 11

Site 11 is a prehistoric deposit of fire-affected rock that includes three subsurface fire features and one bone fragment. The features and the bone were found in both surface and subsurface contexts. The site is on the floor of Fremont Valley in the northeastern portion of the project site in a former agricultural field which appears to have been subject to plowing. The archaeologists for the applicant note a sparse lag deposit[19] of rock on the land surface where the site is found. The more particular physical context for Site 11 is landform designation Hf2 (see “Geoarchaeology Study” subsection, above).The vegetation on the site in August, 2008 was limited to intermittent patches of an unreported species of short desert grass.

The surface component of Site 11, a scatter of fire-affected rock, measures approximately 16 meters from north to south and 8 meters from east to west. No other cultural material was found in or near the scatter. The fire-affected rock is reported to include approximately 230 subangular clasts of granitic rock that range from medium pebbles to small cobbles in size. The archaeologists for the applicant attribute the distribution of the fire-affected rock to past agricultural plowing.

The sedimentary deposits beneath the present surface of the site were examined using a pair of mechanically-excavated cross-trenches through the approximate center of the site. There was a 16.4-meter-long, north-to-south trench through the rock scatter, and a 9-meter-long, east-to-west trench that intersected the first trench at a 90-degree angle. The trenches were approximately 1 meter wide and 1 meter deep.

[19] Residual accumulation of coarse, unconsolidated rock and mineral debris left behind by the winnowing of finer material.

The subsurface component of the site, now known as a result of the excavation of the cross-trenches, includes three, apparently intact, archaeological features that the archaeologists for the applicant interpret to be hearths, Hearths 1–3. Hearth 1 was found in the western wall of the north-to-south trench, south of the east-to-west trench, and was apparently later exposed in plan. The feature was made up of 30 fire-affected rocks in a roughly circular, 46-centimeter in diameter arrangement inside a broader area of ash and charcoal-stained sediments. The overall dimensions of the feature, the fire-affected rock arrangement and the broader area of ash and charcoal-stained sediments, was 86 centimeters from north to south and 55 centimeters from east to west. The top of the feature was found 30 centimeters below the present surface of the project site and the base of the feature was 55 centimeters below that surface. Charcoal fragments of unreported size and a single bird bone fragment were found in the feature. Charcoal (50 grams) is reported to have been gathered from the feature. An assay of that sample yielded calibrated radiocarbon dates of approximately either 655 or 580 years before present (1950)[20].

Hearth 2 was found in the north-to-south trench, south of the east-to-west trench. The feature was reported to be 0.5 meters north of Hearth 1 and was exposed in plan. Hearth 2 was apparently made up of 35 fire-affected rocks in a roughly circular arrangement, measuring 42 centimeters north to south and 62 centimeters east to west, inside a broader depression. Overall, the fire-affected rock arrangement and the broader depression were 85 centimeters in diameter. The top of the feature was found 25 centimeters below the present surface of the project site, and the base of the feature was 40 centimeters below that surface. Charcoal fragments of unreported size and a single bird bone fragment were found in the feature. Charcoal (67.9 grams) is reported to have been gathered from the feature.

Hearth 3 was found in the southern wall of the east-to-west trench, east of the north-to-south trench. The feature is depicted in Figure 5 of the report for the evaluation program (Apple, Cleland, and Glenny 2008) to be approximately 5.6 meters east-northeast of Hearth 2. Hearth 3 appears to be an earthen pit the outline of which is made more apparent by discontiguous bands of charcoal-stained, pinkish, oxidized sediment. No fire-affected rocks are reported for the feature. The top of the feature was found 13 centimeters below the present surface of the project site, and the base of the feature was 25 centimeters below that surface. The cross-section of the feature, in the trench wall, was 45 centimeters.

The physical context for Hearths 1–3 is the upper portion of the Hf2 landform (see “Geoarchaeology Study” subsection, above). The archaeologists for the applicant report Hearth 1 to have been found in tan layers of silty sand, apparently with no gravel, that they refer to respectively as “Plow Zone” and “Root Zone” deposits. The pit portion of the features appear to have been originally dug from former land surfaces now buried in the Plow Zone deposits, down into the upper portion of the Root Zone deposits. The reported layers of silty sand represent the upper approximately 4 meters of the Hf2 landform, layers which were laid down as relatively repetitive sequences of particularly low-energy sheetwash and flood events that have taken place throughout the middle

[20] The fact that the results of the assay provide multiple possible ages for the sample is a function of the results of the calibration process.

and late Holocene. Each sequence represents a flood event that brought water and sediment out to the distal reaches of either the Pine Tree Wash or Jawbone Canyon alluvial fans where the water pooled and then slowly dried out leaving behind a typical playa surface with polygonal cracks and clay films. The sequences nearer the surface of the landform are thicker than those further down. The near-surface sequences which encase Hearths 1–3, vary from 20 to 30 centimeters in thickness and are thought to indicate prolonged surface flows of water and more long-term pooling. Intact buried archaeological deposits in the form of prehistoric and early historic Native American hearths, such as Hearths 1–3, are clearly present as frequent components of the top one meter of the Hf2 landform.

The archaeologists for the applicant recommend that Site11 be found eligible for listing in the CRHR. The discovery of three buried, intact fire features on the site and its association with the surface scatter of fire-affected rock make it likely that more such features are present at the site. Intact fire features are important units of archaeological analysis, because they have the potential to preserve organic residues that may inform our understanding of prehistoric patterns of natural resource selection and use, because they inform our understanding of prehistoric resource preparation technology, and because they provide datable material that places such information in time. The investigation of such features may also offer the opportunity to identify and document the former land surfaces that once surrounded the features and the contemporary material assemblages that may be present on those surfaces, and thereby inform our understanding of the broader behavioral contexts of which the fire features are a part. The above considerations, in combination with the relative general scarcity of buried, intact archaeological deposits in the Mojave Desert, lead staff to recommend that Site 11 is eligible for listing in the CRHR under Criterion 4, because the resource has yielded and has the potential to yield information important to the Late Prehistoric period prehistory of the western Mojave Desert.

Site 12

Site 12 is a late prehistoric to early historic Native American deposit of fire-affected rock that includes one subsurface fire feature, one handstone or mano fragment, and one stone flake. The feature and the artifacts were found in both surface and subsurface contexts. The site is on the floor of Fremont Valley in the northeastern portion of the project site in a former agricultural field which appears to have been subject to plowing. The more particular physical context for Site 12 is landform designation Hf2 (see “Geoarchaeology Study” subsection, above). The vegetation on the site in August, 2008, was limited to an unreported species of dry grass.

The surface component of Site 12 measures approximately 25 meters from northeast to southwest and 14 meters from northwest to southeast, and includes two concentrations of what are reported to be fire-affected rock, the mano fragment, and the stone flake. The concentrations are reported to be round and subangular clasts of granite and basalt that range predominantly from medium pebbles to small cobbles in size. The stone is noted to be fire-blackened and cracked. Concentration 1, in the southwestern portion of the site, consists of approximately 330 pieces of fire-affected rock and measures approximately 10 meters from north to south and 12 meters from east to west. Concentration 2, adjacent to and to the northeast of Concentration 1, consists of

approximately 250 pieces of fire-affected rock and measures approximately 12 meters from north to south and 8 meters from east to west. The archaeologists for the applicant report that plowing has scattered the fire-affected rock along a northeast to southwest axis.

The surface artifact assemblage for Site 12, the mano fragment and the stone flake, are the only evidence of the character of the use of the site beyond the fire-affected rock concentrations and Hearth 1. The mano fragment is an unshaped, unifacially ground, broken cobble of granitic rock that appears to have been found in the southwestern portion of Concentration 2. The flake, of unreported character, was found adjacent to the western boundary of Concentration 1.

The sedimentary deposits beneath the present surface of the site were examined using pairs of mechanically-excavated cross-trenches through Concentrations 1 and 2. There was a 14-meter-long, north-to-south trench through Concentration 1, and a 12.5-meter long, east-to-west trench that intersected the first trench at a 90 degree angle in the approximate center of Concentration 1. There was a 13.3-meter-long, north-to-south trench through Concentration 2, and an 8.5-meter-long, east-to-west trench that intersected the first trench at a 90 degree angle in the approximate center of Concentration 2. All trenches were approximately 1 meter wide and 1 meter deep.

The subsurface component of the site, now known as a result of the excavation of the cross-trenches, includes a single intact archaeological feature, an apparent hearth. Hearth 1 was found in the floor of the east-to-west trench through Concentration 1 just west of the intersection of that trench with the north-to-south trench through the concentration. The feature was made up of four fire-affected rocks of medium cobble size inside an earthen pit the bottom of which was apparent as charcoal-stained, reddish, oxidized sediment. The fire-affected rocks were embedded in a sedimentary matrix that included charcoal fragments of unreported size. The overall dimensions of the feature, the fire-affected rocks and the broader pit, was 46 centimeters from north to south and 46 centimeters from east to west. The top of the feature was found 36.5 centimeters below the present surface of the project site and the base of the feature was 50 centimeters below that surface. Charcoal (13 grams) is reported to have been gathered from the feature. An assay of that sample yielded a calibrated radiocarbon date of roughly 150 years before present (1950).

The physical context for Hearth 1 is the upper portion of the Hf2 landform (see “Geoarchaeology Study” subsection, above). The archaeologists for the applicant report Hearth 1 to have been found in layers of silty sand that they refer to clearly only as “stratigraphic layers I and II.” The reported layers of silty sand represent the upper approximately 4 meters of the Hf2 landform, layers which were laid down as relatively repetitive sequences of particularly low-energy sheetwash and flood events that have taken place throughout the middle and late Holocene. Each sequence represents a flood event that brought water and sediment out to the distal reaches of either the Pine Tree Wash or Jawbone Canyon alluvial fans where the water pooled and then slowly dried out leaving behind a typical playa surface with polygonal cracks and clay films. The sequences nearer the surface of the landform are thicker than those further down. The near-surface sequences, one or several of which encase Hearth 1, vary from 20 to 30 centimeters in thickness and are thought to indicate prolonged surface flows of water

and more long-term pooling. Intact buried archaeological deposits in the form of prehistoric and early historic Native American hearths, such as Hearth 1, are clearly present as frequent components of the top one meter of the Hf2 landform.

The archaeologists for the applicant recommend that Site 12 be found eligible for listing in the CRHR. The discovery of a buried intact fire feature on the site and its association with the surface scatter of fire-affected rock make it likely that more such features are present at the site. Intact fire features are important units of archaeological analysis, because they have the potential to preserve organic residues that may inform our understanding of prehistoric patterns of natural resource selection and use, because they inform our understanding of prehistoric resource preparation technology, and because they provide datable material that places such information in time. The investigation of such features may also offer the opportunity to identify and document the former land surfaces that once surrounded the features and the contemporary material assemblages that may be present on those surfaces, and thereby inform our understanding of the broader behavioral contexts of which the fire features are a part. The above considerations, in combination with the relative general scarcity of buried, intact archaeological deposits in the Mojave Desert, lead staff to recommend that Site 12 is eligible for listing in the CRHR under Criterion 4, because the resource has yielded and has the potential to yield information important to the transition from the Late Prehistoric period prehistory to the early historic period Native American history of the western Mojave Desert.

Site 13

Site 13 is a prehistoric deposit of fire-affected rock that includes one millingstone or metate fragment, one biface fragment, one stone flake, and bone. The artifacts were found in both surface and subsurface contexts. The site is on the floor of Fremont Valley in the northwestern portion of the project site in an area where the intermittent pooling of water and the relatively high clay content of surface sediments produce polygonal mud cracks at the surface. The more particular physical context for Site 13 is landform designation Hf2 (see “Geoarchaeology Study” subsection, above). Creosote (*Larrea tridentata*) and an unreported desert grass species are reported to have been the predominant vegetation on the site in August, 2008.

The primary surface component of Site 13, a scatter of fire-affected rock, measures approximately 31 meters from north to south and 35 meters from east to west, and includes the metate fragment and the fragmentary biface. The fire-affected rock is reported to include approximately 25 rounded, subangular, and angular clasts of fire-blackened and cracked granite and schist that range from medium pebbles to small cobbles in size.

The metate fragment and the fragmentary biface are the only shaped artifacts in the fire-affected rock scatter on the present surface of the site. The metate fragment is reported to be of “volcanic material.” The fragment is of small cobble size, and has remnants of two different ground surfaces which are perpendicular to one another. One of the ground surfaces exhibits peck marks, indicative of grinding surface rejuvenation. The metate fragment provides no evidence as to whether the complete implement had been shaped. The fragmentary biface is of obsidian. The artifact is 4.5 centimeters in

length, 2.2 centimeters in width, and 0.8 centimeters thick. The archaeologists for the applicant identify it as a tip and midsection fragment with a bending break through the midsection. The archaeologists interpret the piece as a being unfinished and broken during manufacture. The artifact was subject to x-ray fluorescence analysis to ascertain the probable source of the obsidian of which the piece was made. The results of the analysis indicate that Sugarloaf Mountain in the Coso Volcanic Field, roughly 60 miles north-northeast of the project area, is the likely source of the obsidian. The artifact was also subject to obsidian band hydration analysis to facilitate a determination of the age of the manufacture of the piece. The result of the analysis is that the biface fragment was found to have a mean hydration band measurement of 5.9 microns. The archaeologists for the applicant interpret this mean measurement to indicate a relatively crude date of manufacture sometime from the late Gypsum to the Rose Spring complex, roughly 2,500 to 900 years ago.

The sedimentary deposits beneath the present surface of the site were examined using a pair of hand-excavated cross-trenches near the center of the site. There was a 12-meter-long, north-to-south trench through the rock scatter, and a 3.5-meter-long, east-to-west trench to the east of the first trench that terminated in the latter trench at a 90 degree angle. The trenches, excavated as series of contiguous TEUs, were 0.5-meters wide and were excavated to an unreported depth of at least 40 centimeters.

The examination of the subsurface component of the site yielded charcoal, fire-affected rock, a stone flake, and bone. Charcoal of unreported size was found scattered throughout the deposits exposed in the trenches from 0 to 40 centimeters below the present surface. A sample of charcoal (0.1 grams) was gathered from 0 to 10 centimeters below the present surface in the northern part of the north-to-south trench. An assay of that sample yielded a calibrated radiocarbon date of approximately 810 years before present (1950). Fire-affected rock appears to have been found below the surface in twelve of the TEUs. Bone of unreported character was found in three of the TEUs. The stone flake is reported to be of “volcanic” stone and was found from 0 to 10 centimeters below the present surface in the southern part of the north-to-south trench. The flake was apparently 3.1 centimeters in length and the archaeologists for the applicant interpret the artifact to be a core reduction flake.

The physical context for the subsurface material culture assemblage of Site 13 is the upper portion of the Hf2 landform (see “Geoarchaeology Study” subsection, above). The archaeologists for the applicant only report the assemblage to have been found in layers of silty sand. The reported layers of silty sand represent the upper approximately 4 meters of the Hf2 landform, layers which were laid down as relatively repetitive sequences of particularly low-energy sheetwash and flood events that have taken place throughout the middle and late Holocene. Each sequence represents a flood event that brought water and sediment out to the distal reaches of either the Pine Tree Wash or Jawbone Canyon alluvial fans where the water pooled and then slowly dried out leaving behind a typical playa surface with polygonal cracks and clay films. The sequences nearer the surface of the landform are thicker than those further down. The near-surface sequences which encase the subsurface material culture assemblage of Site 13 vary from 20 to 30 centimeters in thickness and are thought to indicate prolonged surface flows of water and more long-term pooling. Intact buried archaeological deposits in the form of prehistoric and early historic Native American hearths are present as frequent

components of the top one meter of the Hf2 landform. The charcoal, fire-affected rock, the stone flake, and the bone that make up the subsurface assemblage of Site 13 undoubtedly share a broad association with the hearths.

The archaeologists for the applicant recommend that Site 13 be found eligible for listing in the CRHR. The surface and subsurface scatter of fire-affected rock and the wide subsurface distribution of charcoal make it likely that fire features such as those at Sites 8, 9, 11, and 12 are also present at Site 13. Intact fire features are important units of archaeological analysis, because they have the potential to preserve organic residues that may inform our understanding of prehistoric patterns of natural resource selection and use, because they inform our understanding of prehistoric resource preparation technology, and because they provide datable material that places such information in time. The investigation of such features may also offer the opportunity to identify and document the former land surfaces that once surrounded the features and the contemporary material assemblages that may be present on those surfaces, and thereby inform our understanding of the broader behavioral contexts of which the fire features are a part. The above considerations, in combination with the relative general scarcity of buried, intact archaeological deposits in the Mojave Desert, lead staff to recommend that Site 13 is eligible for listing in the CRHR under Criterion 4, because the resource has yielded and has the potential to yield information important to the Late Prehistoric period prehistory of the western Mojave Desert.

Site 17

Site 17 is a sparse (1 piece/75 square meters) prehistoric lithic scatter that measures approximately 20 meters from north to south and 15 meters from east to west, and includes one biface, one utilized flake, and two stone flakes. The artifacts were found on the surface of the site, which is in a fallow agricultural field in the southwestern portion of the project site. The present site surface is reported to be deflated and to have a gravel lag deposit. The vegetation on the site in November, 2007, a sparse cover of unreported shrub and grass species, facilitates the formation of small coppice dunes on the site surface. The archaeologists for the applicant note that a more consolidated ground surface appears to be beneath the looser surface sediments and that the site surface appears to have been subject to plowing.

The site artifact assemblage includes one biface, one utilized flake, and two stone flakes. The four pieces are of CCS and of unreported color. The utilized flake and the biface are reported to exhibit use wear. The further character of any of the four artifacts is unreported.

The more particular physical context for Site 17 is landform designation Hf1d (see “Geoarchaeology Study” subsection, above). The stratigraphy of the landform, an uplifted sequence of alluvial fan deposits, represents three primary phases of sedimentary deposition. The upper approximately one meter of the deposits that compose the landform is predominantly made up of Holocene alluvial fan deposits that encase coppice dunes and sand sheets. The deposits from approximately 1 to 2 meters below the present ground surface become a sequence of fine sands and silts that indicate deposition on the distal portion of an alluvial fan similar to, although much older than, the deposits of the Hf2 landform. Below a depth of 2 meters, the stratigraphy

changes abruptly to deposits where pebbles and cobbles predominate, indicating deposition in high-energy flood and wash events, probably in the Pleistocene epoch.

Although it is presently not known whether Site 17 includes subsurface deposits, its location on the Hf1d landform means that such deposits may be present. The sedimentary deposits of the upper 2 meters of the landform indicate deposition in relatively low-energy environments that are conducive to the preservation of archaeological materials and the spatial associations among them. The spatial associations reflect the behavior of the people who are responsible for the manufacture, use, and discard of archaeological materials and are critical to the reconstruction of local prehistory. Any archaeological materials found in the lower, high-energy deposits of the landform would most likely not retain their original spatial associations. Artifacts found in the predominately pebble and cobble matrix of those deposits would most likely have been washed down from a higher elevation and would have simply become another part of the rock matrix of the deposits. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory. As the lower deposits are also thought to date to the Pleistocene epoch, largely predating the commonly acknowledged presence of humans in North America, the potential presence of artifacts in the deposits would reasonably be concluded to be slight.

The archaeologists for the applicant recommend, on the basis of surface observation, that Site 17, interpreted by the archaeologists to have been a temporary camp, be found ineligible for listing in the CRHR. The sparse character of the surface assemblage and the apparent absence of archaeological materials that would facilitate the placement of the deposit in time are said to indicate that the site does not have the potential to yield information important to prehistory. Absent primary field data on the presence of a subsurface component for the site, staff cannot evidence a consideration of the site sufficient to reasonably dismiss the possibility that it may retain the potential to yield information important to prehistory. Staff therefore recommends that Site 17 be assumed eligible for listing in the CRHR, for the purpose of the present analysis.

Site 18

Site 18 is an extremely sparse (1 piece/135 square meters) prehistoric lithic scatter that measures approximately 18 meters from north to south and 45 meters from east to west, and includes one core chopper, one core fragment, and four stone flakes. The artifacts were found on the surface of the site, which is in a fallow agricultural field in the southwestern portion of the project site. The present site surface is reported to be deflated and to have a gravel lag deposit. There are what appear to be three relatively long (6–13 meters), transverse sand dunes along the northern and southern site boundary. The long axes of the dunes are oriented on a roughly northeast to southwest axis with slipfaces that appear to point roughly to the southeast. The vegetation on the site in November, 2007, an extremely sparse cover of an unreported species of small bunch grass, also facilitates the formation of small coppice dunes on the site surface.

The site artifact assemblage includes one core chopper, one core fragment, and four stone flakes. The four stone flakes are of CCS and of unreported color. The further character of any of the six artifacts is unreported.

The more particular physical context for Site 18 is landform designation Hf3 (see "Geoarchaeology Study" subsection, above). The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan. Although it is presently not known whether the site includes subsurface deposits, archaeological materials on and in this part of the alluvial fan most likely do not retain spatial associations that reflect the behavior of the people who made, used, or discarded such materials. Artifacts found on the surface of the alluvial fan or eroding out of the deposits of rock and sediment that form it have most likely been washed down from a higher elevation and have simply become another part of the rock matrix of the fan. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory.

The archaeologists for the applicant recommend, on the basis of surface observation, that Site 18 be found ineligible for listing in the CRHR. The extremely sparse character of the surface assemblage, the apparent absence of archaeological materials that would facilitate the placement of the deposit in time, and the apparent loss of the original spatial associations among the artifacts in the assemblage for the site would appear, collectively, to indicate that the site does not have the potential to yield information important to prehistory. Staff therefore recommends that Site 18 is not eligible for listing in the CRHR.

Site 19

Site 19 is a sparse (about1 piece/76 square meters) prehistoric lithic scatter that measures approximately 13 meters from north to south and 35 meters from east to west, and includes six stone flakes. The artifacts were found on the surface of the site, which is in a fallow agricultural field in the southwestern portion of the project site. The present site surface is reported to be deflated and to have a relatively substantial gravel lag deposit. The vegetation on the site in November, 2007, sparse patches of an unreported grass species, facilitates the formation of short (~50 centimeters) coppice dunes on the site surface. The archaeologists for the applicant note that the site surface appears to have been subject to plowing.

The site artifact assemblage includes six stone flakes. The six pieces are of CCS. The further character of the flakes is unreported.

The more particular physical context for Site 19 is landform designation Hf3 (see "Geoarchaeology Study" subsection, above). The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan. Although it is presently not known whether the site includes subsurface deposits, archaeological materials on and in this part of the alluvial fan most likely do not retain spatial associations that reflect the behavior of the people who made, used, or discarded such materials. Artifacts found on the surface of the alluvial fan or eroding out of the deposits of rock and sediment that form it have most likely been washed down from a higher elevation and have simply become another part of the rock matrix of the fan. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory.

The archaeologists for the applicant recommend, on the basis of surface observation, that Site 19 be found ineligible for listing in the CRHR. The sparse character of the surface assemblage, the apparent absence of archaeological materials that would facilitate the placement of the deposit in time, and the apparent loss of the original spatial associations among the artifacts in the assemblage for the site would appear, collectively, to indicate that the site does not have the potential to yield information important to prehistory. Staff therefore recommends that Site 19 is not eligible for listing in the CRHR.

Site 54

Site 54 is a sparse (1 piece/50 square meters) prehistoric lithic scatter that measures approximately 20 meters from north to south and 30 meters from east to west, and includes one core, one modified flake, and 10 stone flakes. The artifacts were found on the surface of the site approximately one mile west of the project site and approximately 0.4 miles west of SR 14. The present site surface appears to be on a mid- to lower slope of the Pine Tree Wash alluvial fan. The predominant vegetation type on the site appears to be Mojave creosote bush scrub.

The site artifact assemblage includes 1 core, 1 modified flake, and 10 stone flakes. The pieces are all of CCS. The further character of the artifacts is unreported.

The more particular physical context for Site 54, extrapolating information from Cultural Resources Figure 1 to the location of the site, appears to be landform designation Hf3 (see “Geoarchaeology Study” subsection, above). The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan. Although it is presently not known whether the site includes subsurface deposits, archaeological materials on and in this part of the alluvial fan most likely do not retain spatial associations that reflect the behavior of the people who made, used, or discarded such materials. Artifacts found on the surface of the alluvial fan or eroding out of the deposits of rock and sediment that form it have most likely been washed down from a higher elevation and have simply become another part of the rock matrix of the fan. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory.

The archaeologists for the applicant originally made the assertion in the inventory report (Apple and Glenny 2008, p. 52) that Site 54 has the potential to yield information important to prehistoric lithic technology in the western Mojave Desert and is, therefore, potentially eligible for listing in the CRHR under Criterion 4. On the basis of a discussion between staff and the applicant at the April 14, 2009 PSA workshop in California City, the applicant now recommends, and staff concurs, that Site 54 be found ineligible for listing in the CRHR. The sparse character of the surface assemblage, the apparent absence of archaeological materials that would facilitate the placement of the deposit in time, and the apparent loss of the original spatial associations among the artifacts in the assemblage for the site would appear, collectively, to indicate that the site does not have the potential to yield information important to prehistory.

Site 56

Site 56 is an extremely sparse (1 piece/350 square meters) prehistoric lithic scatter that measures approximately 25 meters from north to south and 70 meters from east to west, and includes three cores and two stone flakes. The artifacts were found on the surface of the site approximately one mile west of the project site and approximately 0.1 miles west of SR 14. The present site surface appears to be on a mid- to lower slope of the Pine Tree Wash alluvial fan. The archaeologists for the applicant report off-highway vehicle impacts to the site surface. The predominant vegetation type on the site appears to be Mojave creosote bush scrub.

The site artifact assemblage includes three cores and two stone flakes. The pieces are all of CCS. The further character of the artifacts is unreported.

The more particular physical context for Site 56, extrapolating information from Cultural Resources Figure 1 to the location of the site, appears to be landform designation Hf3 (see “Geoarchaeology Study” subsection, above). The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan. Although it is presently not known whether the site includes subsurface deposits, archaeological materials on and in this part of the alluvial fan most likely do not retain spatial associations that reflect the behavior of the people who made, used, or discarded such materials. Artifacts found on the surface of the alluvial fan or eroding out of the deposits of rock and sediment that form it have most likely been washed down from a higher elevation and have simply become another part of the rock matrix of the fan. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory.

The archaeologists for the applicant recommend, on the basis of surface observation, that Site 56 be found ineligible for listing in the CRHR due to the low data potential of the site assemblage and the apparent poor quality of assemblage integrity. The sparse character of the surface assemblage, the apparent absence of archaeological materials that would facilitate the placement of the deposit in time, and the apparent loss of the original spatial associations among the artifacts in the assemblage for the site would appear, collectively, to indicate that the site does not have the potential to yield information important to prehistory. Staff therefore recommends that Site 56 is not eligible for listing in the CRHR.

Site 59

Site 59 appears to be a prehistoric trail. The portion of the trail in the project area of analysis is approximately one mile to the west-southwest of the project site and approximately one-tenth of one mile west of SR 14, and runs approximately north-northeast to south-southwest. It occurs in two segments. The southern terminus of the southern segment is Site 40, which appears to be previously recorded archaeological site CA-KER-2142/H. The trail runs north-northeast from CA-KER-2142/H for approximately 1.5 kilometers and fades into the landscape. Approximately 200 meters north of the northern terminus of the southern trail segment, the northern trail segment begins and runs another approximately 1.3 kilometers to the north-northeast where it again fades into the landscape. The trail is approximately 30 to 35 centimeters in width.

The archaeologists for the applicant note that the sandy sediments of the area make the trail segments difficult to trace, and that erosion and heavy off-highway vehicle activity have destroyed many portions of both trail segments. No cultural materials were found as a result of the close-interval pedestrian survey along the trail. The trail appears to traverse mid-to-lower slopes of the Pine Tree Wash alluvial fan. The more particular physical contexts for Site 59, extrapolating information from Cultural Resources Figure 1 to the location of the site, appear to be landform designations Hf1d and Hf3 (see "Geoarchaeology Study" subsection, above). The predominant vegetation type on the site appears to be Mojave creosote bush scrub.

The archaeologists for the applicant originally made the assertion that Site 59 does not have the potential to yield information important to the prehistory of the western Mojave Desert and is, therefore, not eligible for listing in the CRHR under Criterion 4. Staff however holds the opinion that Site 59 most likely represents two segments of an extensive prehistoric trail system that winds along the southern bases of the Tehachapi and Sierra Nevada Mountains through prehistoric archaeological sites similar to the prehistoric component of CA-KER-2142/H (Site 40), which includes assemblages of ground and chipped stone artifacts and partially buried fire features among two areas of apparently discolored anthropogenic sediments. On the basis of a discussion between staff and the applicant at the April 14, 2009 PSA workshop in California City, the applicant now recommends, and staff concurs, that the portion of Site 59 in the project area of analysis be determined not to potentially contribute to the historical significance of Site 59, the potential trail system as a whole, should Site 59 ever be found eligible for listing in the CRHR, because the two trail segments in the project area of analysis, sporadically ephemeral in character and proximal to SR 14 and numerous electric transmission lines, lack integrity of design, setting, and feeling, and would, therefore, no longer be able to convey the historical significance of the resource.

Historical Archaeological Sites

BSPL-H-01

BSPL-H-01 is a historic refuse deposit approximately three miles south-southeast of the project site and approximately 20 meters east of Neuralia Road, the formerly proposed location for the natural gas pipeline to the proposed project. The deposit appears to be a surface phenomenon and measures approximately 50 meters from north to south and 55 meters from east to west. The vegetation on the site in December, 2007, is reported as sparse creosote with burro grass and bottle brush also present. The archaeologists for the applicant state that site artifacts have been redistributed by wind and sheet wash and that the site surface is deflated.

The site artifact assemblage includes approximately 70 tin cans and tin can fragments, and glass, ceramic, and metal fragments. The tin can assemblage is reported to include hole-in-top and sanitary cans, and tobacco tins. The glass assemblage is reported to include fragments of milk glass, and fragments of manganese-decolorized, aqua, brown, green, and colorless glass. The ceramic assemblage is reported to include fragments of white and green ceramics. The further character, and the absolute or relative quantity of any of the artifact types in any of the assemblages are unreported.

The archaeologists for the applicant recommend that BSPL-H-01, interpreted by the archaeologists to reflect multiple roadside dumping events from the 1920s through the 1960s, be found ineligible for listing in the CRHR, primarily due to the difficulty in associating the deposit with important historic themes or persons. While the resolution of the documentation for the deposit makes it difficult to assess the actual date range that it represents and, hence, its potential association with important historic themes, staff nonetheless recommends that BSPL-H-01 is not eligible for listing in the CRHR, because it is highly improbable that the deposit would ever be able to yield information important to the early twentieth-century history of the western Mojave Desert.

BSPL-H-02

BSPL-H-02 is a historical archaeological site that includes two concrete foundations and a nearby refuse deposit. The site is approximately four miles south-southeast of the project site and approximately 20 meters east of Neuralia Road, the formerly proposed location for the natural gas pipeline to the proposed project. The site appears to be largely a surface phenomenon and measures approximately 25 meters from north to south and 15 meters from east to west. The vegetation on the site in December, 2007, is reported to have been predominantly creosote with burro grass and bottle brush also present. The archaeologists for the applicant cite the presence of silty sand on the site surface as evidence of surface deflation by sheet wash.

The archaeological features on the site include two weathered and cracked concrete foundations, a larger one toward the northern end of the site that measures approximately 10 feet by 30 feet, and a smaller one approximately 33 feet to the southwest of the larger one that measures approximately 7 feet by 8 feet. Five-eighth-inch threaded bolts appear to be set into and along the perimeter of both foundations, and both foundations appear to have local aggregate in the foundation concrete. There is a set of four steps on the northern side of the larger foundation that leads down into a basement that measures approximately 9 feet by 12 feet. The archaeologists for the applicant surmise that the smaller foundation may have been for a cistern or a septic tank. The further type, form, or character of the foundations are unreported.

The sparse artifact assemblage that is the refuse deposit on the site is reported to include five fragments of manganese-decolorized glass, 20 fragments of colorless window glass, three hole-in-top cans, two fragments of “polychrome ceramic,” one fragment of “white ceramic with a floral pattern,” and barbed wire.

The archaeologists for the applicant make the assertion in the inventory report (Apple and Glenny 2008, p. 54), on the basis of the presence of the concrete foundations and the refuse deposit, the potential presence of other refuse-filled features, and the nonspecific potential to provide information not in the archival record, that BSPL-H-02 has the potential to yield information important to the late nineteenth- and early twentieth-century history of the western Mojave Desert and is, therefore, potentially eligible for listing in the CRHR under Criterion 4. On the basis of a statement by the applicant at the April 14, 2009 PSA workshop in California City that the applicant could not foresee any potential for the construction of the former natural gas pipeline to impact BSPL-H-02, staff now recommends the placement of the site outside of the project area.

Further consideration of the site in the present analysis would therefore become unnecessary.

CA-KER-5264H

CA-KER-5264H was a surficial historic refuse deposit in the northern portion of the project site. The archaeologists for the applicant were unable to relocate the site during the recent intensive pedestrian cultural resources survey and suggest that the artifacts that originally made up the deposit may have been entirely collected at the time of the original recordation of the site in 1997.

Staff recommends the dismissal of CA-KER-5264H from further consideration in the present analysis, because it no longer appears to exist.

Site 16

Site 16 is a historic refuse deposit near the center of the project site. The deposit appears to be a surface phenomenon in a fallow agricultural field, and measures approximately 20 meters from north to south and 15 meters from east to west. The site is devoid of vegetation. The archaeologists for the applicant note that the site surface appears to have been subject to plowing.

Site artifacts include glass, ceramic, and tin can assemblages, as well as three automobile spark plugs, a can opener, a four-hole, milk glass button, and metal fragments. The glass assemblage is reported to include one whole bottle with a stopper finish, three fragments of manganese-decolorized glass, one colorless glass fragment with an embossed mark, fragments of window glass and milk glass, and fragments of aqua, brown, and green glass. The ceramic assemblage includes one white ceramic fragment with a maker's mark and one green and white ceramic fragment. The tin can assemblage includes "modern" [sanitary] cans, seven hole-in-top cans, two tobacco tins, and two possible sardine cans. The majority of the metal fragments were tin can fragments. The further character of the artifact types in the assemblages is unreported.

The archaeologists for the applicant recommend that Site 16, interpreted by the archaeologists to reflect multiple dumping events in the historic and recent past, be found ineligible for listing in the CRHR, primarily due to the difficulty in associating the deposit with important historic themes or persons. While the resolution of the documentation for the deposit makes it somewhat difficult to assess the actual date range that it represents and, hence, its potential association with important historic themes, staff nonetheless recommends that Site 16 is not eligible for listing in the CRHR, because it is highly improbable that the deposit would ever be able to yield information important to the early twentieth century history of the western Mojave Desert.

Multiple-Component Archaeological Sites

Site 3

Site 3 is an oblong archaeological deposit that includes both prehistoric and historic components. The deposit is approximately three-quarters of mile to the west of the project site and 300 feet west of SR 14. The long axis of the deposit parallels and is

adjacent to an improved dirt road that runs roughly northwest from SR 14 to a nearby electrical substation. The prehistoric component appears to be a surface phenomenon, while the historic component appears to occur in both surface and subsurface contexts. The present site surface appears to be on a mid-to-lower slope of the Pine Tree Wash alluvial fan. The predominant vegetation type on the site appears to be Mojave creosote bush scrub.

The surface component of the site measures approximately 127 meters from northwest to southeast and 37 meters from northeast to southwest, and includes three concentrations of predominantly historic artifacts, which appear to be partially buried. Surface observations of the concentrations suggest that shallow depressions may have been mechanically excavated through the gravelly deposits on this portion of the Pine Tree Wash alluvial fan, filled with historic refuse, and then partially buried with the excavated dirt and gravel. The archaeologists for the applicant note that construction-related debris and miscellaneous hardware dominate the overall artifact assemblage of the concentrations, although household refuse is present.

Concentration 1, the most northwesterly of the three concentrations on the site, includes the entire prehistoric component of the site, in addition to a concentration of historic artifacts. The whole concentration measures 5.5 meters from north to south and 6 meters from east to west. The prehistoric component is a sparse scatter of 10 artifacts which includes one core, one unmodified nodule of obsidian, and eight stone flakes. The further character of the artifacts is unreported. The historic component of Concentration 1 includes glass, ceramic, tin can, wood, and metal assemblages, and automobile parts. The glass assemblage includes what is reported to be a wine bottle fragment, 11 fragments of flat (window) glass of unreported color, two fragments of aqua glass, and 15 fragments of what are reported to be pink frosted glass. The ceramic assemblage is reported as polychrome, glazed, and earthenware fragments. The tin can assemblage includes what is reported to be a Prince Albert tobacco tin and modern food tins (sanitary cans) of unreported character. The wood assemblage is milled lumber of unreported quantity, dimensions, or finish. The metal assemblage includes one metal spike, crown caps, one gun cartridge, one spring, and 15 wire nails. The automobile parts include tire fragments, one air filter, one hose, and an unreported quantity of nuts. The further character of the artifacts in Concentration 1 is unreported.

Concentration 2, approximately 41 meters southeast of Concentration 1, is a historic refuse deposit and measures approximately 4 meters from north to south and 3 meters from east to west. The concentration includes glass, ceramic, tin can, and metal assemblages, and automobile parts. The glass assemblage includes one Delaware Punch bottle fragment with the embossed date of “March 4 1924” (bottle patent date), and two fragments of brown glass. The ceramic assemblage appears to be reported as three glazed ceramic tile fragments. The tin can assemblage is reported to be a Prince Albert tobacco tin. The metal assemblage is four wire nails and an unreported quantity or type of wire mesh. The balance of the reported portion of the concentration is reported as miscellaneous car parts. The further character of the artifacts in Concentration 2 is unreported.

Concentration 3, roughly adjacent to and southeast of Concentration 2, is a historic refuse deposit that measures approximately 5 meters from north to south and 5 meters

from east to west. The concentration includes glass, ceramic, and metal assemblages, and automobile parts. The glass assemblage includes one fragment of frosted glass of unreported color. The ceramic assemblage includes what is reported to be two glazed porcelain tile fragments and one earthenware fragment. The metal assemblage is one wire fan cover, one crown cap, and three wire nails. The balance of the reported portion of the concentration is reported as miscellaneous car parts. The further character of the artifacts in Concentration 3 is unreported.

The more particular physical context for Site 3, extrapolating information from Cultural Resources Figure 1 to the location of the site, appears to be landform designation Hf3 (see “Geoarchaeology Study” subsection, above). The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan. Although it is presently not known whether the site includes subsurface prehistoric archaeological deposits, older archaeological materials on and in this part of the alluvial fan are less likely to retain spatial associations that reflect the behavior of the people who made, used, or discarded such materials. Older artifacts found on the surface of the alluvial fan or eroding out of the deposits of rock and sediment that form it have often been washed down from a higher elevation and have simply become another part of the inorganic matrix of the fan. Archaeological materials rearranged in such a manner rarely offer the potential to yield information important to prehistory or history.

The archaeologists for the applicant interpret the historic component of Site 3 to reflect three dumping events in the early-to-mid-twentieth century. They cite the apparent similar method of refuse disposal among the three concentrations and the relative similarity of the artifacts in the concentrations as evidence that the same individual or group of people are likely to have been responsible for the deposits and that the deposits may originate from a single source. The archaeologists recommend that Site 3, be found ineligible for listing in the CRHR, primarily due to the difficulty in associating the deposit with important historic themes or persons.

The archaeologists did conduct additional archival research for the evaluation program. The study of five USGS maps for the area that date 1915, 1923, 1943, 1947, and 1956 found no structures along the improved dirt road that now fronts the site or within one mile of the site. While the resolution of the documentation for the deposits makes it difficult to assess the actual date ranges that they represent and to thereby more narrowly focus the potential association of the deposits with important historic themes or persons, staff nonetheless recommends that the historic component of Site 3 is not eligible for listing in the CRHR, because it is highly improbable that the deposit, which appears, on the basis of the above information and a field inspection of the site by staff, to be a Depression-era assemblage, would ever be able to yield information important to the early twentieth-century history of the western Mojave Desert.

The archaeologists for the applicant do not explicitly address whether the prehistoric component of Site 3 is eligible for listing in the CRHR. The sparse character of the surface assemblage, the apparent absence of archaeological materials that would facilitate the placement of the deposit in time, and the apparent loss of the original spatial associations among the artifacts in the assemblage for the site would appear,

collectively, to indicate that the component does not have the potential to yield information important to prehistory. Staff therefore recommends that the prehistoric component of Site 3 is not eligible for listing in the CRHR.

Site 6

Site 6 is an archaeological deposit that includes both prehistoric and historic components. The deposit is approximately one mile to the west of the project site and 650 feet west of SR 14. Both the prehistoric and historic components appear to be surface phenomena. The overall deposit measures approximately 63 meters from northwest to southeast and 40 meters from northeast to southwest. The present site surface appears to be on a mid-slope of the Pine Tree Wash alluvial fan. The predominant vegetation type on the site appears to be Mojave creosote bush scrub.

The prehistoric component of the deposit is an extremely sparse (about1 piece/229 square meters) scatter of 11 artifacts, which are reported as one projectile point base fragment, three cores, and seven stone flakes. The archaeologists for the applicant report that most of the pieces are of CCS. The further character of the artifacts is unreported.

The historic component of Site 6 includes glass, ceramic, tin can, wood, and metal assemblages. The glass assemblage includes an unclear number of fragments of aqua glass, one of which appears to be embossed with the date “March 4, 1924” (Delaware Punch bottle patent date). The ceramic assemblage is reported as 12 glazed, tan (yellowware) fragments, and an unspecified number of white whole plate and white plate fragments, one fragment of which represents a rice bowl. The archaeologists for the applicant identify an indefinite number of the white ceramics as being Japanese in origin. The tin can assemblage includes one tobacco tin, and the archaeologists also report one Bully Beef can. The wood assemblage is milled lumber of unreported quantity, dimensions, or finish. The metal assemblage is reported as two nails, one screw, one square bolt, wire, and one oil drum. The further character of the artifacts of Site 6 is unreported.

The archaeologists for the applicant make the assertion in the inventory report (Apple and Glenny 2008, p. 36) that the historic component of Site 6 has the potential, upon the establishment of associations between the component and a particular historic event or theme, through additional archival research or data collection, to yield information important to an unspecified period in the history of the western Mojave Desert and is, therefore, potentially eligible for listing in the CRHR under Criterion 4. While the resolution of the documentation for the deposit makes it difficult to assess the actual date range that it represents and to thereby more narrowly focus the potential association of the deposit with important historic themes or persons, staff nonetheless recommends that the historic component of Site 6 is not eligible for listing in the CRHR, because it is highly improbable that the apparently sparse deposit, which appears, on the basis of the above information, to be a 1920s to 1940s assemblage, would ever be able to yield information important to the early to mid-twentieth-century history of the western Mojave Desert.

The archaeologists for the applicant express the opinion that the prehistoric component of Site 6 has the potential to yield information important to prehistoric settlement and lithic technology in the western Mojave Desert and is, therefore, potentially eligible for listing in the CRHR under Criterion 4. The archaeologists cite the diversity of the lithic assemblage as evidence that the use of the site may not have been only for lithic reduction, or tool making. They note that an investigation to discern the presence of a subsurface component at the site would help address the potential historical significance of the site. On the basis of a statement by the applicant at the April 14, 2009 PSA workshop in California City that the applicant cannot foresee any potential for the construction of electric transmission line Option 1 to impact Site 6, staff now recommends the placement of the site outside of the project area. Further consideration of the site in the present analysis would therefore become unnecessary.

Prehistoric Archaeological District

Energy Commission staff here proposes the designation of a prehistoric to early historic Native American archaeological district that incorporates a zone of similar archaeological deposits buried across the eastern and northern portions of the project site. The temporary designation for the district is Archaeological Zone 1, and it presently includes archaeological sites FWARG-01, and Sites 8, 9, and 11–13. Cultural Resources Figure 2 depicts the provisional boundary of the district. The known prehistoric to early historic period archaeological sites that presently make up the district appear to represent the cyclical Native American exploitation of wetland resource patches that periodically developed along the distal margins of the Pine Tree Wash and Jawbone Canyon alluvial fans during the late Holocene. The apparent pattern of wetland resource use may have intermittently been a significant component of the local economy of Native American groups from the Late Prehistoric period through the early historic period. Further study of the district may provide new and important insight into the mosaic of resources that helped to underwrite traditional Native American lifeways in the western Mojave Desert in general, and, more particularly, in Fremont Valley. Such study may also provide insight into early historic period shifts in that mosaic as perhaps the Kawaiisu or the Kitanemuk began to adapt to the irreversible consequences of European and Euroamerican intrusion.

The boundary and the thematic associations of Archaeological Zone 1 are necessarily provisional. The fact that our present knowledge of the district only includes information from the project site constrains the accuracy of the present boundary for the district. As documentation for the district accumulates over time, the boundary for it will most likely come to encompass lands below the Cantil Valley fault to the northeast, north and northwest of the project site. The landforms that ultimately bound the distribution of the archaeological deposits that make up the district are most likely the Cantil Valley fault to the south and southeast, the Jawbone Canyon alluvial fan to the northeast and the north, the distal reaches of the bajada at the base of the Sierra Nevada to the northwest, and the Hf3 landform to the west and southwest. Our present relatively small sample of the archaeological deposits that make up the district similarly constrain the scope of the historic themes that the district may represent. The implementation of the proposed mitigation plan for the portion of the district on the project site and future

research on portions of the district beyond the project site will undoubtedly contribute to the development of a more complete scope of the thematic associations for which the district is significant.

Energy Commission staff recommends that Archaeological Zone 1 is eligible for listing on the CRHR under Criterion 4, because the district has yielded and has the potential to yield further information important to the prehistory and early history of Native American life in the western Mojave Desert, and because the district retains particularly high degrees of integrity of location, design, materials, and association and is therefore well-able to convey its significance. The presently known contributing elements for the district are archaeological sites FWARG-01, and Sites 8, 9, and 11–13, which are each also recommended above as being individually eligible for inclusion in the CRHR.

Built Environment Resources Evaluations

There presently appear to be 16 built-environment resources that the proposed project may impact. The resources include 15 standing structures and one historic railroad in the project area of analysis that have the potential to be subject to direct impacts.

Descriptions and evaluations of the historical significance of the 16 built-environment resources that the proposed project may impact are presented below. The information for the descriptions and evaluations is drawn from (Hirsch 2008 and attachment 3 (DPR 523 series forms)).

In their survey, the applicant identified 15 standing structures that were (or would be by 2010) of sufficient age to be considered potentially significant historical resources (Hirsch 2008, p. 20). Fourteen of these resources (21000-21001 and 21257 79th Street, and 21001-21225 Neuralia Road) are simple ranch-style residences constructed between 1963 and1964. These one-story residences are similar in plan and appearance. They are L-shaped buildings with predominantly gable roofs. The exteriors are clad with a combination of stucco and wood-veneer siding, and fenestration consists of aluminum sliding windows.

Staff recommends that these 14 ranch-style residences located along 79th Street and along Neuralia are not eligible for inclusion in the CRHR. Evaluated under Criterion 1, the buildings are not associated with events that have made a significant contribution to the broad patterns of our history, either individually or as a part of a larger district. Rather they represent a common trend within the context of residential development. Research did not indicate these residences were associated with historically significant persons, and so they do not appear to be eligible under Criterion 2. Under Criterion 3, these fourteen resources do not embody a distinctive type, period, or method of construction. Instead, they represent a fairly standardized housing type and construction method. These resources are also not eligible under Criterion 4 because they are not likely to yield information important to history.

The remaining potential historical resource, “Rancho Cantil,” located at 7696 Neuralia Road, consists of multiple structures—an abandoned vernacular residential building, a contemporary ranch-style residence, and several outbuildings. The applicant did not have access to the complex and was only able to survey the resource from the public-

right of-way. The abandoned residential structure appeared to be the only building that was more than 45 years old. The applicant reviewed historic maps and determined that the resource appears on a 1947 USGS map, and so was constructed prior to 1947. The vernacular residence is a frame structure with a gable roof and appears to have been a ranch house at one time. The contemporary ranch-style house is thought to date within the last 30 years. The outbuildings are thought to be of wood, but neither the exact construction materials nor the age could be determined due to inaccessibility.

The applicant recommended that the pre-1947 vernacular residence at 7696 Neuralia Road could potentially be eligible for inclusion in the CRHR. However, staff believes it does not appear to meet the criteria for inclusion in the CRHR. Agricultural and ranching industries were unsustainable in the Fremont Valley and did not contribute to significant patterns within the development of this region and state. As a result, this residence does not appear to be significant within the patterns of area history under Criterion 1. Research did not indicate this residence was associated with historically significant persons, and so it does not appear to be eligible under Criterion 2. Under Criterion 3, this residence does not embody a distinctive type, period, or method of construction. This residence also is not eligible under Criterion 4 because it is not likely to yield information important to history.

An approximately 1.2-mile stretch of the “Jawbone” Branch (CA-KER-3366H) of the Southern Pacific Railroad forms the western boundary of the proposed BSEP project site, and so was identified as a built-environment resource in the applicant’s survey of the 200-foot buffer zone around project components. This branch extends 90 miles from Mojave through the Jawbone region and Owens Valley to Owenyo (a few miles north of Lone Pine). The line was built between 1908 and 1912 to carry supplies for the construction of the Los Angeles Aqueduct. The first 23 miles of the branch line opened to Cantil on June 1, 1905. The applicant states that the Jawbone Branch is potentially significant under CRHR Criterion 1 for its association with the construction of the Los Angeles Aqueduct (BS 2008a).

Railroads, with their associated tunnels, trestles, and bridges, are potentially significant under Criterion 1 if they are significantly associated with trends and/or events in transportation development or regional or local economic development. Railroads, however, like other transportation infrastructure, are inherently important to their communities, as they affect communication and the distribution of people, goods, and services that in turn affects development on both the local and regional levels. This effect is not typically sufficient to warrant recognition of a railroad as significant under Criterion 1, otherwise virtually any railroad, with its associated structures, would be shown to be important in this way.

To be eligible for listing in the CRHR, resource types such as railroads and other transportation infrastructure must have demonstrable importance directly related to important historic events and trends, with emphasis given to specific demand for such infrastructure, and its effects on social, economic, commercial, and industrial developments locally, regionally, or nationally. In this way, railroad lines and associated structures, may be significant as physical manifestations of important transportation and community developments on the local, regional, state, or national level.

The most common instance in which a railroad line or its separate structural components might be considered under Criterion 1 would be if either the line or separate components (tunnels, trestles, or bridges) were the first to be located at its site, thus providing expanded transportation opportunity and advancing economic development into previously isolated or underdeveloped areas. This development trend is identified as “ahead of demand” development, indicating the transportation route predated development and subsequent development directly related to the presence of the transportation route. One such example of this development pattern would be the line the Southern Pacific Railroad constructed down the length of California’s San Joaquin Valley. While several towns connected by wagon roads existed in the Central Valley prior to the coming of the railroad, the placement of the new line away from the wagon road initiated the development of a large number of new towns along the new transportation route. These towns, now the location of the valley’s main populations, exist because the railroad was built through a previously undeveloped area, which in turn opened a new area for economic development.

In the case of the Jawbone Branch, the line did not significantly affect trends and or events in the development within the regional or local economy. Railroads are not likely to be eligible under Criterion 2 because they rarely illustrate a person’s important achievements under Criterion 2. Historically significant persons associated with the development of the Southern Pacific Railroad are better represented by other historical resources. Under Criterion 3, this segment of the railroad does not represent embody a distinctive type, period, or method of construction nor would this resource be eligible under Criterion 4, for its potential to yield important information because railroads are well documented in the historical record.

Summary of CRHR-Eligible Cultural Resources for the Beacon Solar Energy Project

There are presently seven cultural resources in the proposed project area that staff recommends as eligible for listing on the CRHR and that are, consequently, historical resources for the purposes of CEQA. The seven historical resources are prehistoric archaeological sites FWARG-01, and Sites 8, 9, and 11–13, and prehistoric archaeological district Archaeological Zone 1. Assessments of the character of the impacts of the proposed project on these resources, a single buried prehistoric fire feature or hearth and multiple fire-affected rock deposits that also often include intact buried hearths, and a proposal for a program to mitigate those impacts across the eastern and northern portions of the project site are developed below.

There is presently one further cultural resource (Site 17) in the proposed project area that staff recommends assuming as eligible for listing in the CRHR for the purpose of the present siting case. This resource, by benefit of the above assumption, is a historical resource under CEQA, and the consideration of the character of the impacts of the proposed project on it is a requisite part of the present analysis. A proposal for a phased program to mitigate those impacts is also developed below.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE OF IMPACTS TO 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. Resources Code, § 21084.1). Thus, staff analyzes whether a proposed project would cause a substantial adverse change in the significance, that is, the CRHR eligibility, of all historical resources identified in the Cultural Resources Inventory as CRHR eligible. The degree of significance of an impact depends on:

- The cultural resource impacted;
- The nature of the resource's historical significance;
- How the resource's historical significance is manifested physically and perceptually;
- Appraisals of those aspects of the resource's integrity that figure importantly in the manifestation of the resource's historical significance; and
- How much the impact will change those integrity appraisals.

DIRECT/INDIRECT IMPACTS AND MITIGATION

In the abstract, direct impacts to cultural resources are those associated with project development, construction, and 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 standing structures when 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 which 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 creates improved accessibility and vandalism or greater weather exposure becomes possible.

Ground disturbance accompanying construction at a proposed project site, along proposed linear facilities, and at a proposed laydown area has the potential to directly impact archaeological resources, unidentified at this time. 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.

Construction Impacts and Mitigation

Identification and Assessment of Direct Impacts on Archaeological Resources and Proposed Mitigation

The assessment of the potential direct impacts of the proposed project on archaeological resources is presented below relative to three primary project components, the main plant site or project site, the transmission line alignments, and the emergency access road. Mitigation proposals for the impacts of each project component conclude the assessment of each component.

Main Plant Site

Construction-related activities on the main plant site, or project site, have the potential to cause significant impacts to archaeological resources as follows:

- Grading and leveling would take place during the preparation of the project site using cuts and fills (BS 2008a, p. 2-26). This phase of construction would bury or destroy the majority of the known surface archaeological resources on the project site and may potentially wholly or partially destroy buried archaeological deposits that are presently unknown for the lateral extent and to the depth of ground disturbance across and beneath the project site.
- An approximately 14,000-foot-long drainage channel would be constructed with an average channel depth of 8 feet (BS 2008a, p. 2-25). This excavation would potentially impact buried archaeological deposits that are presently unknown for the lateral extent and to the depth of ground disturbance across and beneath that portion of the project site.
- An approximately 9,000-foot-long existing railroad drainage ditch (approximately 1 foot deep and minimally 15 feet wide at the bottom) would be re-routed during construction towards the new alignment for Pine Tree Wash (BS 2008a, p. 2-25). This excavation could potentially impact buried archaeological deposits that are presently unknown for the lateral extent and to the depth of ground disturbance across and beneath that portion of the project site.
- Three evaporation ponds with a surface area of 2.0- or 2.7 acres each, dependent upon which of two proposed water supply and discharge configurations the applicant chooses, of a presently undetermined depth, would be excavated during project construction (BS 2008a, p. 2-19; DB 2009r, pp. 2-2–2-4, and 3-2). These excavations, as proposed in the AFC, would occur on a portion of the project site in the Hf3 landform (see “Geoarchaeology Study” subsection, above), where sensitivity for buried archaeological resources is low.
- Security fencing would be installed surrounding the project site, including the solar field (BS 2008a, p. 2-25). Fence installation could potentially impact buried archaeological deposits that are presently unknown to the extent of the area and to the depth of ground disturbance across and beneath that portion of the project site.

- In the event that new water supply wells would be developed during construction (BS 2008a, p. 2-14), the excavation of the wells could potentially impact buried archaeological deposits that are presently unknown to the extent of the area and to the depth of ground disturbance across and beneath that portion of the project site.
- Foundation excavations for project components would be dug (specified in Cultural Resources Table 9) (BS 2008a, p. 2-4–2-5; DB 2008d, Response to Data Request No. 33). The excavations would occur across each landform designation for the project site (see "Geoarchaeology Study" subsection, above) and would therefore most likely impact buried archaeological deposits that are presently unknown to the extent of the area and to the depth of ground disturbance across and beneath those landforms where sensitivity for buried archaeological resources is moderate to high, Hf1, Hf1d, Hf2, and Hf4.

CULTURAL RESOURCES TABLE 9
Summary of Foundation Depths for Select Project Components

Project Component	Foundation Depth[21]
Steam Turbine	8'–10'
Circulating Water Pipe	12'–15'
Cooling Tower Basin	18'–22'
Oil/Water Separator	2.5'–3' (above ground)
Solar Field Pedestals	12'–15'

* DB 2008d, Response to Data Request No. 33

The primary, significant, direct physical impact of the construction of the project, as proposed in the AFC, on historical resources on the project site, presently would appear to be the whole or partial destruction of prehistoric archaeological sites FWARG-01, and Sites 8, 9, and 11–13, and the partial destruction of prehistoric archaeological district Archaeological Zone 1. Other archaeological sites similar in character to FWARG-01, and Sites 8, 9, and 11–13, and eligible for listing in the CRHR both as individual historical resources and as contributing elements to Archaeological Zone 1, are almost certainly buried in the zone across the eastern and northern portions of the project site and would also likely be subject to whole or partial destruction. The construction of the project has the further potential to destroy prehistoric archaeological site Site 17, a historical resource for the purpose of the present siting case (see "Archaeological Resources Evaluations" subsection, above). Project construction, as proposed in the AFC or as subsequently redesigned, may also lead to the whole or partial destruction of presently unknown types of buried archaeological deposits in Archaeological Zone 1 and the whole or partial destruction of presently unknown buried archaeological deposits outside of it, in other portions of the project site.

[21] Once the fill has been placed, the elevations of the component foundations inside of the power block would be 0'–5' less than what is shown here. Once the cuts have been excavated, the elevations of the component foundations outside the power block would be the depth of those components plus the depth of the cut at the location of each foundation.

Archaeological Zone 1

The destruction of a portion of Archaeological Zone 1 as a result of the construction of the proposed project would cause a substantial adverse change in the significance of the historical resource, and would, therefore, have a significant effect on the environment. Staff here proposes a program to reduce the significance of the partial loss of the resource, prior to the onset of any ground disturbance by the applicant within 30 meters of the provisional boundary for the Zone (see Cultural Resources Figure 2, above). The partial loss of the resource represents a loss of information that it is in the public interest to preserve. The proposed program, the details of which may be found in **CUL-6**, attempts to compensate the public for the loss of a unique body of information on the prehistory and early history of Native American life in Fremont Valley through the partial recovery and dissemination of that information.

Staff proposes a phased program that would partially mitigate the destruction of buried deposits that represent the one basic type of archaeological site that is presently known to make up Archaeological Zone 1. That site type encompasses archaeological deposits the most significant constituent of which is Native American fire features or hearths such as those found at archaeological sites FWARG-01, and Sites 8, 9, and 11 and 12. The hearths occur both as feature clusters and as isolate features that may or may not occur in association with fire-affected rock. Infrequent material culture constituents that have so far been found in association with the hearths and the fire-affected rock include partial bifaces, handstone and millingstone fragments, stone flakes, bird bone, and other undifferentiated bone. The phases of mitigation that staff proposes would serve to recover information on the part of Archaeological Zone 1 that would be subject to destruction through the development of a more complete inventory of the population of the archaeological deposits that make up the Zone, the documentation of the variation in the physical character, the material content, and the age of the constituent hearths of the Zone, and the documentation of the material culture assemblages that may be present on the buried landform surfaces from which Zone hearths were constructed and used.

The first phase of the mitigation program would be to develop a more representative inventory of the buried archaeological deposits that make up Archaeological Zone 1. A staff field inspection on January 27, 2009, of the subsurface stratigraphy of the Zone during the field phase of the geoarchaeology study found that the sedimentary deposits below the surface of the Zone are largely made up of fine-grained silts that contain almost no gravel. The types of deposits that are now known from archaeological sites FWARG-01, and Sites 8, 9, 11, and 12 include clusters of fire-affected, igneous pebbles and cobbles, and fire-hardened bands of oxidized sediment that are so distinct from the sedimentary matrix that encases them that such deposits would appear to be high-quality candidates for location using geophysical methods such as ground-penetrating radar or magnetometry. The use of geophysical methods to conduct a sample survey for the inventory phase of the mitigation program offers the opportunity to more accurately and efficiently document the extent and the character of Archaeological Zone 1.

More specifically, staff proposes that the applicant conduct the inventory phase of the mitigation program using one of two investigatory sequences. The first stage of both

sequences would be to conduct a relatively small (1-acre) test of the geophysical method that the applicant proposes to use to determine whether the method is able to locate the types of archaeological deposits that make up Archaeological Zone 1. The applicant has done initial research, in response to discussions that were held at the July 1, 2009 public workshop in California City, on the geophysical method most appropriate to the survey of the geologic context of the Zone, and proposes to use magnetometry[22]. The test would include a small magnetometer survey through and in the near vicinity of (approximately 30 meters beyond) known archaeological sites in Archaeological Zone 1, and the subsequent ground truthing of a sample of the magnetic anomalies found in the test survey areas. Upon the determination, by the applicant, that the use of magnetometry appears to be reasonably reliable, the applicant would proceed to a broader geophysical sample survey of the district and of the area 30 meters to the southwest of the provisional district boundary. The results of the broader geophysical survey would also be subject to ground truthing to more precisely establish the range of error of the survey results. The corrected results would then serve as the basis for the refinement of the provisional district boundary and for the data recovery phase investigation of a sample of the hearths of Archaeological Zone 1, and as the basis on which to search for and document a sample of the buried land surfaces that may surround them.

Should the results of the initial geophysical test demonstrate that the use of magnetometry is not reasonably well able to locate the types of archaeological deposits that make up Archaeological Zone 1, the applicant would conduct a broader subsurface sample survey of the Zone using construction equipment such as a road grader or a backhoe rather than proceeding with the broader geophysical survey. This mechanical subsurface survey would employ transects the width and length of which the applicant would develop in consultation with staff, and would involve the excavation of the transects in thin (no thicker than approximately 5 centimeters) layers to carefully expose and facilitate the accurate preliminary documentation of target archaeological deposits.

The development of the samples for either the broader geophysical survey or the mechanical subsurface survey would be critical to establishing an accurate profile of Archaeological Zone 1 and, consequently, to shaping the data recovery phase in a manner that staff would be able to demonstrate would result in the recovery of a representative sample of the various data sets that the Zone has the potential to yield. Staff proposes that the applicant develop a stratified random sample[23] specific to the type of survey that would ultimately be done to inventory Archaeological Zone 1. If the applicant determines that the use of magnetometry appears to be reasonably reliable, then the applicant would develop a stratified random sample for the Zone that would result in the geophysical survey of a minimum of 10 percent of it. Staff believes that the minimum 10 percent sample would be necessary in order to reasonably ensure the derivation of a statistically valid inventory of the population of the types of archaeological deposits that are now known to constitute the Zone. The applicant stated

[22] Magnetometry is a field method whereby one measures variations in the magnitude and direction of magnetic fields across a landscape.

[23] A stratified random sample divides the population to be surveyed into a number of nonoverlapping classes which together represent the entire population. A statistically random sample of each resultant class is then subject to survey.

at the July 1, 2009 public workshop in California City that the preliminary estimate of the area of the portion of Archaeological Zone 1 in the project area is approximately 550 acres. The 10 percent geophysical survey of that portion of the Zone would therefore equal approximately 55 acres. If the applicant determines that the use of magnetometry does not appear to be reasonably reliable, then the applicant would develop a stratified random sample for the Zone that would result in the mechanical subsurface survey of a minimum of 2.5 percent of it, or approximately 14 acres. Staff and the applicant agreed to this amount of survey coverage at the July 1, 2009 public workshop. The percentage is arguably arbitrary, although staff and the applicant believe that it does represent a defensible compromise between the need to have a representative inventory of the archaeological deposits in the Zone and the greater relative cost of conducting the mechanical survey. The applicant would stratify the sample, for either survey, on the basis of criteria that the applicant would develop in consultation with staff. The criteria would reflect the spatial variability in the physical and material character and in the chronology of Archaeological Zone 1, as such variability is presently known from the field investigations in the project area to date.

The data recovery phase that staff proposes for the mitigation of Archaeological Zone 1 would include different modes of investigation for the different constituents of the archaeological deposits that make up the Zone. One mode would be to excavate small (approximately 1–3 meters square) exposures to uncover and document a sample of the individual hearths that are one constituent of the Zone. The purpose of this documentation would be to gather data to describe the physical variability of the features, to identify and inventory the artifacts and ecofacts that are found in them, and to interpret the methods of construction and the potential uses of the features. Staff and the applicant agreed during the July 1, 2009 public workshop in California City that the number of hearths in the Zone that would be subject to thorough, small exposure excavation would be 12. The number is arguably arbitrary, although staff and the applicant believe that it does represent a defensible compromise between the need to thoroughly document the hearths of the Zone and the relatively high cost of conducting such excavation.

A second mode of investigation in Archaeological Zone 1 would be to excavate larger (5 meters square) block exposures to attempt to uncover a sample of the buried land surfaces that may surround individual hearths or groups of them, and to document the material culture assemblages that may be found on such surfaces. The purpose of this documentation would be to gather data on the composition and spatial distribution of the assemblages to more holistically interpret the use of the features and to interpret the broader behavioral contexts in which the use of the features was embedded. A staff field inspection on January 27, 2009, of the subsurface stratigraphy of the Zone during the field phase of the geoarchaeology study found that the preservation of subtle sedimentary features such as ancient polygonal surface cracks was common and indicates that the character of the sedimentary deposition in Archaeological Zone 1 would highly favor the preservation of former land surfaces and archaeological deposits related to the use of those surfaces. Staff and the applicant agreed during the July 1, 2009 public workshop in California City that the number of block exposures would be 4. The number is arguably arbitrary, although staff and the applicant believe that it does

represent a defensible compromise between the need to attempt to document the former land surfaces around the hearths of the Zone and the relatively high cost of conducting such large excavations.

Staff proposes three further measures to promote the preservation of the portion of Archaeological Zone 1 that the construction of the proposed project would not destroy to more adequately offset the loss of information that the above field investigations alone cannot satisfactorily mitigate. One measure is the preparation of a CRHR nomination for the Zone and the submission of the nomination to the State Historic Resources Commission for formal consideration. Such a nomination would facilitate pulling the extant information for the Zone together in one place, and the consideration of the nomination would help to raise public awareness of it, if not afford it greater protection under local, State, and Federal historic preservation programs in the future.

Another measure is the preparation of a research paper and its presentation at a professional conference, or the preparation and publication of a peer-reviewed journal article to inform the professional archaeological community of the Zone and to interpret its implications for our understanding of the prehistory and early history of Native American life in the region.

A final measure is the preparation and presentation of materials that interpret the Zone for the public so that the public derives a direct and relatively immediate benefit from the degradation of their environment. Potential public interpretation efforts may include the preparation of an instructional module for use in local school districts, or the preparation of a display for existing public interpretation venues such as Red Rock Canyon State Park.

Site 17

The potential destruction of Site 17 as a result of the construction of the proposed project would cause a substantial adverse change in the significance of what is here assumed to be a historical resource, and would, therefore, have a significant effect on the environment. Staff here proposes that the applicant implement a series of active avoidance measures, incorporated in staff's recommended **CUL-5**, to ensure that there would be no physical damage to the site as a result of the construction, operation, or maintenance of the project. Prior to the onset of any ground disturbance by the applicant in the southwestern portion of the project site, the applicant would re-establish the boundary of the site, add a 10-meter wide buffer around the periphery of that boundary, and flag the boundary around the site and the buffer in a conspicuous manner. The applicant would then ensure that a cultural resources monitor would enforce the avoidance of the flagged area during project construction. A further provision would be made in **CUL-5** to permanently mark the boundary around the site and the buffer, subsequent to the construction of the project, and then set the bounded area aside as an environmentally sensitive area that would not be subject to disturbance during the life of the project.

Discovery of Buried Archaeological Deposits

Construction activity on the main plant site, or project site, as proposed in the AFC or as necessary for subsequent redesigns of the proposed project, may cause the whole or

partial destruction of significant and unknown buried archaeological deposits that may be parts of the different landforms that make up the project site. Such deposits may include archaeological sites in Archaeological Zone 1 of types that are not now known. Staff here proposes a construction monitoring program that provides for different monitoring protocols for each known landform designation (Cultural Resources Table 10) on the project site, and along select portions of the transmission line alignments. The primary basis for the protocols is the results of the geoarchaeology study that was done on the project site (see "Geoarchaeology Study" subsection, above). The construction of project components on the project site, whether those proposed in the AFC or any that are subsequently redesigned or added, would be monitored relative to the appropriate landform designation protocol to attenuate damage to any buried archaeological deposits found during construction. The monitoring protocols for the landforms that are presently known to include archaeological deposits that are constituents of Archaeological Zone 1 (Hf1, Hf2, and Hf4) provide for active construction monitoring outside of the Zone and passive monitoring inside the Zone. The entire construction monitoring program is set out in **CUL-8** and prescribes monitoring protocols for the landforms of the project site, as well as for those that are known along the transmission line alignments.

CULTURAL RESOURCES TABLE 10
Construction Monitoring Protocols for Project Area Landform Designations

Landform Designation	Monitoring Protocol	Portion of Project Area
Hf1	Monitor all ground disturbance outside refined provisional district boundary for Archaeological Zone 1 down approximately 2 m to upper boundary of late Pleistocene paleosol	Project site
Hf1d	Monitor all ground disturbance down approximately 2 m to deposits of Pleistocene-age pebbles and cobbles	Project site, transmission line alignments
Hf2	Monitor all ground disturbance outside refined provisional district boundary for Archaeological Zone 1	Project site
Hf3	No monitoring	Project site, transmission line alignments
Hf4	Monitor all ground disturbance outside refined provisional district boundary for Archaeological Zone 1	Project site
Unknown landforms	Monitor all ground disturbance	Emergency access road route

The proposed construction monitoring program for the project takes into account the age and the depositional origin of the five landforms that represent the project site landscape. Each of the five landform designations on the project site (Hf1, Hf1d, Hf2, Hf3, and Hf4) has, under the proposed program, a unique monitoring protocol in **CUL-8** that the applicant would implement during construction there.

Monitoring Protocol for Landform Hf1

The active component of the Hf1 monitoring protocol would apply to the portions of that landform that are beyond or to the southwest of the refined provisional district boundary for Archaeological Zone 1. The protocol would require the applicant to monitor all ground disturbance down to the upper boundary of the paleosol that is buried in the landform. That boundary, which is the upper boundary of a preserved A horizon, is approximately 2 meters below the present surface of the landform. The sediments above the paleosol represent low-energy deposits of fine sands and silts that would have been conducive to the preservation of archaeological materials and the spatial associations among them. The paleosol itself dates approximately to the boundary between the Pleistocene and subsequent Holocene epochs, largely predating the commonly acknowledged presence of humans in North America. Staff believes that construction monitoring through or beneath the paleosol would be largely unproductive. The ultimate results of the monitoring activity on the upper portion of the Hf1 landform would be taken into account during the preparation of the CRHR nomination for Archaeological Zone 1 to derive the formal boundary for the district across the project site.

Staff proposes passive monitoring for the Hf1 landform in the area of Archaeological Zone 1 inside or to the northeast of the refined provisional district boundary. The applicant would have completed the field portion of the data recovery investigation of the district prior to any ground disturbance in it. The completion of that fieldwork and of the balance of the mitigation program for the district would be understood to fully mitigate the ultimate impacts of the proposed project on it and to obviate the need to salvage archaeological deposits that are subsequently found in the district that are of site types already known for the district. Any buried archaeological deposits that are found during the course of ground disturbance in the district, that do not represent known site types for the district, would, however, be subject to the discovery protocol in **CUL-9**. Construction personnel would be given training, as part of the training program of **CUL-7**, that would facilitate the field recognition of archaeological site types that are and are not known for the district.

Monitoring Protocol for Landform Hf1d

The Hf1d monitoring protocol would require that the applicant monitor all ground disturbance down approximately 2 meters from the present surface of the landform to the upper contact of what are presently thought to be Pleistocene-age deposits of pebbles and cobbles. The sedimentary deposits above the pebbles and cobbles, sequences of Holocene alluvial fan deposits that encase coppice dunes and sand sheets underlain by apparently Holocene, distal alluvial fan deposits of fine sands and silts, would have presumably been conducive to the preservation of archaeological materials and the spatial associations among them. The underlying Pleistocene-age deposits represent high-energy deposits that would most likely not retain the original

spatial associations among any archaeological materials found there and are of an age that largely predates the commonly acknowledged presence of humans in North America. Staff believes that construction monitoring through the pebble and cobble deposits would be largely unproductive.

Monitoring Protocol for Landform Hf2

The active component of the Hf2 monitoring protocol would require that the applicant monitor all ground disturbance to the maximum depth of such disturbance across the portions of the landform that are beyond or to the southwest of the refined provisional district boundary for Archaeological Zone 1. The upper approximately 4 meters of the Hf2 landform include relatively repetitive sequences of particularly low-energy sheetwash and flood deposits that reflect weather events that have taken place over thousands of years, up to the present day. The upper sequences are underlain by deposits that reflect a high-energy flood, subsequent lower-energy deposition of fine sediments, and then a prolonged period of drying that may represent the early Holocene climate of the region. The high sensitivity of the upper portion of the landform for buried archaeological deposits is now well-established and clearly warrants proactive monitoring to facilitate the recognition and mitigation of archaeological sites that may or may not relate to Archaeological Zone 1. The age and the potential archaeological sensitivity of the lower sedimentary deposits in the landform also warrant such monitoring. The ultimate results of the monitoring activity on the Hf2 landform would be taken into account during the preparation of the CRHR nomination for Archaeological Zone 1 to derive the formal boundary for the district across the project site.

Staff proposes passive monitoring for the Hf2 landform in the area of Archaeological Zone 1 inside or to the northeast of the refined provisional district boundary. The applicant would have completed the field portion of the data recovery investigation of the district prior to any ground disturbance in it. The completion of that fieldwork and of the balance of the mitigation program for the district would be understood to fully mitigate the ultimate impacts of the proposed project on it and to obviate the need to salvage archaeological deposits that are subsequently found in the district that are of site types already known for the district. Any buried archaeological deposits that are found during the course of ground disturbance in the district, that do not represent known site types for the district, would, however, be subject to the discovery protocol in **CUL-9**. Construction personnel would be given training, as part of the training program of **CUL-7**, that would facilitate the field recognition of archaeological site types that are and are not known for the district.

Monitoring Protocol for Landform Hf3

The Hf3 monitoring protocol would be that the applicant not monitor any ground disturbance on that landform. The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan. The archaeological sensitivity of the constituent sedimentary deposits of the landform is, therefore, thought to be low. Staff believes that construction monitoring on the landform would be largely unproductive.

Monitoring Protocol for Landform Hf4

The active component of the Hf4 monitoring protocol would require that the applicant monitor all ground disturbance to the maximum depth of such disturbance across the portions of the landform that are beyond or to the southwest of the refined provisional district boundary for Archaeological Zone 1. The Hf4 landform is made up of a relatively complex sedimentary sequence. The upper approximately 2 meters of the deposits that compose the landform are predominantly gravels and sands that form a relatively recent alluvial fan where Pine Tree Wash cuts north across the scarp of the Cantil Valley fault and down onto the surfaces of the Hf2 and Hf3 landforms. Sedimentary deposits of the Hf4 landform overlay and interfinger with the deposits of the latter landforms. The portion of the Hf4 landform from approximately 2 meters below the present ground surface to a depth of approximately 4 meters is a sequence of sheetwash and minor flood deposits similar in character to the deposits that characterize the Hf2 landform. The origin of the deposits may be the distal reaches of streams other than Pine Tree Wash. The portion of the landform greater than 4 meters in depth is similar in character to the deposits of the Hf3 landform and evidence relatively high-energy sheetwash and stream channel deposition. The archaeological sensitivity of the Hf4 landform is thought to be moderate, primarily across its eastern and northern portions, despite the interpretation of the landform as being largely the product of moderate- to high-energy depositional regimes, because the Hf2 landform, a landform known to be highly sensitive for buried archaeological deposits, may be shallowly buried there. The ultimate results of the monitoring activity on the Hf4 landform would be taken into account during the preparation of the CRHR nomination for Archaeological Zone 1 to derive the formal boundary for the district across the project site.

Staff proposes passive monitoring for the Hf4 landform in the area of Archaeological Zone 1 inside or to the northeast of the refined provisional district boundary. The applicant would have completed the field portion of the data recovery investigation of the district prior to any ground disturbance in it. The completion of that fieldwork and of the balance of the mitigation program for the district would be understood to fully mitigate the ultimate impacts of the proposed project on it and to obviate the need to salvage archaeological deposits that are subsequently found in the district that are of site types already known for the district. Any buried archaeological deposits that are found during the course of ground disturbance in the district, that do not represent known site types for the district, would, however, be subject to the discovery protocol in **CUL-9**. Construction personnel would be given training, as part of the training program of **CUL-7**, that would facilitate the field recognition of archaeological site types that are and are not known for the district.

Transmission Line Infrastructure

Construction-related activities have the potential to cause significant impacts to archaeological resources in or near the two proposed alternative project transmission line alignments, Options 1 and 2, as follows:

- Foundation excavations of unreported depth for 36 new steel/concrete monopoles (the same number would be required for either alternate route) would be dug along the selected transmission line alignment (BS 2008a, p. 2-30). The majority of the excavations would occur in a portion of the project area that, extrapolating

information from Cultural Resources Figure 1 to the location of the alternative routes, appears to be landform designation Hf3 (see "Geoarchaeology Study" subsection, above), where sensitivity for buried archaeological resources is low. The balance of the excavations could potentially impact buried archaeological deposits that are presently unknown to the extent of the area and the depth of ground disturbance of the natural ground in the project area.

- A new dirt access road to access the new transmission line ROW would be cleared and graded. The length of the new road, 1.0 miles or 1.9 miles, would depend on which transmission line option is selected. Additionally, new stub access roads, each about 100 feet long, would be cleared and graded from the new and existing transmission line access roads to each new monopole (BS 2008a, p. 2-30). The majority of the access road construction would occur in a portion of the project area that, extrapolating information from Cultural Resources Figure 1 to the location of the alternative routes, appears to be landform designation Hf3 (see "Geoarchaeology Study" subsection, above), where sensitivity for buried archaeological resources is low. The balance of the access road construction could potentially impact buried archaeological deposits that are presently unknown to the extent of the area and the depth of ground disturbance of the natural ground in the project area.
- Eight pulling sites would be established on unreported locations along the selected transmission line alignment (BS 2008a, p. 2-32). The pulling activities could potentially impact surface and near-surface archaeological resources in or near the selected transmission line alignment.

No significant direct construction impacts to historical resources along the alignments for the proposed transmission line are presently confirmed (see "Summary of CRHR-Eligible Cultural Resources for the Beacon Solar Energy Project" subsection, above). The construction of transmission line infrastructure, as proposed in the AFC or as subsequently redesigned, may, however, lead to the whole or partial destruction of presently unknown buried archaeological deposits.

Discovery of Buried Archaeological Deposits

Staff proposes that the construction of transmission line infrastructure components in the project area be monitored relative to the monitoring program protocols for landforms Hf1d, Hf2, Hf3, and Hf4 to attenuate damage to any buried archaeological deposits that may be found during the construction of transmission line infrastructure. For the construction of the portions of the transmission line alignments that traverse the project site from the proposed switchyard and power block in the approximate center of the project site to the western project site boundary, the applicant would implement the active components of the monitoring protocols for landforms Hf2, Hf3, and Hf4. While the majority of the portion of the project area that encompasses the transmission line alignments is outside of the study area for the geoarchaeology study (see "Geoarchaeology Study" subsection, above), staff concludes that the Hf1d and Hf3 landforms can be reliably extrapolated out across those alignments and that the use of the monitoring protocols for landforms Hf1d and Hf3 is appropriate. To implement the protocols for the portions of the transmission line alignments off of the project site, the applicant would project out the boundary between the Hf1d and Hf3 landforms, which appears to be coincident with the Cantil Valley fault, to the southwest of the project site

and implement the appropriate protocol for each respective landform. The entire construction monitoring program is set out in **CUL-8** and prescribes the monitoring protocols for the subject landforms.

Monitoring Protocol for Landform Hf1d

The Hf1d monitoring protocol for the portion of the project area that includes the transmission line alignments would require that the applicant monitor all ground disturbance down approximately 2 meters from the present surface of the landform to the upper contact of what are presently thought to be Pleistocene-age deposits of pebbles and cobbles. The sedimentary deposits above the pebbles and cobbles, sequences of Holocene alluvial fan deposits that encase coppice dunes and sand sheets underlain by apparently Holocene, distal alluvial fan deposits of fine sands and silts, would have presumably been conducive to the preservation of archaeological materials and the spatial associations among them. The underlying Pleistocene-age deposits represent high-energy deposits that would most likely not retain the original spatial associations among any archaeological materials found there and are of an age that largely predates the commonly acknowledged presence of humans in North America. Staff believes that construction monitoring through the pebble and cobble deposits would be largely unproductive.

Monitoring Protocol for Landform Hf2

The Hf2 monitoring protocol, as it relates to the construction of the transmission line infrastructure, would require that the applicant actively monitor all ground disturbance to the maximum depth of such disturbance across the southwestern portion of the landform. The upper approximately 4 meters of the Hf2 landform include relatively repetitive sequences of particularly low-energy sheetwash and flood deposits that reflect weather events that have taken place over thousands of years, up to the present day. The upper sequences are underlain by deposits that reflect a high-energy flood, subsequent lower-energy deposition of fine sediments, and then a prolonged period of drying that may represent the early Holocene climate of the region. The high sensitivity of the upper portion of the landform for buried archaeological deposits is now well-established and clearly warrants proactive monitoring to facilitate the recognition and mitigation of archaeological sites that may or may not relate to Archaeological Zone 1. The age and the potential archaeological sensitivity of the lower sedimentary deposits in the landform also warrant such monitoring. The ultimate results of the monitoring activity on the Hf2 landform would be taken into account during the preparation of the CRHR nomination for Archaeological Zone 1 to derive the formal boundary for the district across the project site.

Monitoring Protocol for Landform Hf3

The Hf3 monitoring protocol for the portion of the project area that includes the transmission line alignments would be that the applicant not monitor any ground disturbance on that landform. The surface and subsurface aspects of the landform represent moderate- to high-energy deposition of rocks and sediment by water flowing through ephemeral stream channels on and across the middle slopes of the Pine Tree Wash alluvial fan. The archaeological sensitivity of the constituent sedimentary deposits of the landform is, therefore, thought to be low. Staff believes that construction monitoring on the landform would be largely unproductive.

Monitoring Protocol for Landform Hf4

The Hf4 monitoring protocol, as it relates to the construction of the transmission line infrastructure, would require that the applicant actively monitor all ground disturbance to the maximum depth of such disturbance across the southwestern portion of the landform. The Hf4 landform is made up of a relatively complex sedimentary sequence. The upper approximately 2 meters of the deposits that compose the landform are predominantly gravels and sands that form a relatively recent alluvial fan where Pine Tree Wash cuts north across the scarp of the Cantil Valley fault and down onto the surfaces of the Hf2 and Hf3 landforms. Sedimentary deposits of the Hf4 landform overlay and interfinger with the deposits of the latter landforms. The portion of the Hf4 landform from approximately 2 meters below the present ground surface to a depth of approximately 4 meters is a sequence of sheetwash and minor flood deposits similar in character to the deposits that characterize the Hf2 landform. The origin of the deposits may be the distal reaches of streams other than Pine Tree Wash. The portion of the landform greater than 4 meters in depth is similar in character to the deposits of the Hf3 landform and evidence relatively high-energy sheetwash and stream channel deposition. The archaeological sensitivity of the Hf4 landform is thought to be moderate, primarily across its eastern and northern portions, despite the interpretation of the landform as being largely the product of moderate- to high-energy depositional regimes, because the Hf2 landform, a landform known to be highly sensitive for buried archaeological deposits, may be shallowly buried there. The ultimate results of the monitoring activity on the Hf4 landform would be taken into account during the preparation of the CRHR nomination for Archaeological Zone 1 to derive the formal boundary for the district across the project site.

Emergency Access Road

Construction related activities have the potential to cause significant impacts to archaeological resources along the route of the proposed emergency access road as follows:

- The construction of the 12-foot-wide emergency access road, the exact construction specifications for which are presently unknown, could potentially impact buried archaeological deposits that are presently unknown to the extent of the area and the depth of ground disturbance of the natural ground in the project area.

No significant direct construction impacts to historical resources along the route for the proposed emergency access road are presently confirmed (see “Summary of CRHR-Eligible Cultural Resources for the Beacon Solar Energy Project” subsection, above). The construction of the emergency access road, as proposed in the Project Design Refinements to the AFC, or as subsequently redesigned, may, however, lead to the whole or partial destruction of presently unknown buried archaeological deposits.

Discovery of Buried Archaeological Deposits

Staff proposes that the construction of the proposed emergency access road in the project area be monitored relative to the monitoring program protocol for unknown landforms to attenuate damage to any buried archaeological deposits that may be found during road construction. Given that the proposed emergency access road is east of the project site and outside of the study area for the geoarchaeology study (see

“Geoarchaeology Study” subsection, above), and, given the variation in the local geomorphology to the east of the project site and the absence of factual data on that variation, staff concludes that it would be necessary to monitor all ground disturbance along the proposed route of the emergency access road to the maximum depth of any such disturbance. The entire construction monitoring program is set out in **CUL-8** and prescribes the monitoring protocols for the portions of the project area where the landforms are unknown.

Monitoring Protocol for Unknown Landforms

The construction monitoring program for the route of the proposed emergency access road would require the applicant to implement the monitoring protocol for unknown landforms. The protocol is quite simply that the applicant would monitor all ground disturbance along the proposed alignment to the maximum depth of any such disturbance.

Identification and Assessment of Direct Impacts on Ethnographic Resources

No ethnographic resources, either previously recorded or newly disclosed in the communications with Native Americans conducted by the applicant for the proposed project, were identified in the vicinity of the project. The proposed project would, therefore, have no significant impact on ethnographic resources.

Identification and Assessment of Direct Impacts on Built-Environment Resources and Proposed Mitigation

No built-environment resources that qualify as historical resources for the purpose of CEQA analysis are now known or likely to be found in the project area of analysis. The proposed project would, therefore, have no significant impact on built-environment resources.

Indirect Impacts

Neither the applicant nor Energy Commission staff has identified any indirect impacts to any CRHR-eligible resources in the project area of analysis. Staff believes, therefore, that there are no indirect impacts for the proposed project.

Operation Impacts and Mitigation

During operation of the proposed BSEP project, if a leak should develop in the gas or water pipelines supplying the plant, repair of the buried utility could require the excavation of a large hole. Such repairs could impact previously unknown subsurface archaeological resources in areas unaffected by the original excavation. The measures proposed above and below to mitigate impacts to previously unknown archaeological resources found during the construction of the proposed project would also serve to mitigate impacts that occur due to repairs that are made during the operation of the plant on the extant facility.

Cumulative Impacts and Mitigation

A cumulative impact refers to a proposed project's incremental effects 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

effect 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 BSEP vicinity could occur if any other existing or proposed projects, in conjunction with the proposed BSEP, had or would have impacts on cultural resources that, considered together, would be significant. The previous ground disturbance from prior projects and the ground disturbance related to the future construction of the BSEP and other proposed projects in the vicinity could have a cumulatively considerable effect on subsurface archaeological deposits, both prehistoric and historic. The alteration of the setting which could be caused by the construction and operation of the proposed BSEP and other proposed projects in the vicinity could be cumulatively considerable, but may or may not be a significant impact to cultural resources.

In addition to the BSEP, the applicant has identified two other projects in the general area. The Los Angeles Department of Water and Power (LADWP) Barren Ridge-Castaic Transmission Project is a transmission line which would run south from the Barren Ridge Switching Station (located about 1.5 miles south of the project site and the point of interconnection for BSEP's Option 1 transmission line) to Los Angeles County. This LADWP project is in the early stages of the environmental review process, and no data on potential cultural resources impacts are yet available (BS2008a, p. 5.4-24).

Cultural resources consultants for the other known nearby project, the Pine Tree Wind Development project (located six miles west of the BSEP site) identified seven archaeological sites recommended as CRHR eligible and requiring impact mitigation in the form of data recovery (BS 2008a, p. 5.4-24). Thus this project's impacts would be mitigated, and it would not contribute to a cumulative impact to cultural resources. Staff is not aware of any other projects in the vicinity of the BSEP site.

Staff has proposed conditions of certification that would mitigate the BSEP's impacts to known CRHR-eligible cultural resources to below the level of significance. Staff has also proposed conditions of certification for the BSEP project providing for identification, evaluation, and avoidance or mitigation of impacts to previously unknown CRHR-eligible archaeological resources discovered during the construction of the project.

Proponents of any other future projects in the vicinity of the BSEP could mitigate impacts to as-yet-undiscovered subsurface archaeological sites to less-than-significant levels by requiring construction monitoring, evaluation of resources discovered during monitoring, and avoidance or data recovery for resources evaluated as CRHR-eligible. Impacts to human remains can be mitigated by following the protocols established by state law in Public Resources Code, section 5097.98. Since the impacts from the proposed BSEP would be mitigated to a less-than-significant level by the project's compliance with proposed Conditions of Certification **CUL-1** through **CUL-10**, and since similar protocols can be applied to other projects in the area, staff does not expect any incremental effects on cultural resources of the proposed BSEP to be cumulatively considerable when viewed in conjunction with other projects.

Construction Impacts and Mitigation for Treated Wastewater Pipeline Alternatives

The construction of either of the treated wastewater pipeline alternatives has the potential to cause significant impacts to archaeological resources along either route as follows:

- The construction of the Rosamond Community Service District alternative would entail the installation of a 12-inch-diameter transmission main in trenches, the exact location, width, and depth of which are presently unknown. The new approximately 38.7-mile pipeline would convey tertiary effluent from the Rosamond Community Service District wastewater treatment plant in the community of Rosamond to the project site. The excavation of the trenches for the alternative could potentially impact surficial and buried archaeological deposits that are presently unknown to the extent of the area and the depth of ground disturbance of the natural ground in the project area.
- The construction of the City of California City alternative would entail the installation of a 14-inch-diameter transmission main in trenches, the exact location, width, and depth of which are presently unknown. The new approximately 12.2-mile pipeline would convey tertiary effluent from the municipal wastewater treatment plant on Mendiburu Road to the project site. The excavation of the trenches for the alternative could potentially impact surficial and buried archaeological deposits that are presently unknown to the extent of the area and the depth of ground disturbance of the natural ground in the project area.

No significant direct construction impacts to historical resources along the initial 17.6-mile route from the project site for the Rosamond Community Service District alternative, or along the initial 9.4-mile route from the project site for the City of California City alternative, both initial routes being coincident with the former natural gas pipeline route, are presently confirmed (see “Summary of CRHR-Eligible Cultural Resources for the Beacon Solar Energy Project” subsection, above). Potential significant direct impacts to historical resources along the surface of the balance of the routes for both the Rosamond Community Service District and City of California City alternatives, approximately 21.1 and 2.8 miles respectively, are presently unknown due to the late addition of the specific alternatives to the project application. The construction of either alternative, as presently proposed or as subsequently redesigned, may also lead to the whole or partial destruction of presently unknown buried archaeological deposits along the full extent of each route.

Consideration of Surface Archaeological Deposits along Pipeline Route Alternatives

Staff proposes the implementation of **CUL-3** in the event that the applicant chooses or is compelled to construct either the Rosamond Community Service District or the City of California City treated wastewater pipeline alternative. The implementation of **CUL-3** would only apply to the portion of the selected alternative that had not already been subject to consideration as part of the original analysis of the former natural gas pipeline route.

Discovery of Buried Archaeological Deposits

Staff proposes that the construction of either the Rosamond Community Service District or the City of California City treated wastewater pipeline alternative be monitored, as appropriate, relative to the monitoring program protocols for landforms Hf1, Hf2, and Hf4, and for unknown landforms to attenuate damage to any buried archaeological deposits that may be found during pipeline construction. For the construction of the portion of either alternative that traverses the project site from the proposed switchyard and power block in the approximate center of the project site to the eastern project site boundary, the applicant would implement both active and passive components of the monitoring protocols for landforms Hf1, Hf2, and Hf4. The portion of the pipeline route, for either alternative, that is east of the project site is outside of the study area for the geoarchaeology study (see "Geoarchaeology Study" subsection, above) and, given the variation in the local geomorphology to the east and south of the project site and the absence of factual data on that variation, staff therefore concludes that it would be necessary to monitor all ground disturbance along the portion of alternative pipeline route that is outside of the project site to the maximum depth of any such disturbance. The entire construction monitoring program is set out in **CUL-8** and prescribes the monitoring protocols for the landforms on the project site and for portions of the project area where the landforms are unknown.

Monitoring Protocol for Landform Hf1

The pipeline route for either alternative appears to traverse only the extreme northeastern extent of landform Hf1 on the project site. For this portion of the subject route, staff proposes passive monitoring across the Hf1 landform through Archaeological Zone 1. The applicant would have completed the field portion of the data recovery investigation of the district prior to any ground disturbance in it. The completion of that fieldwork and of the balance of the mitigation program for the district would be understood to fully mitigate the ultimate impacts of the proposed project on it and to obviate the need to salvage archaeological deposits that are subsequently found in the district that are of site types already known for the district. Any buried archaeological deposits that are found during the course of ground disturbance in the district, that do not represent known site types for the district, would, however, be subject to the discovery protocol in **CUL-9**. Construction personnel would be given training, as part of the training program of **CUL-7**, that would facilitate the field recognition of archaeological site types that are and are not known for the district.

Monitoring Protocol for Landform Hf2

The pipeline route for either alternative appears to traverse the eastern portion of the Hf2 landform, entirely inside Archaeological Zone 1. Staff therefore proposes passive monitoring for the Hf2 landform in this area. The applicant would have completed the field portion of the data recovery investigation of the district prior to any ground disturbance in it. The completion of that fieldwork and of the balance of the mitigation program for the district would be understood to fully mitigate the ultimate impacts of the proposed project on it and to obviate the need to salvage archaeological deposits that are subsequently found in the district that are of site types already known for the district. Any buried archaeological deposits that are found during the course of ground disturbance in the district, that do not represent known site types for the district, would,

however, be subject to the discovery protocol in **CUL-9**. Construction personnel would be given training, as part of the training program of **CUL-7**, that would facilitate the field recognition of archaeological site types that are and are not known for the district.

Monitoring Protocol for Landform Hf4

The active component of the Hf4 monitoring protocol would require that the applicant monitor all ground disturbance to the maximum depth of such disturbance across the central and eastern portions of the landform. The Hf4 landform is made up of a relatively complex sedimentary sequence. The upper approximately 2 meters of the deposits that compose the landform are predominantly gravels and sands that form a relatively recent alluvial fan where Pine Tree Wash cuts north across the scarp of the Cantil Valley fault and down onto the surfaces of the Hf2 and Hf3 landforms. Sedimentary deposits of the Hf4 landform overlay and interfinger with the deposits of the latter landforms. The portion of the Hf4 landform from approximately 2 meters below the present ground surface to a depth of approximately 4 meters is a sequence of sheetwash and minor flood deposits similar in character to the deposits that characterize the Hf2 landform. The origin of the deposits may be the distal reaches of streams other than Pine Tree Wash. The portion of the landform greater than 4 meters in depth is similar in character to the deposits of the Hf3 landform and evidence relatively high-energy sheetwash and stream channel deposition. The archaeological sensitivity of the Hf4 landform is thought to be moderate, primarily across its eastern and northern portions, despite the interpretation of the landform as being largely the product of moderate- to high-energy depositional regimes, because the Hf2 landform, a landform known to be highly sensitive for buried archaeological deposits, may be shallowly buried there. The ultimate results of the monitoring activity on the Hf4 landform would be taken into account during the preparation of the CRHR nomination for Archaeological Zone 1 to derive the formal boundary for the district across the project site.

Staff proposes passive monitoring for the Hf4 landform in the area of Archaeological Zone 1 inside or to the northeast of the refined provisional district boundary. The applicant would have completed the field portion of the data recovery investigation of the district prior to any ground disturbance in it. The completion of that fieldwork and of the balance of the mitigation program for the district would be understood to fully mitigate the ultimate impacts of the proposed project on it and to obviate the need to salvage archaeological deposits that are subsequently found in the district that are of site types already known for the district. Any buried archaeological deposits that are found during the course of ground disturbance in the district, that do not represent known site types for the district, would, however, be subject to the discovery protocol in **CUL-9**. Construction personnel would be given training, as part of the training program of **CUL-7**, that would facilitate the field recognition of archaeological site types that are and are not known for the district.

Monitoring Protocol for Unknown Landforms

The construction monitoring program for the portion of the pipeline route for either alternative that is outside and to the east and south of the project site would require the applicant to implement the monitoring protocol for unknown landforms. The protocol is quite simply that the applicant would monitor all ground disturbance along the selected route to the maximum depth of any such disturbance.

COMPLIANCE WITH LORS

If the conditions of certification below are properly implemented, the proposed BSEP would result in a less-than-significant impact on known and newly found cultural resources. The project would therefore be in compliance with the applicable state laws, ordinances, regulations, and standards listed in Cultural Resources Table 1.

Kern County's General Plan has language promoting the general county-wide preservation of cultural resources, CEQA compliance for discretionary projects, and notification of Native Americans about discretionary projects of concern to them. Staff's proposed conditions of certification here will require specific actions not just to promote but to effect historic preservation and mitigate impacts to all cultural resources in order to ensure CEQA compliance. Consequently, if BSEP implements these conditions, its actions would be consistent with the cultural resources-related goals of Kern County.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Energy Commission staff has, as of the drafting of the present document, received one comment that explicitly relates to the analysis of cultural resources.

PUBLIC COMMENT

This comment is a submission by the California Unions for Reliable Energy (CURE), dated April 30, 2009:

"The PSA finds that the construction, operation, and maintenance of the BSEP will cause substantial adverse changes in the significance of historical resources. The PSA, however, improperly defers the development of plans to mitigate these impacts into the future, without specifying any performance measures.
For example, condition of certification CUL-3 requires the Project owner to submit a Cultural Resources Monitoring and Mitigation Plan ("CRMMP"), which identifies general and specific measures to minimize potential impacts to sensitive cultural resources. The CRMMP will be submitted 30 days prior to the start of ground disturbance.

As discussed above, the public, other agencies, the parties, and decision-makers must be able to determine whether cultural resources impacts will be minimized. Without preparation of a plan for public review, or the establishment of any performance standards, the PSA's proposed mitigation fails to comply with CEQA. Therefore, the CRMMP must be completed now, prior to Project approval, and be included in a revised PSA that is circulated for public review and comment" (ABJC 2009f:68 and 69).

STAFF RESPONSE

The PSA for the proposed project was drafted absent information that was critical to a more precise analysis of the potential impacts of the project and to the formulation of a substantive mitigation proposal. The information gaps in the PSA were made explicit throughout the document.

The FSA, drawing on the results of a geoarchaeology study of the project site (see "Geoarchaeology Study" subsection, above) and on further consultation among staff, the applicant, and the cultural resources consultant to the applicant, presents a complete and thorough analysis of every cultural resource in the project area of analysis and proposes a detailed management program that resolves every potential significant impact to the historical resources in that area. CURE and the public at large now have the opportunity to review and comment on the entire historical resources management program and the complete analysis that is the basis for that program. Staff encourages the submission of such comment and believes that the opportunity to do so satisfactorily addresses the above comment by CURE.

CONCLUSIONS AND RECOMMENDATIONS

This cultural resources analysis concludes that the BSEP project would have a significant direct impact on one historically significant prehistoric to early historic-period Native American archaeological district, referred to herein as "Archaeological Zone 1," and has the potential to have a further significant direct impact on an individual prehistoric archaeological site, referred to herein as "Site 17." The respective adoption and implementation of Conditions of Certification **CUL-6** and **CUL-5** would reduce the potential impacts of the proposed project on these resources to less than significant.

Staff further recommends that the Commission adopt the following additional cultural resources Conditions of Certification **CUL-1** through **CUL-4** and **CUL-7** through **CUL-10**. **CUL-1** and **CUL-2** are administrative conditions that set out who the people are who will implement the balance of the conditions, what the qualifications and roles of those people will be, and the information that the project owner will supply them to help them fulfill those roles. **CUL-3** is a regulatory process condition that articulates the manner in which the project owner and the Compliance Project Manager (CPM) would be able to alter the extent the of the project area to accommodate reconsiderations of the complete range of project components, or changes in project design. The balance of the conditions, **CUL-4** and **CUL-7** through **CUL-10**, along with **CUL-5** and **CUL-6**, above, are treatment conditions the purposes of which are to articulate each different part of the overarching program which would reduce the effects of the proposed project on historical resources to less than significant. The preparation and implementation of the different elements of the program, by the project owner, shall be the result of a number of protocols and consultations set out in the conditions of certification below. **CUL-4**, in particular, provides for the preparation and implementation of the Historical Resources Management Plan (HRMP), which would structure and govern the implementation of the broader treatment program. **CUL-5** and **CUL-6** deal, respectively, with the avoidance of and resolution of significant effects to known historical resources in the present project area. **CUL-7** concerns the training of project construction personnel to identify, avoid, and communicate with cultural resources personnel about known and new potential historical resources in the project area. **CUL-8** and **CUL-9** set out construction monitoring and cultural resources discovery protocols. And **CUL-10** provides for the preparation of a conclusory report to analyze, interpret, and document the ultimate results of the whole historical resources management program. When properly implemented and enforced, staff believes that Conditions of Certification **CUL-1** through **CUL-4** and **CUL-7** through **CUL-10** would reduce to less than significant any impacts to

previously unknown cultural resources encountered during construction or operation. Additionally, with the adoption and implementation of the entire complement of conditions, Conditions of Certification **CUL-1** through **CUL-10**, the BSEP project would be in conformity with all applicable LORS.

Staff would like to note that the time frames below for the verification events in the conditions have been devised in a manner that would require the project owner to complete complex tasks more quickly than would be typical in the cultural resources management industry, and would also require the CPM to complete the review of and comment on project owner submittals more expeditiously than usual. The time frames also reflect options for the project owner to begin construction in the vicinity of Archaeological Zone 1 and away from the Zone on different construction schedules. The time constraints built into the verification events and the options for parallel construction schedules are an attempt by staff to balance the presumed need of the project owner to begin construction as soon as possible and the regulatory responsibility of the Energy Commission to ensure the appropriate treatment of historical resources under CEQA.

PROPOSED CONDITIONS OF CERTIFICATION

CUL-1 *Cultural Resources Personnel.* Prior to the start of ground disturbance (includes “preconstruction site mobilization,” “construction ground disturbance,” and “construction grading, boring and trenching,” as defined in the General Conditions for this project) the project owner shall obtain the services of a Cultural Resources Specialist (CRS) and one or more alternate CRSs, if alternates are needed. The CRS shall manage all monitoring, mitigation, curation, and reporting activities required in accordance with the 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 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 ground disturbance shall occur prior to Compliance Project Manager (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 non-compliance on this or other projects.

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 Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 CFR Part 61). In addition, the CRS shall have the following qualifications:

1. The CRS's qualifications shall be appropriate to the needs of the project and shall include a background in anthropology, archaeology, history, architectural history, or a related field;

2. At least three years of archaeological or historical, as appropriate (per nature of predominant cultural resources on the project site), resource mitigation and field experience in California; and

3. 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:

1. a B.S. or B.A. degree in anthropology, archaeology, historical archaeology or a related field and one year experience monitoring in California; or

2. an A.S. or A.A. degree in anthropology, archaeology, historical archaeology or a related field, and four years experience monitoring in California; or

3. 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.

CULTURAL RESOURCES TECHNICAL SPECIALISTS

The resume(s) of any additional technical specialist(s), e.g., historical archaeologist, historian, architectural historian, and/or physical anthropologist, shall be submitted to the CPM for approval.

Verification

1. At least 112 days prior to the start of ground disturbance anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site, and at least 382 days prior to the start of ground disturbance anywhere in

Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the project owner shall submit the resume for the CRS, and alternate(s) if desired, 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 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 there is no alternate CRS in place to conduct the duties of the CRS, a previously approved monitor may serve in place of a CRS so that project-related ground disturbance may continue up to a maximum of 3 days without a CRS. If cultural resources are discovered then ground disturbance will remain halted until there is a CRS or alternate CRS to make a recommendation regarding significance.

3. At least 20 days prior to any construction-related ground disturbance, the CRS shall provide a letter naming anticipated CRMs for the project and stating 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 additional letters to the CPM identifying the CRMs and attesting to their qualifications. If additional CRMs are obtained during the project, the CRS shall provide additional letters to the CPM identifying the CRMs and attesting to the qualifications of the CRMs, at least 5 days prior to the CRMs beginning on-site duties.

5. At least 10 days prior to any technical specialists beginning tasks, the resume(s) of the specialists shall be provided to the CPM for review and approval.

6. At least 7 days prior to the start of the preparation of the Historical Resources Management Plan (HRMP) (**CUL-4**), the project owner shall confirm in writing to the CPM that the approved CRS will be available for and is prepared to implement the cultural resources conditions.

CUL-2 *Project Documentation for Cultural Resources Personnel.* Prior to the start of ground disturbance anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site, 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, and the Energy Commission's Final Staff Assessment (FSA) 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., 1:2000 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 anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site 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 submitted prior to the start of each construction phase. Written notification 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 97 days prior to the start of ground disturbance anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site, and at least 367 days prior to the start of ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the project owner shall provide the AFC, data responses, confidential cultural resources documents, all supplements, and the Energy Commission's Final Staff Assessment (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. Weekly, during ground disturbance, a current schedule of anticipated project activity shall be provided to the CRS and CPM by letter, e-mail, or fax.

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-3 *Alteration of Project Area*. Changes to the proposed project or to the character of its construction, operation, and maintenance that may become necessary subsequent to the approval of the project, were such approval to occur, may in turn require the re-consideration of the extent of the original project area. Where such changes indicate the need to alter the original project area to include additional lands that were not elements of analysis during the certification process, the effects of any proposed changes on historical resources that may be on such lands would need to be taken into account. Changes in the character of the construction, operation, and maintenance of the proposed project may include such actions as decisions to use non-commercial borrow sites or disposal sites.

Upon the recognition that proposed changes to the project would require the use of lands that were not a part of the original project area, the project owner shall ensure that the CRS surveys any such lands for cultural resources and record each newly found resource on DPR 523 forms. Exceptions would be made to this protocol in cases where cultural resources surveys no greater than five years in age are documented for the entirety of the subject lands and approved by the CPM. Where new cultural resources surveys are warranted, the project owner shall convey the results of such surveys, along with the CRS's recommendations for further action, to the CPM, who will determine whether further action is necessary. If the CPM determines that historical resources may be present and that any such resource may be subject to a substantial adverse change in its significance, the project owner shall ensure that the CRS provides the CPM with substantiated recommendations on whether each such resource is eligible for listing in the CRHR and recommendations for the resolution of any such significant effects. The CRS, the project owner, and the CPM shall then confer on said recommendations, and, upon the concurrence of the CPM with those recommendations, the project owner shall ensure that the CRS proceeds to implement them, and reports on the methods and the results of any such work in the final Cultural Resources Report (CRR) (**CUL-10**).

Verification

1. Upon the recognition that proposed changes to the project or to the character of the construction, operation, and maintenance of the project would require the use of lands that were not a part of the original project area, the project owner shall notify the CRS and CPM. The project owner shall then provide, for CPM review and approval, documentation of any cultural resources surveys five years or less in age that exist for the additional lands.

2. At least 105 days prior to the use of the new additional project area lands, in the absence of any such cultural resources surveys or when the extant cultural resources surveys do not cover the entirety of the lands to be added to the project area, the project owner shall ensure that the CRS surveys the additional lands for cultural resources, notifies the project owner and the CPM of the results of the new cultural resources survey, and recommends further action.

3. No more than 15 days subsequent to the receipt of the information in verification 2, CUL-3, above, the CPM shall determine whether historical resources may be present and whether any such resources may be subject to substantial adverse changes in significance.

4. At least 60 days prior to the use of the new additional project area lands, if the CPM determines that historical resources may be subject to substantial adverse changes in significance, the project owner shall ensure that the CRS provides the CPM with substantiated evaluations, based on archival and field research, on whether each such resource is eligible for listing in the CRHR and recommendations for the resolution of any potential significant effects.

5. For no longer than 15 days, the project owner, the CRS, and the CPM shall confer about the above evaluations and recommendations, and, upon the concurrence of the CPM with those evaluations and recommendations, the project owner shall ensure that the CRS proceeds to resolve any significant effects pursuant to the above recommendations prior to the use of the new additional project area lands.

6. The project owner shall ensure that the CRS reports on the methods and the results of all such work in the CRR (**CUL-10**).

CUL-4 *Historical Resources Management Plan*. The Historical Resources Management Plan (HRMP) shall govern the implementation of the overarching program to reduce the effects of the proposed project on historical resources to less than significant. The preparation and implementation of the different elements of the historical resources management program, by the project owner, shall be the result of a number of protocols and consultations set out in this condition of certification and others (**CUL-5** through **CUL-10**) below.

Prior to the start of any project-related ground disturbance (includes "preconstruction site mobilization," "construction ground disturbance," and "construction grading, boring and trenching," as defined in the General Conditions for this project), the project owner shall submit the HRMP, as prepared by or under the direction of the CRS, to the CPM for review and approval. The HRMP shall follow the content and organization of a similar document, the Cultural Resources Monitoring and Mitigation Plan, a draft model version of which will be provided by the CPM, as general guidance. The authors' name(s) shall appear on the title page of the HRMP. The HRMP shall also incorporate the final results of the January 2009 geoarchaeology study for the proposed project into the appropriate elements of the HRMP. Implementation of the HRMP shall be the responsibility of the CRS and the project owner. Copies of the HRMP 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 HRMP, unless such activities are specifically approved by the CPM.

The HRMP shall include, but not be limited to, the following elements:

Primacy of the Conditions of Certification

1. The statement in the introduction to the HRMP that "any discussion, summary, or paraphrasing of the Conditions of Certification in this HRMP 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 HRMP. The Cultural Resources Conditions of Certification from the Commission Decision are contained in Appendix A."

Implementation of the Historical Resources Management Program

2. Specification of the implementation sequence and the estimated time frames needed to accomplish all historical resources management program tasks prior to and during project-related ground disturbance, and during those analysis phases of the management program that may occur subsequent to project-related ground disturbance.

3. Identification of the person(s) expected to perform each of the historical resources management program tasks, their responsibilities, and the reporting relationships between project construction management and the treatment and monitoring teams.

4. A statement from the project owner that the CRS shall have, for the duration of project-related ground disturbance, access to equipment and supplies necessary for site mapping, photography, and recovery of any cultural resource materials that are found during such ground disturbance, where such materials cannot be treated prescriptively.

Historical Resources Management Program Research Design

5. A project area-specific research design that includes a discussion of archaeological research questions and testable hypotheses appropriate to the archaeological data sets known for the project area. The research design shall provide the broader context for and facilitate tiering down to the research design that the project owner shall prepare, pursuant to **CUL-6**, for Archaeological Zone 1. The project area research design shall clearly articulate why it is in the public interest to address the research questions that it poses. That research design shall also develop a discussion of artifact and ecofact collection, retention, and disposal policies as related to the research questions in the research design.

Documentation and Curation Standards

6. A statement that all found cultural resources over 50 years old shall be recorded on Department of Parks and Recreation (DPR) 523 Series forms, and mapped and photographed. In addition, all artifacts and ecofacts retained as a result of the archaeological investigations (survey,

testing, and 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.

7. A statement that the project owner shall pay all curation fees for artifacts and ecofacts 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.

8. A description of the contents, the format, and the review and approval process for the CRR (**CUL-10**), which shall be prepared according to ARMR guidelines (COHP 1990).

Native American Participation

9. A description of the roles which Native American observers or monitors shall play in the implementation of the HRMP, including the procedures that shall govern the selection of such observers and monitors, and the authority and responsibility of each role.

Treatment and Management of Historical Resources

10. A protocol that articulates, pursuant to **CUL-5**, the avoidance measures that the project owner shall implement to preserve archaeological site Site 17. **CUL-5** sets out the structure and the details of the avoidance measures.

11. A treatment plan for Archaeological Zone 1, pursuant to **CUL-6**, the purpose of which is to reduce the effects of the proposed project on the historical resource to less than significant through a program of data recovery, resource registration, and public outreach. The structure and the details of the program are set out in **CUL-6**.

Construction Monitoring and Discovery

12. A Worker Environmental Awareness Program (WEAP) to guide the orientation of every new worker in the project area to cultural resources statutes and regulations, to the effects of the proposed project on cultural resources, to the management program that has been negotiated to address those effects, to the role of the workers in the management program, to the types of cultural resources in the project area and how to recognize them, and to the protocols that workers are to follow upon the discovery of different types of cultural resources. The structure and the details of the WEAP program are set out in **CUL-7**.

13. A description of the structure, and the review and approval process for the Monitoring and Discovery Plan (**CUL-8** and **CUL-9**).

14. Prescriptive treatment plans, where appropriate, for cultural resources that represent marginal data sets (**CUL-9**).

Verification

1. Prior to the preparation of the HRMP, the project owner shall submit the final technical report for the January 2009 geoarchaeology study for the proposed project to the CPM for review and approval.

2. Upon approval of the CRS proposed by the project owner, the CPM shall provide to the project owner, as general guidance, an electronic copy of the draft model Cultural Resources Monitoring and Mitigation Plan for the use of the CRS.

3. At least 30 days prior to the start of ground disturbance anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site, and at least 270 days prior to the start of ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the project owner shall submit the HRMP to the CPM for review and approval.

4. At least 30 days prior to the start of ground disturbance anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site, and at least 270 days prior to the start of ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, a letter shall be provided to the CPM indicating that the project owner agrees to pay curation fees for any materials collected as a result of the archaeological investigations (survey, monitoring, testing, data recovery).

CUL-5 *Historical Resource Avoidance Measures, Site 17*. The project owner shall direct the CRS to actively implement a sequence of avoidance measures to ensure that there would be no physical damage to Site 17 as a result of the construction, operation, or maintenance of the project. Prior to the onset of any project-related ground disturbance in the southwestern portion of the project site, the CRS shall re-establish the known boundary of Site 17, add a 10-meter wide buffer around the periphery of that boundary, and flag the boundary around the site and the buffer in a conspicuous manner. The CRS, alternate CRS, or a CRM would subsequently enforce the avoidance of the flagged area during project construction.

The CRS would, subsequent to the construction of the project, permanently mark the boundary around Site 17 and the above buffer, and then set the bounded area aside as an environmentally sensitive area that would not be subject to disturbance during the life of the project. The character of the permanent marking shall be decided on the basis of consultation and consensus among the project owner, the CRS, and the CPM.

Verification

1. At least 30 days prior to the onset of project-related ground disturbance in the SE 1/4 of section 8, T. 31 S., R. 37 E., the CRS shall re-establish the known boundary

of Site 17, add a 10-meter wide buffer around the periphery of that boundary, and flag the boundary around the site and the buffer in a conspicuous manner.

2. The CRS, alternate CRS, or a CRM shall enforce the avoidance of the above flagged area for the duration of project-related ground disturbance.

3. No longer than 30 days subsequent to the conclusion of project-related ground disturbance in the SE 1/4 of section 8, T. 31 S., R. 37 E., the CRS shall permanently mark the boundary around Site 17 and the above buffer. The area so marked shall then be an environmentally sensitive area that shall not be subject to any disturbance during the life of the project. The CRS shall continue to enforce the avoidance of the originally flagged area until the area has been permanently marked.

4. The CRS shall ensure that the measures and verifications of this condition of certification are, pursuant to subpart 10, **CUL-4**, completely incorporated as a protocol in the HRMP.

CUL-6 *Archaeological Zone 1 Historical Resource Treatment Plan.* The project owner shall prepare and implement a treatment plan the purpose of which is to reduce the effects of the proposed project on Archaeological Zone 1 to less than significant. The treatment plan shall accomplish the reduction of effects through a program of data recovery, resource registration, and public outreach. Prior to the onset of any project-related ground disturbance within 30 meters of the provisional boundary for Archaeological Zone 1, the project owner shall prepare, secure the approval of the CPM for, and conclude the field investigation portions of the Archaeological Zone 1 Historical Resource Treatment Plan (HRTP). The HRTP shall, at a minimum, include and set out the details of each of the following elements:

1. *Research Design*. A research design specific to Archaeological Zone 1 that tiers off of the research design for the project area in the HRMP (Subpart 5, **CUL-4**) and that clearly articulates why it is in the public interest to address the research questions that it poses. The research design shall evidence consideration of archaeological themes that relate to the identity and the lifeways of Native American groups in the prehistoric and historic periods.

2. *Data Recovery Program.* Thorough descriptions of the overall goals of the data recovery program, how the data sets that are anticipated for Archaeological Zone 1 will contribute to our knowledge of the prehistoric and historic period Native American themes of the research design and answer particular research questions, of the purposes and the methods of the different field phases of the data recovery program, and of the purposes and methods of the material analyses that will also occur. The

descriptions of the field and laboratory efforts for the data recovery program shall include, at a minimum, and more thoroughly articulate the following phases:

a. *Inventory, Phase 1 (Geophysical Test).* The initial component of the data recovery program shall be a discontiguous 1-acre test of the efficacy of the use of magnetometry to derive a representative sample of the predominant type of archaeological deposits that are now thought to make up Archaeological Zone 1, fire features or hearths that occur both as feature clusters and as isolate features and that may or may not occur in association with fire-affected rock. The test shall include a small magnetometer survey through and in the near vicinity of (approximately 30 meters beyond) known archaeological sites in Archaeological Zone 1, and the subsequent ground truthing of a representative sample of the magnetic anomalies found in the survey areas for the test. The ground truthing sample shall, at a minimum, be the lesser of 25 percent of the anomalies or 12 individual anomalies. The excavation of the anomalies may, at the discretion of the CRS, be by hand or mechanical means. The CRS shall ensure that the field notes and the forms for the survey areas and for the ground truthing are sufficient to completely document the geophysical test.

b. *Inventory, Phase 2a (Geophysical Survey)*. If the CRS and CPM agree, after consultation, that the geophysical test demonstrates that the use of magnetometry appears to be reasonably reliable, the project owner shall ensure that the CRS proceeds to a broader magnetometry sample survey of Archaeological Zone 1 and of the area 30 meters to the southwest of the provisional district boundary (Cultural Resources Figure 2). The CRS and CPM shall first derive and agree upon, in consultation with one another, the precise location of the provisional district boundary on the surface of the project site. The project owner shall then ensure that the CRS develops a single stratified random sample for Archaeological Zone 1 and the adjacent area 30 meters to the southwest of the provisional district boundary that would result in a magnetometry survey of a minimum of 10 percent of that total area. The CRS and the CPM shall, in consultation, derive and agree upon criteria that shall form the basis for the stratification of the survey sample. The criteria shall reflect the spatial variability in the physical and material character and in the chronology of Archaeological Zone 1, as such variability is presently known from the field investigations in the project area. The results of the broader magnetometry survey would also be subject to the ground truthing of a representative sample of the magnetic anomalies found in the survey areas to more precisely establish the range of error of the survey results. The ground truthing sample shall, at a minimum, be the lesser of 10 percent of the anomalies or 48 individual anomalies. The excavation of the anomalies may, at the discretion of the CRS, be by hand or mechanical means. The project owner shall ensure that the CRS's field notes and the

forms for the survey areas and for the ground truthing are sufficient to completely document the geophysical survey to the satisfaction of the CPM.

c. *Inventory, Phase 2b (Mechanical Subsurface Survey)*. Should the results of the initial geophysical test demonstrate that the use of magnetometry is not reasonably well able to locate the types of archaeological deposits that make up Archaeological Zone 1, the applicant would conduct a broader subsurface sample survey of the Zone using construction equipment such as a road grader or a backhoe rather than proceeding with the broader geophysical survey. This mechanical subsurface survey would employ transects, the proposed width and length of which the CPM would approve, and would involve the excavation of the transects in thin (no thicker than approximately 5 centimeters) layers to carefully expose and facilitate the accurate preliminary documentation of target archaeological deposits. The project owner shall ensure that the CRS, with CPM concurrence, derives criteria to form the basis for the stratification of the survey sample and develops a single stratified random sample for the Zone and the adjacent area to the southwest that would result in the mechanical subsurface survey of a minimum of 2.5 percent of that total area. The criteria shall reflect the spatial variability in the physical and material character and in the chronology of Archaeological Zone 1, as such variability is presently known from the field investigations in the project area. The project owner shall submit, for CPM review and approval, the CRS's methodology for the mechanical subsurface survey. The methodology would prescribe how archaeological deposits found during the survey would be preserved intact until the conclusion of the survey so that the CRS could structure a representative data recovery sample of the found deposits. The methodology would also take into account how the CRS would recover a sample of the buried land surfaces that may surround individual hearths or groups of hearths and document the material culture assemblages that may be found on such surfaces when the act of the mechanical exposure of the hearths may often truncate the surface from which they were constructed and used. The project owner shall ensure that the CRS's field notes and the forms for the survey areas are sufficient to completely document the mechanical subsurface survey to the satisfaction of the CPM.

d. *Inventory, Phase 3 (Refinement of Provisional District Boundary)*. The project owner shall ensure that the CRS, on the basis of the results of either phase 2a or phase 2b of the data recovery program, drafts a refined provisional boundary for Archaeological Zone 1 that shall become an integral part of the implementation of, among other conditions of certification, **CUL-8 and** subparts 2e and 2f of this condition, **CUL-6**.

e. *Data Recovery, Phase 1 (Hearth Excavations)*. One component of the actual data recovery phase of the data recovery program would be to excavate small (approximately 1–3 meters square) exposures to uncover and document a sample of the individual hearths that are one constituent of the Zone. The purpose of this documentation would be to gather data to describe the physical variability of the features, to identify and inventory the artifacts and ecofacts that are found in them, and to interpret the methods of construction and the potential uses of the features. The excavation of the hearths shall proceed by hand to, where feasible, remove the archaeological deposits in anthropogenic layers. Where appropriate, the project owner shall ensure that the CRS retain samples of each layer sufficient to submit for radiocarbon assays, and macrobotanical, palynological, geochemical, or other analyses. The balance of each layer shall be screened through hardware cloth of no greater than 1/8-inch mesh. The project owner shall ensure that the CRS excavates a minimum of 12 such small exposures. In consultation, the CRS and the CPM shall develop and agree upon a sample of the hearths found as a result of the entire cumulative effort to inventory the archaeological deposits of Archaeological Zone 1 to subject to data recovery excavation. The sample shall reflect the apparent physical, material, and chronological variability of the found features. The project owner shall ensure that the CRS's field notes and the forms for the excavation of the hearths are sufficient to acquire the thorough complement of data necessary to the description of each feature, and the interpretation of the construction and use of each feature to the satisfaction of the CPM.

f. *Data Recovery, Phase 2 (Excavation of Former Land Surfaces)*. The other component of the actual data recovery phase of the data recovery program would be to excavate larger (5 meters square) block exposures to attempt to uncover a sample of the buried land surfaces that may surround individual hearths or groups of them, and to document the material culture assemblages that may be found on such surfaces. The excavation of the surfaces shall proceed by hand to, where feasible, remove the archaeological deposits in anthropogenic layers. Where appropriate, the project owner shall ensure that the CRS retain samples of each layer sufficient to submit for radiocarbon assays, and macrobotanical, palynological, geochemical, or other analyses. The balance of each layer shall be screened through hardware cloth of no greater than 1/8-inch mesh. The CRS shall try to excavate each block exposure as a single excavation unit rather than as 25 separate one meter square excavation units. The project owner shall ensure that the CRS excavate a minimum of 4 block exposures or excavation blocks, where intact buried land surfaces are found in each excavation block. The CRS shall excavate a maximum of 8 block exposures, where intact buried land surfaces are not found in at least four of the blocks excavated. In consultation, the CRS and the CPM shall develop and agree upon a sample of the buried surfaces that would be subject to excavation. The sample shall reflect the apparent

physical, material, and chronological variability of the hearth features around which the buried surfaces may be found. The project owner shall ensure that the CRS's field notes and the forms for the excavation of the surfaces are sufficient to acquire the thorough complement of data necessary to the description of the distributions of artifacts and ecofacts across each surface, and the interpretation of the use of each surface, to the satisfaction of the CPM.

g. *Material Analyses*. The project owner shall ensure that the HRTP articulates the anticipated scope of the analyses of the cumulative artifact and ecofact collections that have been and will be the result of the investigations of Archaeological Zone 1, articulates the analytic methods to be used, and articulates how the data sets that such analyses will produce are relevant to the themes and questions in the research design for the Zone.

h. *Report Preparation*. The project owner shall ensure that the HRTP states that a conclusory report is one of the requirements of the data recovery program, and also articulates the outline of, and the production schedule and approval process for the subject report.

3. *California Register of Historical Resources Registration*. The project owner shall prepare a California Register of Historical Resources nomination for Archaeological Zone 1 and submit the nomination to the State Historic Resources Commission for formal consideration. The project owner shall ensure that the CRS, as a part of the registration effort, derives a permanent district name for the Zone to replace the temporary designation of "Archaeological Zone 1." The CRS shall also ensure that the nomination reflects a final formal boundary for the district, a boundary that the CRS shall derive on the basis of the results of the data recovery program and present in the conclusory report for that program.

4. *Outreach Initiatives*

a. *Professional Outreach*. The project owner shall prepare a research paper and present it at a professional conference, or prepare and publish a peer-reviewed journal article to inform the professional archaeological community about Archaeological Zone 1 and to interpret its implications for our understanding of the prehistory and early history of Native American life in the region.

b. *Public Outreach*. The project owner shall prepare and present materials that interpret Archaeological Zone 1 for the public. Potential public interpretation efforts may include the preparation of an instructional module for use in local school districts, or the preparation of a display for existing public interpretation venues such as Red Rock Canyon State Park.

Verification

1. At least 210 days prior to the onset of project-related ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the project owner shall ensure that the CRS completes the geophysical test referred to in subpart 2a, **CUL-6,** above, and as set out in the HRTP component of the HRMP (**CUL-4**), and submit, for the review and approval of the CPM, a formal assessment of the reliability of the use of magnetometry to locate buried hearths in the Zone. If the geophysical test demonstrates that the use of magnetometry appears to be reasonably reliable in this regard, then the project owner shall also submit, for the review and approval of the CPM, the precise geographic coordinates of the provisional boundary of Archaeological Zone 1 and a stratified random sample for a broader magnetometry survey of 10 percent of Archaeological Zone 1 and of the area 30 meters to the southwest of the provisional district boundary. If the geophysical test demonstrates that the use of magnetometry does not appear to be reasonably reliable, then the project owner shall submit, for the review and approval of the CPM, a stratified random sample for a mechanical subsurface survey of 2.5 percent of Archaeological Zone 1 and of the area 30 meters to the southwest of the provisional district boundary.

2. At least 105 days prior to the onset of project-related ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the project owner shall ensure that the CRS completes the formal inventory of that area under, as appropriate, subparts 2b or 2c, **CUL-6** and submits, for the review and approval of the CPM, a preliminary report, prepared by or under the direction of the CRS, of the results of the formal inventory, the precise geographic coordinates of the refined provisional district boundary (subpart 2d, **CUL-6**), and separate samples for the data recovery excavation of a finite number of the hearths found in Archaeological Zone 1 (subpart 2e, **CUL-6**) and of a finite number of block exposures to reveal intact buried land surfaces there (subpart 2f, **CUL-6**). The project owner shall ensure that the preliminary report is a concise document that provides descriptions of the schedule and methods of the inventory field effort, a preliminary tally of the numbers and, where feasible, the types of archaeological deposits that were found, a discussion of the potential range of error in that tally, and a map of the locations of the found archaeological deposits that has topographic contours and the project site landform designations as overlays. The results of the formal inventory, as set out in the preliminary report, shall be the basis for the refinement of the provisional district boundary. The project owner shall ensure that the CRS then derives the samples for the hearths and the buried land surface block exposures relative to the refined provisional district boundary.

3. At least 30 days prior to the onset of project-related ground disturbance anywhere to the northeast of the refined provisional boundary for Archaeological Zone 1, subsequent to the CPM's approval of said boundary, the project owner shall ensure that the CRS completes the data recovery phases of the data recovery program (subparts 2e and 2f, **CUL-6**) and submits, for the review and approval of the CPM, a preliminary report of the results of those phases. The preliminary report shall be a concise document that provides descriptions of the schedule and methods of the data recovery effort, technical descriptions of excavated archaeological features and

buried land surfaces that, while draft in format, present the highest resolution of technical data that can be derived from the data recovery field notes, plan and, as appropriate, profile drawings and photographs of excavated archaeological features and buried land surfaces, and technical descriptions and appropriate graphics of the stratigraphic contexts of excavated archaeological features and buried land surfaces. No project-related ground disturbance shall occur to the northeast of the refined provisional boundary for Archaeological Zone 1 prior to the project owner's receipt, in writing, of the CPM's approval of the preliminary data recovery report.

4. No longer than 180 days subsequent to the CPM's approval of the preliminary data recovery report, the project owner shall ensure that the CRS completes the requisite material analyses for, prepare, and submits, for the approval of the CPM, the conclusory report for the data recovery program (subpart 2h, **CUL-6**).

5. No longer than 240 days subsequent to the CPM's approval of the preliminary data recovery report, the project owner shall ensure that the CRS completes the preparation of the California Register of Historical Resources nomination for Archaeological Zone 1 and submits the nomination to the State Historic Resources Commission for formal consideration (subpart 3, **CUL-6**). The nomination shall reflect the formal district boundary that shall be one result of the implementation of the data recovery program, as presented in the conclusory report for that program.

6. No longer than 240 days subsequent to the CPM's approval of the preliminary data recovery report, the project owner shall ensure that the CRS completes requirements of subpart 4a, **CUL-6** and provides the CPM with three copies of the final product of that effort, and prepares, and submits for the approval of the CPM, a product that fulfills the requirements of subpart 4b, **CUL-6**. Upon the CPM's approval of the latter product, the project owner shall ensure, as appropriate, the product's installation, implementation, or display.

CUL-7 *Worker Environmental Awareness Program (WEAP)*. Prior to and for the duration of project-related 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, laydown area, and along the linear facilities routes. The 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. 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, such as landscaping, resumes. The training shall include:

1. A discussion of applicable cultural resources statutes, regulations, and related enforcement provisions;

2. A summary of the effects of the proposed project on cultural resources;

3. A summary of the historical resources management program that has been negotiated to address the effects of the proposed project on cultural resources;

4. A discussion of the role of the workers in the historical resources management program;

5. Samples or visuals of artifacts that might be found in the project area;

6. A discussion of what such artifacts may look like when partially buried, or wholly buried and then freshly exposed;

7. A discussion of what prehistoric and historical archaeological deposits look like at the surface and when exposed during construction, the range of variation in the appearance of such deposits across the project area, and, more especially, the known range of variation in the archaeological deposits of Archaeological Zone 1;

8. Instruction that the CRS, alternate CRS, and CRMs have the authority to halt project-related 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;

9. Instruction that employees are to halt work on their own in the vicinity of a potential cultural resources discovery, particularly in Archaeological Zone 1 for prehistoric archaeological deposits that are inconsistent with the known range of variation in the archaeological deposits there, 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;

10. An informational brochure that identifies the reporting procedures for Archaeological Zone 1 and non-Archaeological Zone 1 areas in the event of a discovery;

11. An acknowledgement form signed by each worker indicating that they have received the training; and

12. 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 start of ground disturbance anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site, and at least 270 days prior to the start of ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the CRS shall provide, as a stand-alone document or as an element of the HRMP, the training program draft text and graphics and the informational brochure to the CPM for review and approval.

2. At least 30 days prior to the start of ground disturbance anywhere on the project site, the CPM will provide to the project owner a WEAP Training Acknowledgement form for each WEAP-trained worker to sign.

3. Monthly, until all project-related ground disturbance is complete, the project owner shall provide in the Monthly Compliance Report (MCR) the WEAP Training Acknowledgement forms of workers at the project site and on the linear facilities who have completed the training in the prior month and a running total of all persons who have completed training to date.

CUL-8 *Construction Monitoring Program*. The Monitoring and Discovery Plan (subpart 13, **CUL-4**) shall include separate protocols for construction monitoring, and for the discovery and treatment of new cultural resources that are found or when unanticipated effects to known cultural resources become evident during project-related ground disturbance. The construction monitoring protocol shall specify the different procedures below that the project owner shall follow during project-related ground disturbance in different parts of the project area and on different landforms in the project area, where the lateral extent and the character of project area landforms are known. As the source of the water that would be necessary to operate the proposed project remains an active focus of discussion, staff includes specifications here for the monitoring procedures that the project owner would need to follow in the event that the project owner ultimately chooses to construct either the Rosamond Community Service District or the City of California City treated wastewater pipeline alternative. Other alterations of the project area under **CUL-3** shall require the project owner to append the Monitoring and Discovery Plan to include monitoring procedures for the actions that would occur in any lands added to the original project area. The appended procedures shall be consistent with the landform-specific monitoring protocols below.

The project owner shall ensure that the CRS, alternate CRS, or CRMs actively monitor, full time, all project-related ground disturbance in the project area, in accordance with the landform-specific protocols below, to ensure that there are no impacts to undiscovered resources and to ensure that known resources are not impacted in an unanticipated manner. Additionally, the project owner shall ensure that construction personnel, trained to recognize what archaeological site types are and are not known for Archaeological Zone 1, passively monitor project-related ground disturbance in the project area, also in accordance with the landform-specific protocols below.

Landform-specific Monitoring Protocols. The construction monitoring protocols specific to the different landform contexts in the project area variously have active and passive components. The active components relate to the construction monitoring protocols that are required for landform contexts that are outside of Archaeological Zone 1, and the passive components relate to the protocols for such contexts that are in Archaeological Zone 1. The efficacy of the whole series of construction monitoring protocols below depends on the project owner, prior to the

initiation of project-related ground disturbance, physically staking out the boundary of each landform and the refined provisional district boundary for Archaeological Zone 1, and ensuring that the primary author of the January 2009 geoarchaeology study for the proposed project conduct field orientations for the CRS, the alternate CRS, and each CRM so that they are able to recognize the project area landforms and key subsurface sedimentary features such as paleosols and sedimentary contacts. The boundary lines on the surface of the project site are the referents that direct the differential implementation of the active and passive components of the protocols, and the subsurface paleosols and sedimentary contacts are the referents that vertically bound the requisite construction monitoring areas.

Monitoring Protocol for Landform Hf1

Active component. The active component of the monitoring protocol for the Hf1 landform requires the project owner to have the CRS, alternate CRS, or CRMs actively monitor all project-related ground disturbance down to the upper boundary of the paleosol that is buried in the landform. That boundary, which is the upper boundary of a preserved A horizon, is approximately 2 meters below the present surface of the landform.

Passive component. The owner shall have construction personnel on the project passively monitor for and halt construction upon the discovery of buried archaeological deposits in the portion of Archaeological Zone 1 on the Hf1 landform that appear to represent archaeological site types not previously known for the Zone. Any such discovery shall be subject to the discovery protocol of **CUL-9**. Construction personnel shall be given training, as part of the training program of **CUL-7**, which would facilitate the field recognition of archaeological site types that are and are not known for the district.

Applicability

Project Site. Active monitoring to the southwest of the refined provisional district boundary, and passive monitoring to the northeast of the refined provisional district boundary.

Transmission Line Infrastructure. Not applicable.

Emergency Access Road. Not applicable.

Rosamond Community Service District or City of California City Treated Wastewater Pipeline Alternatives. Passive monitoring to the northeast of the refined provisional district boundary.

Monitoring Protocol for Landform Hf1d

Active component. The active component of the monitoring protocol for the Hf1d landform requires the project owner to have the CRS, alternate CRS, or CRMs actively monitor all project-related ground disturbance down approximately 2 meters from the present surface of the landform to the upper

contact of what are presently thought to be Pleistocene-age deposits of pebbles and cobbles.

Passive component. No passive monitoring on the Hf1d landform.

Applicability

Project Site. Active monitoring across the whole extent of the landform on the project site.

Transmission Line Infrastructure. Active monitoring across the whole extent of the landform in the portion of the project area that encompasses the construction area for the transmission line infrastructure. To implement the protocol for the Hf1d landform in the construction area for the transmission line infrastructure, the project owner shall project out the boundary between the Hf1d and Hf3 landforms, which appears to be coincident with the Cantil Valley fault, to the southwest of the project site, and implement the protocol for the Hf1d landform to the southeast of that projected boundary.

Emergency Access Road. Not applicable.

Rosamond Community Service District or City of California City Treated Wastewater Pipeline Alternatives. Not applicable.

Monitoring Protocol for Landform Hf2

Active component. The active component of the monitoring protocol for the Hf2 landform requires the project owner to have the CRS, alternate CRS, or CRMs actively monitor all project-related ground disturbance to the maximum depth of such disturbance.

Passive component. The project owner shall have construction personnel on the project passively monitor for and halt construction upon the discovery of buried archaeological deposits in the portion of Archaeological Zone 1 on the Hf2 landform that appear to represent archaeological site types not previously known for the Zone. Any such discovery shall be subject to the discovery protocol of **CUL-9**. Construction personnel shall be given training, as part of the training program of **CUL-7**, which would facilitate the field recognition of archaeological site types that are and are not known for the district.

Applicability

Project Site. Active monitoring to the southwest of the refined provisional district boundary, and passive monitoring to the northeast of the refined provisional district boundary.

Transmission Line Infrastructure. Not applicable.

Emergency Access Road. Not applicable.

Rosamond Community Service District or City of California City Treated Wastewater Pipeline Alternatives. Passive monitoring to the northeast of the refined provisional district boundary.

Monitoring Protocol for Landform Hf3

Active component. No active monitoring on the Hf3 landform.

Passive component. No passive monitoring on the Hf3 landform.

Applicability

Project Site. Not applicable.

Transmission Line Infrastructure. Not applicable.

Emergency Access Road. Not applicable.

Rosamond Community Service District or City of California City Treated Wastewater Pipeline Alternatives. Not applicable.

Monitoring Protocol for Landform Hf4

Active component. The active component of the monitoring protocol for the Hf4 landform requires the project owner to have the CRS, alternate CRS, or CRMs actively monitor all project-related ground disturbance to the maximum depth of such disturbance.

Passive component. The owner shall have construction personnel on the project passively monitor for and halt construction upon the discovery of buried archaeological deposits in the portion of Archaeological Zone 1 on the Hf4 landform that appear to represent archaeological site types not previously known for the Zone. Any such discovery shall be subject to the discovery protocol of **CUL-9**. Construction personnel shall be given training, as part of the training program of **CUL-7**, which would facilitate the field recognition of archaeological site types that are and are not known for the district.

Applicability

Project Site. Active monitoring to the southwest of the refined provisional district boundary, and passive monitoring to the northeast of the refined provisional district boundary.

Transmission Line Infrastructure. Not applicable.

Emergency Access Road. Not applicable.

Rosamond Community Service District or City of California City Treated Wastewater Pipeline Alternatives. Active monitoring to the southwest of the refined provisional district boundary, and passive monitoring to the northeast of the refined provisional district boundary.

Monitoring Protocol for Unknown Landforms

Active component. The active component of the monitoring protocol for unknown landforms requires the project owner to have the CRS, alternate CRS, or CRMs actively monitor all project-related ground disturbance to the maximum depth of any such disturbance.

Passive component. No passive monitoring on unknown landforms.

Applicability

Project Site. Not applicable.

Transmission Line Infrastructure. Not applicable.

Emergency Access Road. Active monitoring for the whole length of the proposed emergency access road, which is outside and projects east of the project site to Neuralia Road.

Rosamond Community Service District or City of California City Treated Wastewater Pipeline Alternatives. Active monitoring for the whole length of either pipeline route alternative, both of which are outside and to the east and south of the project site.

Full-time archaeological monitoring for this project shall be the archaeological monitoring of all project-related ground disturbance in the project area, in accordance with the Landform-specific Monitoring Protocols, above. 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 further than fifty feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.

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 research design in the HRMP shall govern the collection, treatment, retention/disposal, and curation of any archaeological materials encountered.

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.

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 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 anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological

Zone 1 or on the portions of the project area beyond the project site, and at least 270 days prior to the start of ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the project owner shall submit the Monitoring and Discovery Plan to the CPM for review and approval.

2. At least 30 days prior to the start of project-related 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 HRMP.

4. At least 30 days prior to the start of project-related ground disturbance, the project owner shall physically stake out, every 200 feet along the surface of the ground and in a conspicuous manner, either the provisional boundary of Archaeological Zone 1, or, if it has been given the approval of the CPM, the refined provisional district boundary for the Zone, and the known boundary of each landform on the project site as each such boundary is reported in the February 6, 2009 preliminary field report for the geoarchaeology study (Young 2009b). The project owner shall engage the author of that preliminary report to assist in the location of each landform boundary on the ground.

5. At least 30 days prior to the start of project-related ground disturbance, the project owner shall engage the author of the February 6, 2009 preliminary field report for the geoarchaeology study (Young 2009b) to conduct field orientations for the CRS, the alternate CRS, and each CRM so that they are each able to recognize the project area landforms and key subsurface sedimentary features in the landform-specific monitoring protocols such as paleosols and sedimentary contacts. The replacement of the CRS, the alternate CRS, or CRMs shall necessitate new field orientations to train new personnel.

6. At least 30 days prior to the start of project-related ground disturbance in any portion of the project area added under **CUL-3**, the project owner shall submit a numbered appendix to the Monitoring and Discovery Plan to the CPM for review and approval. Each such appendix shall include monitoring procedures for the actions that would occur in lands added to the original project area. The appended procedures shall be consistent with the landform-specific monitoring protocols of **CUL-8**.

7. 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 email, or in some other form acceptable to the CPM.

8. 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.

9. At least 24 hours prior to implementing a proposed change in monitoring level, documentation justifying the change shall be submitted to the CPM for review and approval.

10. 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.

11. 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-9 *Discovery and Discovery Treatment Protocols*. The Monitoring and Discovery Plan (subpart 13, **CUL-4**) shall include separate protocols for construction monitoring, and for the discovery and treatment of new cultural resources that are found outside of the refined provisional boundary for Archaeological Zone 1, when archaeological site types not previously known for the Zone are found inside said boundary, or when unanticipated effects to known cultural resources become evident during project-related ground disturbance. The Discovery Protocol shall specify the procedures that the project owner shall follow upon the discovery of a new resource outside of Archaeological Zone 1, of a new archaeological site type in Archaeological Zone 1, or upon the recognition of an unanticipated effect. The project owner shall, in any such instance, grant authority to halt project-related ground disturbance to the CRS, alternate CRS, and the CRMs. Redirection of ground disturbance shall be accomplished under the direction of the construction supervisor in consultation with the CRS.

In the event that cultural resources that may be over 50 years of age are found, or, if younger, determined exceptionally significant by the CPM, or archaeological site types not previously known for Archaeological Zone 1 are found in it, or impacts to such resources 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. Monitoring and daily reporting as provided in **CUL-8** shall continue during all ground-disturbing activities elsewhere on the project site. 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 mitigation of 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 expressed a desire to be notified in the event of such a discovery.

3. The CRS has completed field notes, measurements, and photography for a DPR 523A "Primary Record" form. Unless the find can be treated prescriptively, as specified in the HRMP, the "Description" entry of the DPR 523A "Primary Record" 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.

The discovery and discovery treatment protocols in the Monitoring and Discovery Plan shall specify that the preferred treatment strategy for any buried archaeological deposits found during the course of the construction, operation, and maintenance of the proposed project is avoidance. A mitigation plan shall be prepared for any CRHR-eligible (as determined by the CPM) resource, impacts to which cannot be avoided, except for archaeological site types in Archaeological Zone 1 that are already known to be characteristic of that district.

Prescriptive treatment plans may be included, where appropriate, in the HRMP for cultural resources that represent marginal data sets.

Verification

1. At least 30 days prior to the start of ground disturbance anywhere on the project site 30 meters or greater to the southwest of the provisional boundary of Archaeological Zone 1 or on the portions of the project area beyond the project site, and at least 270 days prior to the start of ground disturbance anywhere in Archaeological Zone 1 or 30 meters or less to the southwest of the provisional boundary for the Zone, the project owner shall submit the Monitoring and Discovery Plan to the CPM for review and approval.

2. 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 project-related 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.

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.

4. Unless the discovery can be treated prescriptively, as specified in the HRMP, completed DPR 523 Series 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.

CUL-10 *Cultural Resources Report (CRR)*. The project owner shall submit the final 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 (COHP 1990). The final CRR shall report on all field activities including dates, times and locations, findings, samplings, and analyses. All survey reports, DPR 523 Series 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 project-related 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 on the same day as the suspension/extension request. 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 90 days after completion of all project-related 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.

2. Within 90 days after completion of all project-related ground disturbance (including landscaping), if cultural materials requiring curation were 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 cultural materials, if any, from this project. Any agreements concerning curation will be retained and available for audit for the life of the project.

3. Within 10 days after CPM approval, 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.

4. 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.

CULTURAL RESOURCES GLOSSARY

IVANPAH SOLAR ENERGYGENERATING SYSTEM

AFC	Application for Certification
Archaeological Zone 1	the temporary designation for a proposed prehistoric to early historic-period Native American archaeological district the southern portion of which extends across the eastern and northern portions of the project site
ARMR	Archaeological Resource Management Report
BSEP	Beacon Solar Energy Project
CCS	cryptocrystalline silicate (Cryptocrystalline silicates are rocks such as flint, chert, chalcedony, or jasper that contain a high percentage of silica (SiO^2), the primary compound that composes quartz.)
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System
Conditions	Conditions of Certification
CPM	Compliance Project Manager
CRHR	California Register of Historical Resources
CRM	Cultural Resources Monitor
CRR	Cultural Resource Report
CRS	Cultural Resources Specialist
DPR 523	Department of Parks and Recreation cultural resources inventory form
FAR	fire-affected rock
FSA	Final Staff Assessment
HRMP	Historical Resources Management Plan
LORS	laws, ordinances, regulations, and standards
MCR	Monthly Compliance Report

MLD	Most Likely Descendent
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
OHP	California Office of Historic Preservation
Project area	the project site, the rights-of-way of all linear and other ancillary power facility features, construction laydown areas, and non-commercial borrow sites
Project area of analysis	the project area and all further areas in which the proposed project has the potential to directly or indirectly affect cultural resources
Project site	the principal 2,012-acre proposed plant site parcel or main plant site of which the power block area and the solar thermal field would occupy approximately 1,240 acres and the rest of the support facilities would occupy the remaining approximately 770 acres
PSA	Preliminary Staff Assessment
SHPO	State Historic Preservation Officer
Staff	Energy Commission cultural resources technical staff
WEAP	Worker Environmental Awareness Program

REFERENCES

The *tn: 00000* in a reference below indicates the transaction number under which the item is catalogued in the Energy Commission's Docket Unit. The transaction number allows for quicker location and retrieval of individual items docketed for a case or used for ease of reference and retrieval of exhibits cited in briefs and used at Evidentiary Hearings.

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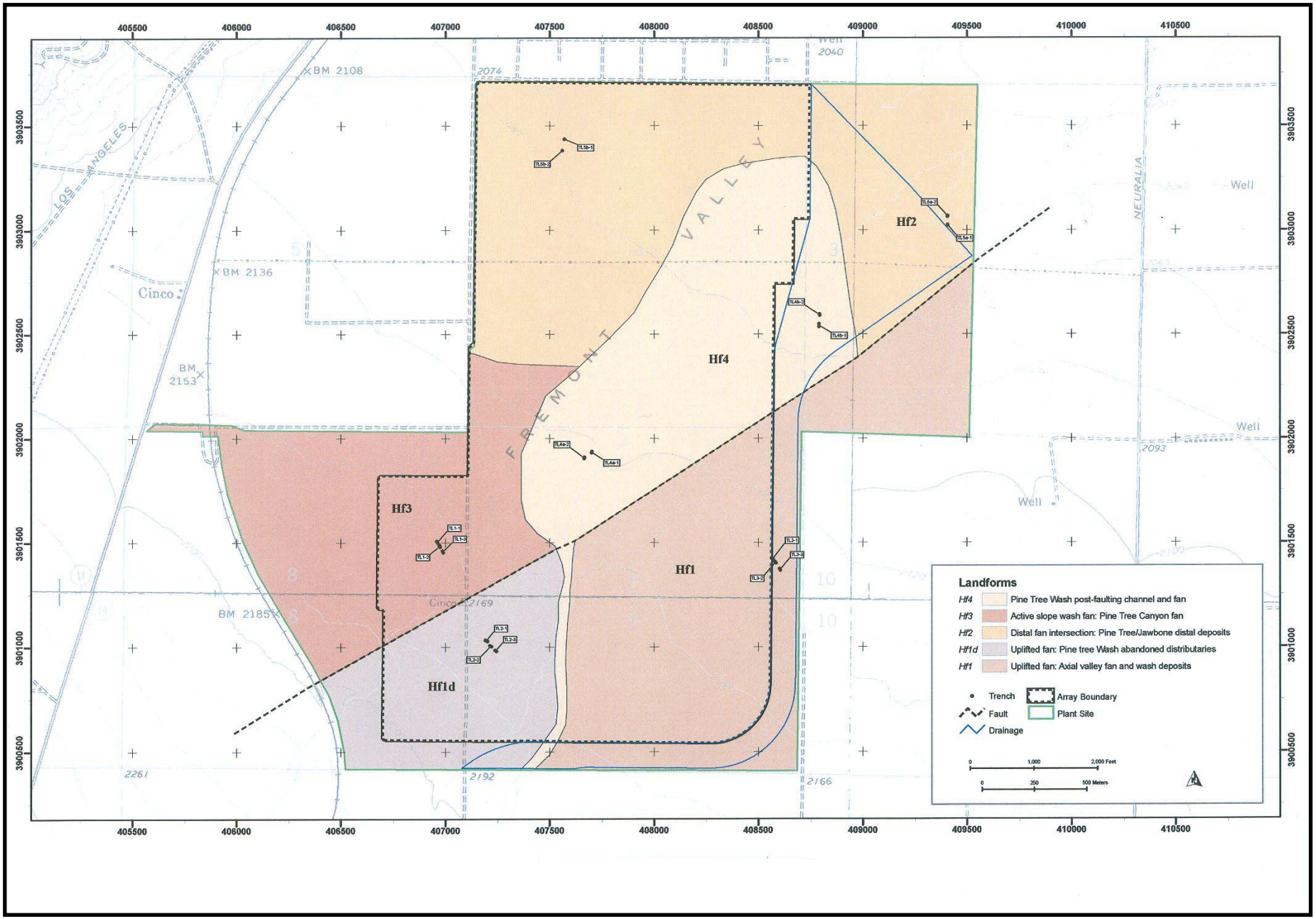
CULTURAL RESOURCES - FIGURE 1

Beacon Solar Energy Project - Project Site Landforms

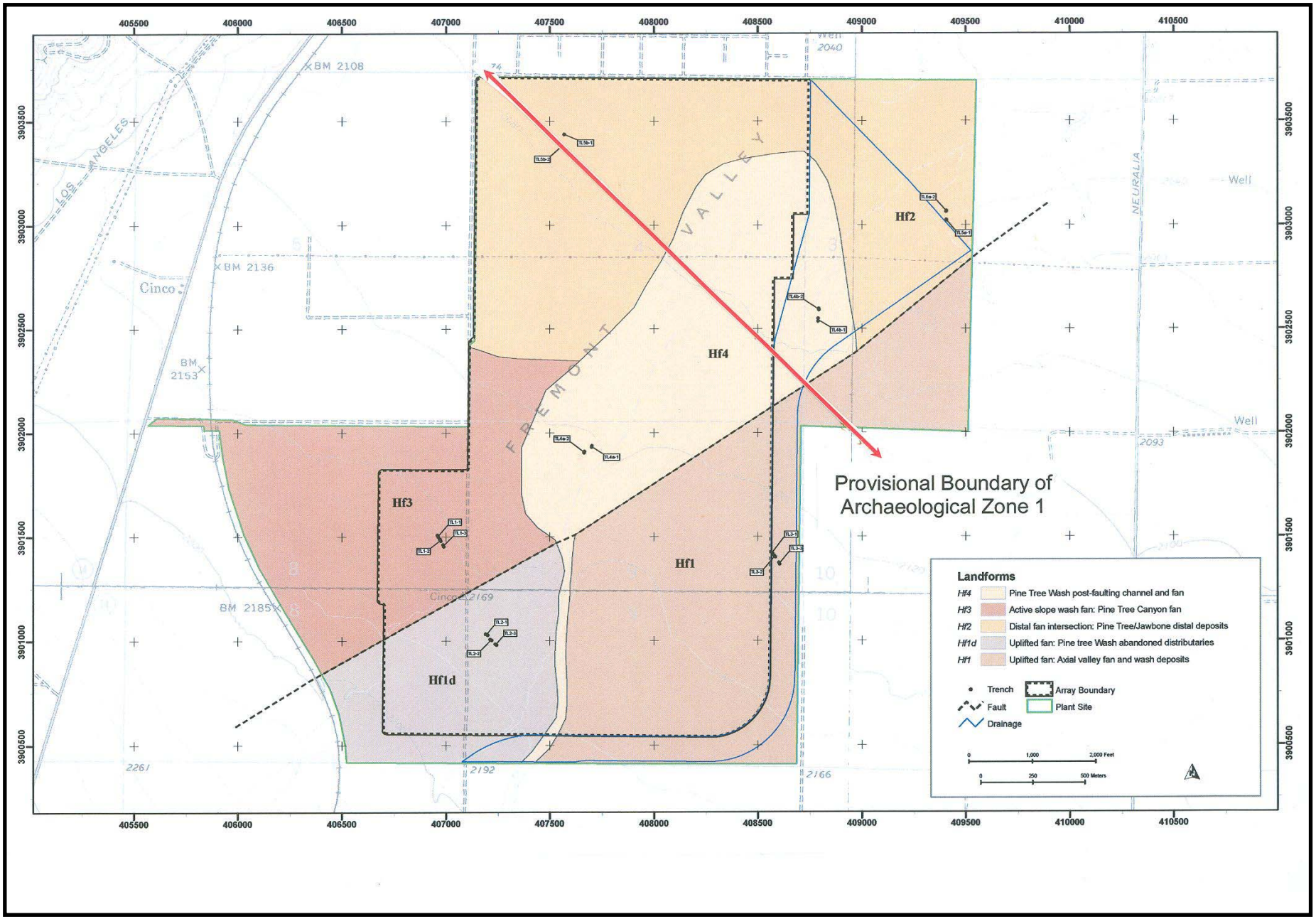


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: Preliminary Results Beacon Solar Energy Project Geoarchaeology, Feb 5, 2009 - D.Craig Young, Far Western Anthropological Research Group, Davis, CA.

CULTURAL RESOURCES - FIGURE 2

Beacon Solar Energy Project - Provisional Boundary of Archaeological Zone 1



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: Preliminary Results Beacon Solar Energy Project Geoarchaeology, Feb 5, 2009 - D.Craig Young, Far Western Anthropological Research Group, Davis, CA. - Modified by CEC Staff

HAZARDOUS MATERIALS MANAGEMENT

Testimony of Geoff Lesh, PE and Rick Tyler

SUMMARY OF CONCLUSIONS

Staff's evaluation of the proposed project, along with staff's proposed mitigation measures, indicate that hazardous materials use at the proposed Beacon Solar Energy Project (BSEP) would not present a significant impact on the public. With adoption of the proposed conditions of certification, the proposed project will comply with all applicable laws, ordinances, regulations, and standards (LORS).

INTRODUCTION

The purpose of this **HAZARDOUS MATERIALS MANAGEMENT** analysis is to determine if the proposed BSEP could potentially cause significant impacts on the public from the use, handling, storage, or transportation of hazardous materials at the proposed project site. If significant adverse impacts on the public are identified, Energy Commission staff must evaluate facility design alternatives and additional mitigation measures to reduce those impacts to the extent feasible.

This analysis does not address the potential exposure of workers to hazardous materials used at the proposed project site. Employers must inform employees of hazards associated with their work and provide those employees with special protective equipment and training to reduce the potential of health impacts from the handling of hazardous materials. The **WORKER SAFETY AND FIRE PROTECTION** section of this document describes the protection of workers from those risks.

Other hazardous materials such as mineral and lubricating oils, corrosion inhibitors, herbicides, and acids and bases to control pH will be present at the proposed project site. Hazardous materials used during the construction phase include gasoline, diesel fuel, motor oil, lubricants, and small amounts of solvents and paint. No acutely toxic hazardous materials will be used on-site during construction. None of these materials pose a significant potential for off-site impacts as a result of the quantities on-site, their relative toxicity, their physical states, and/or their environmental mobility. The project will involve the handling and storage of moderate amounts of liquefied petroleum gas (LPG), also known as propane. LPG poses some risk of both fire and explosion. LPG will be delivered for the project boilers by semi-weekly tank truck delivery and stored in two permanent on-site storage tanks (DB 2009r). The BSEP will also require the transportation of certain liquid and solid hazardous materials to the facility. This document addresses all potential impacts associated with the use, storage, and transport of hazardous materials.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

The following federal, state, and local laws and policies apply to the protection of public health and hazardous materials management. Staff's analysis examines the project's compliance with these requirements.

HAZARDOUS MATERIALS MANAGEMENT Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
The Superfund Amendments and Reauthorization Act of 1986 (42 USC §9601 et seq.)	Contains the Emergency Planning and Community Right To Know Act (also known as SARA Title III).
The Clean Air Act (CAA) of 1990 (42 USC 7401 et seq. as amended)	Establishes a nationwide emergency planning and response program, and imposes reporting requirements for businesses that store, handle, or produce significant quantities of extremely hazardous materials.
The CAA Section on Risk Management Plans (42 USC §112(r)	Requires states to implement a comprehensive system to inform local agencies and the public when a significant quantity of such materials is stored or handled at a facility. The requirements of both SARA Title III and the CAA are reflected in the California Health and Safety Code, section 25531, et seq.
40 CFR Part 68	Risk Management Program Guidance for Propane Storage Facilities provides guidance on RMP's
49 CFR 172.800	Requires that the suppliers of hazardous materials prepare and implement security plans in accordance with U.S. Department of Transportation (DOT) regulations.
49 CFR Part 1572, Subparts A and B	Requires that suppliers of hazardous materials ensure that their hazardous material drivers comply with personnel background security checks.
The Clean Water Act (CWA) (40 CFR 112)	Aims to prevent the discharge or threat of discharge of oil into navigable waters or adjoining shorelines. Requires a written spill prevention, control, and countermeasures (SPCC) plan to be prepared for facilities that store oil that could leak into navigable waters.
Title 49, Code of Federal Regulations, Parts 100 - 185	Federal Hazardous Materials Regulations including coverage of propane usage
Title 49, Code of Federal Regulations, Part 190	Outlines gas pipeline safety program procedures.
6 CFR Part 27	The CFATS (Chemical Facility Anti-Terrorism Standard) regulation of the U.S. Department of Homeland Security (DHS) that requires

	facilities that use or store certain hazardous materials to submit information to the DHS so that a vulnerability assessment can be conducted to determine what certain specified security measures shall be implemented.
State	
California Health and Safety Code, section 25531 to 25543.4	The California Accidental Release Program (Cal-ARP) requires the preparation of a Risk Management Plan (RMP) and Off-site Consequence Analysis (OCA) and submittal to the local Certified Unified Program Authority (CUPA) for approval.
Title 8, California Code of Regulations, Section 5189	Requires facility owners to develop and implement effective safety management plans to ensure that large quantities of hazardous materials are handled safely. While these requirements primarily provide for the protection of workers, they also indirectly improve public safety and are coordinated with the RMP process.
California Health and Safety Code, Sections 13240 – 13243.6	California Propane Storage and Handling Safety Act adopts regulations setting for safety standards for siting and construction of fixed propane storage systems, fire safety compliance requirements, and training requirements
California Health and Safety Code, Section 41700	Requires that "No person shall discharge from any source whatsoever such quantities of air contaminants or other material which causes injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property."
California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)	Prevents certain chemicals that cause cancer and reproductive toxicity from being discharged into sources of drinking water.
Title 24, California Code of Regulations,	2007 California Building Code
LOCAL	
Uniform Fire Code, Kern County Code Section 17.32.010	Adopts the Uniform Fire Code, 2000 Edition, into Kern County regulations.

The Kern County Environmental Health Services Department (KCEHSD) acts as the Certified Unified Program Authority (CUPA), and is responsible for reviewing Hazardous Materials Business Plans. With regard to seismic safety issues, the proposed BSEP site

is located in Seismic Risk Zone 4. The construction and design of buildings and vessels storing hazardous materials will meet the seismic requirements of the Uniform Building Code and the California Building Code (BS 2008a, section 2.5.6).

SETTING

Several characteristics of an area in which a project is located affect its potential for an accidental release of a hazardous material. These include:

- Local meteorology;
- terrain characteristics; and
- location of population centers and sensitive receptors relative to the project.

METEOROLOGICAL CONDITIONS

Meteorological conditions, including wind speed, wind direction, and air temperature, affect both the extent to which accidentally released hazardous materials would be dispersed into the air and the direction in which they would be transported. This affects the potential magnitude and extent of public exposure to such materials, as well as their health risks. When wind speeds are low and the atmosphere is stable, dispersion is severely reduced and can lead to increased localized public exposure.

Recorded wind speeds and ambient air temperatures are described in the Air Quality section (5.2.2.2) and Appendix E.1 of the Application for Certification (AFC) (BS 2008a).

TERRAIN CHARACTERISTICS

The location of elevated terrain is often an important factor in assessing potential exposure. An emission plume from an accidental release may impact high elevations before it impacts lower elevations. The topography of the BSEP site is essentially flat at about 2,100 feet above sea level, as are the immediately surrounding areas. Because of the nature of the surrounding area, terrain above stack height is not of concern for the project.

LOCATION OF EXPOSED POPULATIONS AND SENSITIVE RECEPTORS

The general population includes many sensitive subgroups that may be at greater risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. In addition, the location of the population in the area surrounding a project site may have a large bearing on health risk. There are no sensitive receptors within a 3-mile radius of the project site. Red Rock Elementary School, no longer in use, is located 3-miles northeast of the project boundary. Four residences are within 1-mile of the project site. The nearest receptors are located along the site boundary, approximately one-third of a mile from the proposed location of the power block (BS 2008a, section 5.10.2).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Staff reviewed and assessed the potential for the transportation, handling, and use of hazardous materials to impact the surrounding community. All chemicals and LPG were evaluated. Staff's analysis examines the potential impacts on all members of the population including the young, the elderly, and people with existing medical conditions that may make them more sensitive to the adverse effects of hazardous materials. In order to accomplish this goal, staff utilizes the most current acceptable public health exposure levels (both acute and chronic) to protect the public from the effects of an accidental chemical release.

In order to assess the potential of released hazardous materials traveling off-site and affecting the public, staff analyzed several aspects of the proposed use of materials at the facility. Staff recognizes that some hazardous materials must be used at power plants. Therefore, staff conducted its analysis by focusing on the choice and amount of chemicals to be used, the manner in which the applicant will use the chemicals, the manner by which it will be transported to the facility and transferred to facility storage tanks, and the way in which the applicant plans to store those materials on-site.

Staff reviewed the applicant's proposed engineering and administrative controls for hazardous material use. Engineering controls are physical or mechanical systems such as storage tanks or automatic shut-off valves that can prevent a spill of hazardous material from occurring, or that can limit the spill to a small amount or confine it to a small area. Administrative controls are rules and procedures that workers must follow to help either prevent accidents or keep them small if they do occur. Both engineering and administrative controls can act as either methods of prevention or methods of response and minimization. In both cases, the goal is to prevent a spill from moving off-site and harming the public.

Staff reviewed and evaluated the proposed use of hazardous materials, as described by the applicant (BS 2008a, section 5.6). Staff's assessment followed the five steps listed below:

- Step 1: Staff reviewed the chemicals and amounts proposed for on-site use, as listed in Table 5.6-3 of the AFC and determined the need and appropriateness of their use. Only those that are needed and appropriate are allowed to be used. If staff feels that a safer alternative chemical can be used, staff will recommend or require its use, depending upon the impacts posed.
- Step 2: Those chemicals, proposed for use in small amounts or whose physical state is such that there is virtually no chance that a spill would migrate off the site and impact the public, were removed from further assessment.
- Step 3: Measures proposed by the applicant to prevent spills were reviewed and evaluated. These included engineering controls such as automatic shut-off valves and different size transfer-hose couplings and administrative controls such as worker training and safety management programs.

- Step 4: Measures proposed by the applicant to respond to accidents were reviewed and evaluated. These measures also included engineering controls such as catchment basins and methods to keep vapors from spreading, and administrative controls such as training emergency response crews.
- Step 5: Staff analyzed the theoretical impacts on the public of a worst-case spill of hazardous materials even with the mitigation measures proposed by the applicant. When mitigation methods proposed by the applicant are sufficient, no further mitigation is recommended. If the proposed mitigation is not sufficient to reduce the potential for adverse impacts to an insignificant level, staff will propose additional prevention and response controls until the potential for causing harm to the public is reduced to an insignificant level. It is only at this point that staff can recommend that the project be allowed to use hazardous materials.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Small Quantity Hazardous Materials

In conducting this analysis, staff determined in Steps 1 and 2 that most of the proposed materials, although present at the proposed facility, pose a minimal potential for off-site impacts since they will be stored in either solid form or in small quantities, have low mobility, low vapor pressure, or low levels of toxicity. These hazardous materials, which were eliminated from further consideration, are discussed briefly below.

During the construction phase of the project, the only hazardous materials proposed for use include paint, cleaners, solvents, gasoline, diesel fuel, motor oil, and lubricants. Any impact of spills or other releases of these materials would be limited to the site because of the small quantities involved, the infrequent use and hence reduced chances of release, and/or the temporary containment berms used by contractors. Petroleum hydrocarbon-based motor fuels, mineral oil, lube oil, and diesel fuel all have very low volatility and would represent limited off-site hazards, even in larger quantities.

During operations, hazardous chemicals such as cleaning agents, lube oil, sulfuric acid, sodium hydroxide, hydrogen gas, diesel fuel and other various chemicals (see **Hazardous Materials Appendix A** for a list of all chemicals proposed to be used and stored at BSEP) would be used and stored on-site and represent limited off-site hazard due to their small quantities, low volatility, and/or low toxicity.

After removing from consideration those chemicals that pose no risk of off-site impact in Steps 1 and 2, staff continued with Steps 3, 4, and 5 to review the remaining hazardous materials: sodium hypochlorite, sodium hydroxide, sulfuric acid, LPG, and Therminol VP-1.

Large Quantity Hazardous Materials

Sodium Hypochlorite

According to the Table 5.6-3 (BS 2008a), 17,000 gallons of sodium hypochlorite would be stored at the site. Sodium hypochlorite has a low potential to affect the off-site public because its vapor pressure is low and it is in an aqueous solution. In fact, hypochlorite is used at many such facilities as a substitute for chlorine gas, which is much more toxic

and much more likely to migrate off-site because it is a gas and is stored in concentrated form under pressure. Thus, the use of a water solution of sodium hypochlorite is much safer to use than the alternative chlorine gas. The amount of sodium hypochlorite that would be stored on the site is below the Reportable Quantity as defined in the Cal-ARP regulations. Based upon staff's knowledge about the use of this material and the modeling of accidental releases, an aqueous solution of sodium hypochlorite poses an insignificant risk to the off-site public. However, the chances for accidental spills during transfer from delivery vehicles to the storage tanks should still be reduced as much as possible. Thus, measures to prevent transfer spills are extremely important and would be required as a standard condition in a Safety Management Plan for delivery of sodium hypochlorite (see Condition of Certification **HAZ-3**).

Sodium Hydroxide

Sodium hydroxide would be stored on site but would not pose a risk of off-site impacts because it has relatively low vapor pressure and thus spills would be confined to the site. Therefore, no further analysis is needed.

Sulfuric Acid

Sulfuric acid would be stored on site but would not pose a risk of off-site impacts because it has relatively low vapor pressure and thus spills would be confined to the site. Therefore, no further analysis is needed.

Liquefied Petroleum Gas

Liquefied petroleum gas (LPG), also known as propane, poses a fire and/or possible explosion risk because of its flammability. LPG is composed mostly of propane, but may also contain small amounts of ethane, nitrogen, butane, isobutene, and isopentane. It is colorless, odorless, tasteless, and heavier than air. LPG can cause asphyxiation when propane's concentration exceeds 90%. Propane is flammable when mixed in air at concentrations of 2.2 -9.6%, which is also its detonation range. LPG therefore poses a risk of fire and/or explosion if a release were to occur under certain specific conditions and an unconfined vapor cloud of LPG can explode under certain conditions.

LPG will be used in significant quantities, and will be stored on-site in two 18,000 gallon storage tanks. The risk of a fire and/or explosion on-site can be reduced to insignificant levels through adherence to applicable codes and the development and implementation of effective safety management practices. The National Fire Protection Association codes (NFPA 54, 58 and 85A) require the use of double block and bleed valves for gas shut-off and automated combustion controls, and adherence to ASME pressure vessel design and construction requirements. These measures will significantly reduce the likelihood of an explosion in gas-fired equipment. The Safety Management Plan proposed by the applicant would address both the handling and use of LPG and significantly reduce the potential for equipment failure due to either improper maintenance or human error.

If loss of containment occurs as a result of tank, piping, valve, or other mechanical failure or external forces, significant quantities of LPG could be released rapidly. Such a release could result in a significant fire and/or explosion hazard, which could cause loss

of life and/or significant property damage in the vicinity of the leak. However, the probability of such an event is extremely low if the storage facility is constructed according to present standards.

The applicant conducted a worst-case offsite consequence analysis (OCA) (DB 2009r). Staff believes the worst case scenario for an off-site LPG impact is a large rupture of one the tanks caused by improper use of heavy equipment near the tank. This worst case scenario would possibly result in a significant asphyxiation hazard until is disperses since LPG gas is heavier than air, although the more likely hazard would be that of a vapor cloud explosion should the cloud find a source of ignition before it disperses to the atmosphere. Staff agrees with the applicant's modeling which conforms to EPA's RMP Off-Site Consequence Analysis Guidance document. The resulting maximum distance of significant impact (blast damage) was less than 600 meters. Thus significant impact from the worst case scenario would not extend beyond the facility fence line. The worst case scenario is primarily a safety hazard to on-site employees. The storage facility will be built in conformance with State and Federal regulations to lower the probability of this occurring and Staff considers the potential for such an event to be very low, as the mean time to catastrophic failure of similar pressurized tanks is 10,500 years. Staff considers the potential impact to the public as a result of propane storage at BSEP to be less than significant.

Therminol VP-1

Therminol VP1 is the HTF that will be used in the solar panels to collect solar heat and transfer it in order to generate steam to run the steam turbine. Approximately 1.3 million gallons of HTF will be contained in the pipes and heat exchanger. Therminol is a mixture of 73.5 percent diphenyl ether and 26.5 percent biphenyl, and is a solid at temperatures below ~54 °F. Because nighttime temperatures during the winter often drop below 54 °F in the high desert, auxiliary heating is provided to keep Therminol liquid. Therminol can therefore be expected to remain liquid if a spill occurs. While the risk of off-site migration is minimal, Therminol is highly flammable and fires have occurred at other solar generating stations that use it. Staff has assessed the properties of Therminol, and reviewed the record of its use at Solar Electric Generating Stations 8 and 9 at Harper Lake, California. Past leaks, spills, and fires involving this HTF were examined and discussed. It appears that the placement of additional isolation valves in the HTF pipe loops throughout the solar array would add significantly to the safety and operational integrity of the entire system by allowing a loop to be closed if a leak develops in a ball joint, flex-hose, or pipe, instead of closing off the entire HTF system and shutting down the plant. Applicant has proposed including isolation valves for this purpose in the project description (BS 2008a, section 2.5.3.1). Staff therefore proposes Condition of Certification **HAZ-7,** which would require the project owner to install a sufficient number of isolation valves that can be either manually or remotely activated.

Mitigation

Staff believes that this project's use of hazardous materials poses no significant risk but only if mitigation measures are used. These mitigation measures are discussed in this section. The potential for accidents resulting in the release of hazardous materials is

greatly reduced by the implementation of a Safety Management Program (see **HAZ-3**), which includes both engineering and administrative controls. Elements of facility controls and the safety management plan are summarized below.

Engineering Controls

Engineering controls help prevent accidents and releases (spills) from moving off-site and impacting the community by incorporating engineering safety design criteria into the project's design. Engineering safety features proposed by the applicant include:

- Usage of secondary containment areas surrounding each of the hazardous materials storage areas, designed to contain accidental releases during storage;
- Physical separation of stored chemicals in isolated containment areas, separated by a noncombustible partition in order to prevent the accidental mixing of incompatible materials, which may in turn cause the formation and release of toxic gases or fumes.

Administrative Controls

Administrative controls help prevent accidents and releases (spills) from moving off-site and impacting the community by establishing worker training programs and process safety management programs.

A Worker Health and Safety Program will be prepared by the applicant and include (but not be limited to) the following elements (see the **WORKER SAFETY/FIRE PROTECTION** section in this FSA for specific regulatory requirements):

- Worker training on chemical hazards, health and safety issues, and hazard communication;
- Procedures to ensure the proper use of personal protective equipment;
- Safety operating procedures for the operation and maintenance of systems that use hazardous materials;
- Fire safety and prevention; and
- Emergency response actions including facility evacuation, hazardous material spill cleanup, and fire prevention.

At BSEP, the project owner will be required to designate an individual who will have the responsibility and authority to ensure a safe and healthful workplace. This project health and safety official will oversee the health and safety program and will have the authority to halt any action or modify any work practice in order to protect the workers, facility, and the surrounding community in the event that the health and safety program is violated.

A Hazardous Materials Business Plan (HMBP) will also be prepared by the applicant (see **HAZ-2**) that would incorporate state requirements for the handling of hazardous materials (BS 2008a, section 5.6.3.3). A Spill Prevention Control and Countermeasure Plan (SPCC) is required by Federal Regulations (see LORS above) and will be prepared for the petroleum-containing hazardous materials.

On-site Spill Response

In order to address spill response, the facility will prepare and implement an emergency response plan which includes information on hazardous materials contingency and emergency response procedures, spill containment and prevention systems, personnel training, spill notification, on-site spill containment, prevention equipment and capabilities, etc. Emergency procedures will be established which include evacuation, spill cleanup, hazard prevention, and emergency response.

A Kern County HazMat team is currently based at Station #14 in Mojave, California, which is located approximately 19 miles from the project site. The Kern County HazMat Team response time to a hazmat emergency call from BSEP would be approximately 23 minutes (Eckroth).

Staff concludes that the hazardous material response time is acceptable, and that the Kern County HazMat Team is adequately trained and equipped to respond to an emergency at BSEP in a timely manner.

Transportation of Hazardous Materials

Containerized hazardous materials including sulfuric acid, and cleaning chemicals, will be transported to the facility via truck. While many types of hazardous materials will be transported to the site, previous modeling of spills involving much larger quantities of toxic materials, (more toxic aqueous ammonia and 93% sulfuric acid) has demonstrated that minimal airborne concentrations would occur only at short distances from the spill.

During construction and operation of BSEP, staff believes that minimal amounts and types of hazardous materials (paint, cleaners, solvents, gasoline, diesel fuel, motor oil, lubricants, 29% sulfuric acid, and welding gases in standard-sized cylinders) do not pose a significant risk of either spills or public impacts along any transportation route. Staff therefore does not recommend a specific route.

Staff believes that transport of LPG poses the predominant risk associated with hazardous materials transport to the proposed project site. Approximately 11 LPG delivery truck trips, carrying approximately 6000 gallons per delivery will be required monthly. LPG can be released during a transportation accident, and the extent of its impact in the event of a release would depend on the location of the accident, the rate of release, the rate of dispersion of the LPG from the spill area, and whether a source of ignition was found by the resulting vapor cloud before it was sufficiently dispersed. The likelihood of an accidental release during transport is dependent upon three factors:

- The skill of the tanker truck driver;
- The type of vehicle used for transport; and
- Accident rates.

To address this concern, staff evaluated the risk of an accidental transportation release in the project area. Staff's analysis focused on the project area after the delivery vehicle leaves the main divided California State Highway (SR-14). Because improved highways pass adjacent to the project's western boundary, there is no local off-highway area with public access that the LPG deliveries will pass through. Staff believes it is

appropriate to rely upon the extensive regulatory program that applies to shipment of hazardous materials on California Highways to ensure safe handling in general transportation (see the Federal Hazardous Materials Transportation Law 49 USC §5101 et seq., the U.S. Department of Transportation Regulations 49 CFR Subpart H, §172-700, and the California DMV Regulations on Hazardous Cargo). These regulations also address issues of driver competence. Hazardous materials delivery routes must also be approved by the California Highway Patrol. See AFC section 5.13.1 for additional information on regulations governing the transportation of hazardous materials.

The transportation of similar volumes of hazardous materials on the nation's highways is neither unique nor infrequent. Staff believes that the risk of impact to the public resulting from accidental release of LPG during transportation to the facility is insignificant.

Seismic Issues

The possibility exists that an earthquake could cause the failure of a hazardous materials storage tank. A quake could also cause the failure of the secondary containment system (berms and dikes), as well as electrically controlled valves and pumps. The failure of all these preventive control measures might then result in a vapor cloud of hazardous materials that could move off-site and impact residents and workers in the surrounding community. The effects of the Loma Prieta earthquake of 1989, the Northridge earthquake of 1994, and the earthquake in Kobe, Japan, in January 1995, heighten concerns about earthquake safety.

Information obtained after the January 1994 Northridge earthquake showed that some damage was caused to several large and small storage tanks at the water treatment system of a cogeneration facility. The tanks with the greatest damage, including seam leakage, were older tanks, while newer tanks sustained lesser damage with displacements and attached line failures. Therefore, staff conducted an analysis of the codes and standards, which should be followed to adequately design and build storage tanks and containment areas that could withstand a large earthquake. Staff also reviewed the impacts of the February 2001 Nisqually earthquake near Olympia, Washington, a state with similar seismic design codes as California. No hazardous materials storage tanks were impacted by this quake. Referring to the sections on **GEOLOGIC RESOURCES AND HAZARDS** and **FACILITY DESIGN** in the AFC, staff notes that the proposed facility will be designed and constructed to the applicable standards of the 2007 California Building Code for Seismic Zone 4 (BS 2008a, section 5.6.3.3). Therefore, on the basis of occurrences at Northridge with older tanks and the lack of failures during the Nisqually earthquake with newer tanks, staff determined that tank failures during seismic events are not likely and do not represent a significant risk to the public.

Site Security

BSEP proposes to use hazardous materials identified by the US EPA as materials where special site security measures should be developed and implemented to prevent unauthorized access. US EPA published a *Chemical Accident Prevention Alert* regarding site security (EPA 2000a), the U.S. Department of Justice published a special report on Chemical Facility Vulnerability Assessment Methodology (US DOJ 2002), the

North American Electric Reliability Corporation (NERC) published *Security Guidelines for the Electricity Sector* in 2002 (NERC 2002), and the U.S. Department of Energy published a draft *Vulnerability Assessment Methodology for Electric Power Infrastructure* in 2002 (DOE 2002). The energy generation sector is one of 14 areas of critical Infrastructure listed by the U.S. Department of Homeland Security. On April 9, 2007, the U.S Department of Homeland Security published, in the Federal Register (6 CFR Part 27), an Interim Final Rule requiring facilities that use or store certain hazardous materials to conduct vulnerability assessments and implement certain specified security measures. This rule was implemented with the publication of Appendix A, the list of chemicals, on November 2, 2007. Staff believes that all power plants under the jurisdiction of the Energy Commission should implement a minimum level of security consistent with the guidelines listed here.

In order to ensure that this facility (or a shipment of hazardous material) is not the target of unauthorized access, staff's proposed conditions of certification **HAZ-5** and **HAZ-6** address both construction security and operations security plans. These plans would require the implementation of site security measures that are consistent with both the above-referenced documents and Energy Commission guidelines.

The goal of these conditions of certification is to provide the minimum level of security for power plants needed to protect California's electrical infrastructure from malicious mischief, vandalism, or domestic/foreign terrorist attacks. The level of security needed for this power plant is dependent upon the threat imposed, the likelihood of an adversarial attack, the likelihood of success in causing a catastrophic event, and the severity of consequences of that event.

In order to determine the level of security, the Energy Commission staff used an internal vulnerability assessment decision matrix modeled after the U.S. Department of Justice Chemical Vulnerability Assessment Methodology (July 2002), the NERC 2002 guidelines, the U.S. Department of Energy VAM-CF model, and U.S. Department of Homeland Security regulations published in the Federal Register (Interim Final Rule 6 CFR Part 27). Staff determined that BSEP would fall into the "low vulnerability" category, so staff proposes that certain security measures be implemented but does not propose that the project owner conduct its own vulnerability assessment.

These security measures include perimeter fencing and breach detectors, possibly guards, alarms, site access procedures for employees and vendors, site personnel background checks, and law enforcement contact in the event of a security breach. Site access for vendors will be strictly controlled. Consistent with current state and federal regulations governing the transport of hazardous materials, hazardous materials vendors will have to maintain their transport vehicle fleets and employ only drivers who are properly licensed and trained. The project owner will be required, through its contractual language with vendors, to ensure that vendors supplying hazardous materials strictly adhere to the U.S. DOT requirements that hazardous materials vendors prepare and implement security plans per 49 CFR 172.800 and ensure that all hazardous materials drivers are in compliance with personnel background security checks per 49 CFR Part 1572, Subparts A and B. The compliance project manager (CPM) may authorize modifications to these measures, or may require additional

measures in response to additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or NERC, after consultation with appropriate law enforcement agencies and the applicant.

CUMULATIVE IMPACTS AND MITIGATION

Staff considered the potential for impacts due to a simultaneous release of any of the hazardous chemicals from the proposed BSEP with any other nearby facilities. Because of the small amounts of the hazardous chemicals to be stored at the facility, Staff determined that there was practically no possibility of producing an offsite impact. Because of this determination, and the additional fact that there are no nearby facilities using large amounts of hazardous chemicals, there is little (if any) possibility that vapor plumes would mingle (combine) to produce an airborne concentration that would present a significant risk.

COMPLIANCE WITH LORS

Staff concludes that construction and operation of BSEP would be in compliance with all applicable LORS for both long-term and short-term project impacts in the area of hazardous materials management.

RESPONSE TO AGENCY COMMENTS

Lahontan Regional Water Quality Control Board commented that seismic events might create large spills of HTF, and asked whether Staff's analysis included both seismically induced ground shaking and potential fault rupture, and what preventative measures would be in place to deal with a seismically induced failure of the proposed project's pipelines.

Staff Response: Surveys of leakage from, and damage to, tanks and piping systems built to modern code requirements that govern materials and design, show that damage is minor during earthquakes, regardless of fault location. Tank and piping codes are continually improving, so systems designed to current codes, as required for this project, should have generally better results than previously surveyed systems.

That minor leaks in the piping system are expected to occur, is mostly due to the large number of flanged connections that, combined with the many flexible connections, will be required by the system design. The expected leaks result from the difficulty of maintaining perfect sealing in pipe couplings during the daily temperature and pressure changes that will occur during operations. They do not portend easily induced structural failure of the piping system. There could be shaking and even fault rupture without large scale subsequent leaking, depending on the magnitude of any seismic event.

In the event that a rupture of a pipe did occur, the regularly spaced valves located throughout the solar field piping system would close to prevent continued leaks and potential fires, limiting the potential size of any leaks (see Condition of Certification **Haz-7**). Any hot HTF that spilled would cool to ambient temperatures and thicken, reducing its environmental mobility and reducing the potential for contamination of ground water,

until it was cleaned up by appropriate methods. At temperatures below 52 Fahrenheit, HTF becomes a wax-like solid with a slow permeation rate, thus limiting its migration until remediated.

Staff's conditions of certification and existing law require that any spills would require immediate reporting and remediation. A Spill Prevention Control and Countermeasure Plan will be required as part of BSEP's permit These requirements effectively eliminate any significant potential for ground water contamination in the event of an accidental release caused by an earthquake or any other event. The handling and disposal of hazardous substances are also addressed in the **Waste Management** section of this assessment.

CONCLUSIONS

Staff's evaluation of the proposed project (with proposed mitigation measures) indicates that hazardous material use, storage, and transportation will not pose a significant impact on the public. Staff's analysis also shows that there will be no significant cumulative impact. With adoption of the proposed conditions of certification, the proposed project will comply with all applicable LORS. Other proposed conditions of certification address the issues of site security matters.

Staff recommends that the Energy Commission impose the proposed conditions of certification, presented below, to ensure that the project is designed, constructed, and operated in compliance with applicable LORS, and will protect the public from significant risk of exposure to an accidental release of hazardous materials. If all mitigation proposed by the applicant and by staff are implemented, the use, storage, and transportation of hazardous materials will not present a significant risk to the public.

Staff proposes six conditions of certification, some of which are mentioned in the text (above), and listed below. **HAZ-1** ensures that no hazardous material would be used at the facility except as listed in the AFC as modified by Applicant's Project Design Refinements (DB 2009r) , unless there is prior approval by the Energy Commission Compliance Project Manager.

HAZ-3 requires the development of a Safety Management Plan that addresses the delivery of all liquid hazardous materials during the construction, commissioning, and operation of the project will further reduce the risk of any accidental release not specifically addressed by the proposed spill prevention mitigation measures, and further prevent the mixing of incompatible materials that could result in the generation of toxic vapors. Site security during both the construction and operation phases is addressed in **HAZ-4** and **HAZ-5. HAZ-7** provides for the capability of limiting the impacts of accidental leaks of HTF.

PROPOSED CONDITIONS OF CERTIFICATION

HAZ-1 The project owner shall not use any hazardous materials not listed in **Appendix A**, below, or in greater quantities than those identified by chemical name in **Appendix A,** unless approved in advance by the Compliance Project Manager (CPM).

Verification: The project owner shall provide to the CPM, in the Annual Compliance Report, a list of hazardous materials contained at the facility.

HAZ-2 The project owner shall concurrently provide a Business Plan to the Kern County Environmental Health Services Department (KCEHSD) and the CPM for review. After receiving comments from the KCEHSD and the CPM, the project owner shall reflect all recommendations in the final documents. Copies of the final Business Plan shall then be provided to the KCEHSD for information and to the CPM for approval.

Verification: At least 60 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Business Plan to the CPM for approval.

HAZ-3 The project owner shall develop and implement a Safety Management Plan for delivery of liquid hazardous materials. The plan shall include procedures, protective equipment requirements, training and a checklist. It shall also include a section describing all measures to be implemented to prevent mixing of incompatible hazardous materials. This plan shall be applicable during construction, commissioning, and operation of the power plant.

Verification: At least sixty (60) days prior to the delivery of any liquid hazardous material to the facility, the project owner shall provide a Safety Management Plan as described above to the CPM for review and approval.

HAZ-4 At least thirty (30) days prior to commencing construction, a site-specific Construction Site Security Plan for the construction phase shall be prepared and made available to the CPM for review and approval. The Construction Security Plan shall include the following:

1. Perimeter security consisting of fencing enclosing the construction area;
2. Security guards;
3. Site access control consisting of a check-in procedure or tag system for construction personnel and visitors;
4. Written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on-site or off-site;
5. Protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency; and
6. Evacuation procedures.

Verification: At least thirty (30) days prior to commencing construction, the project owner shall notify the CPM that a site-specific Construction Security Plan is available for review and approval.

HAZ-5 The project owner shall prepare a site-specific Security Plan for the operational phase and shall be made available to the CPM for review and approval. The project owner shall implement site security measures addressing physical site security and hazardous materials storage. The level of security to be implemented shall not be less than that described below (as per NERC 2002).

The Operation Security Plan shall include the following:

1. Permanent full perimeter fence or wall, at least eight feet high around the Power Block and Solar Field;

2. Main entrance security gate, either hand operable or motorized;

3. Evacuation procedures;

4. Protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency;

5. Written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on-site or off-site;

6. a. A statement (refer to sample, attachment "A") signed by the project owner certifying that background investigations have been conducted on all project personnel. Background investigations shall be restricted to ascertain the accuracy of employee identity and employment history, and shall be conducted in accordance with state and federal law regarding security and privacy;

   b. A statement(s) (refer to sample, attachment "B") signed by the contractor or authorized representative(s) for any permanent contractors or other technical contractors (as determined by the CPM after consultation with the project owner) that are present at any time on the site to repair, maintain, investigate, or conduct any other technical duties involving critical components (as determined by the CPM after consultation with the project owner) certifying that background investigations have been conducted on contractor personnel that visit the project site.

7. Site access controls for employees, contractors, vendors, and visitors;

8. a statement(s) (refer to sample, **Attachment C**), signed by the owners or authorized representative of hazardous materials transport vendors, certifying that they have prepared and implemented security plans in

compliance with 49 CFR 172.880, and that they have conducted employee background investigations in accordance with 49 CFR Part 1572, subparts A and B;

9. Closed Circuit TV (CCTV) monitoring system, recordable, and viewable in the power plant control room and security station (if separate from the control room) capable of viewing, at a minimum, the main entrance gate; and the LPG storage tanks, and

10. Additional measures to ensure adequate perimeter security consisting of either:

    a. Security guard present 24 hours per day, seven days per week, **OR**

    b. Power plant personnel on-site 24 hours per day, seven days per week and **all** of the following:

        1) The CCTV monitoring system required in number 9 above shall include cameras that are able to pan, tilt, and zoom (PTZ), have low-light capability, are recordable, and are able to view 100% of the perimeter fence, the outside entrance to the control room, and the front gate from a monitor in the power plant control room; **AND**

        2) Perimeter breach detectors **<u>or</u>** on-site motion detectors.

The project owner shall fully implement the security plans and obtain CPM approval of any substantive modifications to the security plans. The CPM may authorize modifications to these measures, or may require additional measures, such as protective barriers for critical power pant components (e.g., transformers, gas lines, compressors, etc.) depending on circumstances unique to the facility or in response to industry-related standards, security concerns, or additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or the North American Electrical Reliability Council, after consultation with appropriate law enforcement agencies and the applicant.

<u>Verification:</u> At least 30 days prior to the initial receipt of hazardous materials on-site, the project owner shall notify the CPM that a site-specific Operations Site Security Plan is available for review and approval. In the Annual Compliance Report, the project owner shall include a statement that all current project employee and appropriate contractor background investigations have been performed, and updated certification statements are appended to the Operations Security Plan. In the Annual Compliance Report, the project owner shall include a statement that the Operations Security Plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.

HAZ-6 The project owner shall ensure that the hydrogen gas storage cylinders are stored in an area out of area potentially affected by a turbine over-speed accident and that no combustible or flammable material is stored within 50 feet of the hydrogen cylinders.

Verification: At least sixty (60) days prior to receipt of hydrogen gas on-site, the project owner shall provide copies of the facility design drawings showing the location of the hydrogen gas cylinders and the location of any tanks, drums, or piping containing any combustible or flammable material and the route by which such materials will be transported through the facility.

HAZ-7 The project owner shall place an adequate number of isolation valves in the Heat transfer Fluid (HTF) pipe loops so as to be able to isolate a solar panel loop in the event of a leak of fluid. These valves shall be actuated manually and remotely. The engineering design drawings showing the number, location, and type of isolation valves shall be provided to the CPM for review and approval prior to the commencement of the solar array construction.

Verification: At least sixty (60) days prior to the commencement of solar array construction, the project owner shall provide the design drawings as described above to the CPM for review and approval.

SAMPLE CERTIFICATION (Attachment "A")

Affidavit of Compliance for Project Owners

I, _____
(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

_____
(Company Name)

for employment at

_____
(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

_____
(Signature of Officer or Agent)

Dated this _____ day of _____, 20 _____.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

SAMPLE CERTIFICATION (Attachment "B")

Affidavit of Compliance for Contractors

I, _____
(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

_____
(Company Name)

for contract work at

_____
(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

_____
(Signature of Officer or Agent)

Dated this _____ day of _____, 20 _____.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

SAMPLE CERTIFICATION (Attachment C)

Affidavit of Compliance for Hazardous Materials Transport Vendors

I,

_____

(Name of person signing affidavit)(Title)

do hereby certify that the below-named company has prepared and implemented security plans in conformity with 49 CFR 172.880 and has conducted employee background investigations in conformity with 49 CFR 172, subparts A and B,

_____

(Company name)

for hazaRoadous materials delivery to

_____

(Project name and location)

as required by the California Energy Commission Decision for the above-named project.

_____

(Signature of officer or agent)

Dated this _____ day of _____, 20 _____.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

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Hazardous Materials
Appendix A

Hazardous Materials Proposed for Use
At the
BSEP Power Project
June 2009

Sources: BS 2008a, Table 5.6-2 and
DB 2009r, Table 3

Appendix A: Hazardous Materials Proposed for Use at the BSEP Power Project

Hazardous Material	Relative Toxicity[1] and Hazard Class[2]	Permissible Exposure Limit	Storage Description; Capacity	Storage Practices and Special Handling Precautions
Therminol VP-1 Diphenyl ether (73.5%) Biphenyl (26.5%	Moderate toxicity, Hazard class – Irritant; Combustible Liquid (Class III-B)	Biphenyl = PEL: 0.2 ml/m3 (8-hr TWA) TLV: 0.2 ml/m3 (1 mg/m3) (8-hr TWA) Diphenyl ether = TLV: 1 ml/m3(8-hr TWA) TLV: 2 ml/m3(15-min TWA) PEL: 1 ml/m3 (7 mg/m3) (15-min TWA)	2.4 MM gallons in system, no additional onsite storage	Continuous monitoring of pressure in piping network; routine inspections (sight, sound, smell) by operations staff; isolation valves throughout piping network to minimize fluid loss in the event of a leak; prompt clean up and repair.
Propane	Low toxicity; Flammable gas	PEL: 1,000 ppm	Two 18,000 gallon pressure tanks	Isolated from incompatible chemicals
Hydrogen	Low toxicity; Hazard class – Flammable gas	None Established	In generator cooling loop and “tube trailer”; total inventory of 63,000 SCF (335 pounds)	Pressure safety tank, crash posts, pressure relief valves
Sodium Hydroxide, 50% solution	High toxicity; Hazard class – Corrosive	PEL: 2 mg/m3	Carbon steel tank; 8,500 gallons	Isolated from incompatible chemicals and secondary containment
Sodium Hypochlorite, 12.5% solution	High toxicity; Hazard class – Poison-B, Corrosive	Workplace Environmental Exposure Limit (WEEL) - STEL: 2 mg/m3 PEL: 0.5 ppm (TWA), STEL: 1 ppm as Chlorine TLV: 1 ppm (TWA), STEL: 3 ppm as Chlorine	Plastic tanks; 17,000 gallons total inventory (2 x 8,500 gallons)	Secondary containment

Sulfuric Acid, 29.5% solution	High toxicity; Hazard class – Corrosive, water reactive	PEL: 1 mg/m3	Contained in batteries; 2,000 gallons total inventory	Isolated from incompatible chemicals and secondary containment
Carbon Dioxide	Low toxicity; Hazard class – Non flammable gas	TLV: 5,000 ppm (9,000 mg/m3) TWA	Carbon steel tank, 15 tons maximum onsite inventory	Carbon steel tank with crash posts
Lube Oil	Low toxicity Hazard class – NA	None established	Carbon steel tanks, 10,000 gallons in equipment and piping, additional maintenance inventory of up to 550 gallons in 55gallon steel drums.	Secondary containment for tank and for maintenance inventory
Mineral Insulating Oil	Low toxicity Hazard class – NA	None established	Carbon steel transformers; total onsite inventory of 32,000 gallons	Used only in transformers, secondary containment for each transformer
Diesel Fuel	Low toxicity; Hazard class – Combustible liquid	PEL: none established TLV: 100 mg/m3	Carbon steel tank (300 gallons)	Stored only in fuel tank of emergency engine, secondary containment.
Nitrogen	Low toxicity; Hazard class – Non flammable gas	None established	Carbon steel tank; 7,500 pounds total inventory	Carbon steel tank with crash posts
Water treatment chemical NALCO Acti-Brom (R) 7342 Sodium bromide	Low toxicity; Hazard class – Irritant	Sodium bromide = PEL: none established	Plastic totes, 2 x 400 gallons	Inventory management, isolated from incompatible chemicals and secondary containment
Water treatment chemical NALCO pHreedom® 5200M Sodium salt of phosphonomethylated diamine	Low to moderate toxicity; Hazard class – Irritant	Sodium salt of phosphonomethylated diamine = PEL: none established	Plastic totes, 2 x 400 gallons	Inventory management, isolated from incompatible chemicals and secondary containment

Water treatment chemical NALCO PCL-1346	Low toxicity; Hazard class – Irritant	None established for mixture	Plastic totes, 2 x 400 gallons	Inventory management, isolated from incompatible chemicals and secondary containment
Water treatment chemical NALCO Permacare (R) PC-7408 Sodium bisulfite	Low toxicity; Hazard class – Irritant	Sodium bisulfite = PEL: none established: TLV: 5 mg/m3 TWA	Plastic totes, 2 x 400 gallons	Inventory management, isolated from incompatible chemicals and secondary containment
Water treatment chemical NALCO BT-3000 Sodium hydroxide Sodium tripolyphosphate	High toxicity; Hazard class – Corrosive	Sodium hydroxide = PEL: 2 mg/m3 Sodium tripolyphosphate = PEL: none established	Plastic totes, 2 x 400 gallons	Inventory management, isolated from incompatible chemicals and secondary containment
Water treatment chemical NALCO 8338 Sodium nitrite Sodium tolytriazole Sodium hydroxide	Moderate toxicity; Hazard class – Toxic	Sodium nitrite = PEL: none established Sodium tolytriazole = PEL: none established Sodium hydroxide = PEL: 2 mg/m3	Plastic totes, 2 x 400 gallons	Inventory management, isolated from incompatible chemicals and secondary containment
Welding gas Acetylene	Moderate toxicity; Hazard class – Toxic	PEL: none established	Steel cylinders; 200 cubic foot each, 800 cubic foot total on site	Inventory management, isolated from incompatible chemicals,
Welding gas Oxygen	Low toxicity; Hazard class – Oxidizer	PEL: none established	Steel cylinders; 200 cubic foot each, 800 cubic foot total on site	Inventory management, isolated from incompatible chemicals
Welding gas Argon	Low toxicity; Hazard class – Nonflammable gas	PEL: none established	Steel cylinders; 200 cubic foot each, 800 cubic foot total on site	Inventory management
Fertilizer Urea	Low toxicity; Hazard class - NA	WEEL: 10 mg/m3, 8-hour TWA	Stored in bags (dry pellets), 5 x 50-pound, 250 pound total inventory	Inventory management, indoor storage

Fertilizer Monopotassium phosphate	Low toxicity; Hazard class - Irritant	TLV: 10 mg/m3 (inhalable) 8-hr TWA, 3 mg/m3 (respirable) 8-hr TWA PEL: 15 mg/m3 (total dust) 8-hr TWA, 5 mg/m3 (respirable) 8-hr TWA	Stored in bags (dry pellets), 5 x 50-pound, 250 pound total inventory	Inventory management, indoor storage
Activated Carbon	Non-toxic (when unsaturated), low to moderate toxicity when saturated, depending on the adsorbed material; Hazard class – combustible solid	TWA (total particulate): 15 mg/m3 TWA (respirable fraction): 5 mg/m3 TLV (graphite, all forms except graphite fibers): 2 mg/m3 TWA	Used in two x 2,000-lb canisters, 4,000 pounds total inventory, no additional storage	No excess inventory stored onsite, prompt disposal when spent
Herbicide Roundup® or equivalent	Low toxicity; Hazard class - Irritant	Isoproplyamine salt of glyphosphate = no specific occupational exposure has been established	No onsite storage, brought on site by licensed contractor, used immediately	No excess inventory stored onsite
Soil stabilizer Active ingredient: acrylic or vinyl acetate polymer or equivalent	Non-toxic; Hazard class - NA	None established	No onsite storage, supplied in 55-gallon drums or 400gallon totes, used immediately	No excess inventory stored onsite
Calcium Hydroxide (Lime) (water treatment chemical)	Moderate toxicity; Irritant	PEL: 15 mg/m3 (total dust); PEL: 5 mg/m3 (respirable fraction) TLV: 5 mg/m3 (ACGIH)	Bulk Lime Feed System (1 x 100%): 14' D x 56' H Solid	Isolated from incompatible chemicals
Sodium Carbonate (Soda Ash) (water treatment chemical)	Low toxicity; Hazard class – NA.	No specific limits; Only inert dust limits: PEL: 15 mg/m3 (total dust); PEL: 5 mg/m3 (respirable fraction)	Bulk Soda Ash Feed System (1 x 100%): 12' D x 40' H solid	Isolated from incompatible chemicals
Polymer (water treatment chemical)	Low toxicity Hazard class – NA	None	FRP tank; 3000 gallons	Inventory management, isolated from incompatible chemicals and secondary containment
Magnesium Chloride (water treatment chemical)	Low toxicity; Hazard class – NA	No specific limits; only inert dust limits: PEL: 15 mg/m3 (total dust); PEL: 5 mg/m3 (respirable fraction)	FRP tank; 3000 gallons	Inventory management, isolated from incompatible chemicals and secondary containment

Ferric Chloride (water treatment chemical)	High toxicity; Hazard class – Corrosive	No specific limits. TLV: 1 mg/m3 iron salts; TLV: 1 mg/m3 HCl salts;	FRP tank; 3000 gallons	Inventory management, isolated from incompatible chemicals and secondary containment
Sodium Hydroxide, 50% solution (WAC resin regenerant)	High toxicity; Hazard class – Corrosive	PEL: 2 mg/m3 total dust	Plastic totes, 2 x 400 gallons	Isolated from incompatible chemicals and secondary containment
Hydrochloric Acid, 93% solution (WAC resin regenerant)	High toxicity; Hazard class – Corrosive, water reactive	PEL: 5 ppm TLV: 2 ppm	Plastic totes, 2 x 400 gallons	Isolated from incompatible chemicals and secondary containment
Sodium Hypochlorite, 12.5% solution	High toxicity; Hazard class – Poison-B, Corrosive	Workplace Environmental Exposure Limit (WEEL) - STEL: 2 mg/m3 PEL: 0.5 ppm (TWA), STEL: 1 ppm as Chlorine TLV: 1 ppm (TWA), STEL: 3 ppm as Chlorine	Plastic tanks; 8,500 gallons total inventory (1 x 8,500 gallons)	Secondary containment
Sulfuric Acid, 93% solution (water treatment chemical)	High toxicity; Hazard class – Corrosive, water reactive	PEL: 1 mg/m3	Lined, carbon steel tanks; 8,000 gallons total inventory (1 x 8,000 gallons)	Isolated from incompatible chemicals, lined tank, and secondary containment

[1] Low toxicity is used to describe materials with an NFPA Health rating of 0 or 1. Moderate toxicity is used describe materials with an NFPA rating of 2. High toxicity is used to describe materials with an NFPA rating of 3. Extreme toxicity is used to describe materials with an NFPA rating of 4. [2] NA denotes materials that do not meet the criteria for any hazard class defined in the 1997 Uniform Fire Code.

Sources: BS 2008a, Table 5.6-2 and DB 2009r, Table 3

LAND USE

Testimony of James Adams

SUMMARY OF CONCLUSIONS

Staff has provided findings of conformity and conditions of certification that would bring the Beacon Solar Energy project in conformity with the Kern County General Plan and Ordinance Code.

Energy Commission staff concludes that Beacon Solar Energy project would not:

- Result in any impacts to existing agricultural operations or future use; convert farmland to non-agricultural use; or conflict with existing agricultural zoning or Williamson Act contracts;
- Physically disrupt or divide an established community;
- Conflict with any applicable habitat conservation plan or natural community conservation plan; or
- Result in unmitigated project-related impacts on surrounding land uses.

INTRODUCTION

The land use analysis of the Beacon Solar Energy project (BSEP) focuses on the project's consistency with land use plans, ordinances, regulations, and policies, and the project's compatibility with existing or reasonably foreseeable land uses. The project would occupy over 2,000 acres in eastern Kern County. The site is currently vacant but did support some agricultural activities back in the early 1980s (BSEP 2008a, pg. 2-3).

SETTING

The project site is located along the eastern side of State Route (SR) -14 about four miles north-northwest of California City's northern boundary, 15 miles north of the town of Mojave, and 24 miles northeast of the city of Tehachapi (Ibid, pg 1-2). The project area is lightly populated with about 35 to 40 single family residences on 2.5-acre to 10-acre parcels within a community called Cantil, which is just north of BSEP site. Land surrounding the project site, and the project site itself, is largely undeveloped, flat, desert terrain. The closest residence is approximately 0.3-mile north of the nearest project site boundary. The applicant is considering two relatively similar options for connecting with the Los Angeles Department of Water and Power's 230 kV Barren Ridge Switching Station, which is on the west side of SR-14 about 1.5 miles southwest of the project site (see **Land Use Figure 1**).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following table contains all land use LORS applicable to the proposed project.

Land Use Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	None
State	
California Government Code Sections 65352, 65940, and 65944	Requires evaluation of compatibility with military activities for any land use proposal located near a military installation or airspace.
Local	
Kern County	
General Plan (2007)	
Land Use, Open Space, and Conservation Element	Relevant resource designations include areas with existing uses or potential uses for intensive agriculture or resource management. The resource management has a goal to encourage alternative sources of energy, such as wind and solar.
Energy Element Chapter 5.4.5 – Solar Energy Development	This section has a singular goal of encouraging safe and orderly commercial solar development. Relevant policies are: encourage domestic and commercial solar energy uses to conserve fossil fuel; attempt to identify and remove disincentives to domestic and commercial solar energy development; and permit solar energy development in the desert and valley planning regions that have been previously disturbed, and does not pose significant environmental, public health, and safety hazards. The County is committed to working with state and federal agencies and interest groups to establish consistent policies for solar energy development.
Military Readiness Element	This element will consider the impact of new growth on military readiness activities. This includes activities within the R-2508 Special Use Airspace Complex which overlies the project site.
Airport Land Use Compatibility Plan Policy 1.7c	Prior to the approval of a proposal involving any type of land use development…specific findings shall be made that such development is compatible with the training and operational missions of the military aviation installations. Incompatible land uses that result in significant impacts to the military mission of Department of Defense installations or to the Joint Service Restricted R-2508 Complex that cannot be mitigated, shall not be considered consistent with this plan.
Ordinance Code (2005)	Ordinance codes dealing with exclusive agriculture and limited agriculture lands allow for solar energy electrical generators, commercial or domestic, exceeding five kilowatts.

GENERAL PLAN LAND USE DESIGNATIONS AND ZONING WITHIN THE ONE-MILE RADIUS OF THE PROJECT STUDY AREA

The Beacon Solar Energy plant site, construction laydown areas, power block, and transmission line route are all located within designated agricultural zones and parts of the project site are in flood and seismic hazard zones. The transmission line route is displayed on **Land Use Figure 1**. The applicant's Data Response Land 2 indicates that Beacon Solar owns 26 of the 29 separate parcels of the 2,012-acre site for the project and is in the process of acquiring the remaining three (BSEP 2008b). The construction parking area would also be located onsite.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Energy Commission staff has analyzed the information provided in the Application for Certification (AFC) and acquired from other sources to determine consistency of the BSEP with applicable federal, state, and local LORS and the potential for the project to have significant adverse land use-related impacts. Staff has also assessed mitigation measures proposed by the applicant and conditions developed by staff to reduce any potential impacts to a less than significant level, as well as the feasibility and enforceability of those proposed mitigation measures and recommended conditions of certification.

METHOD AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

State/CEQA

Significance criteria used in this document are based on the California Environmental Quality Act (CEQA) Guidelines and LORS utilized by other governmental agencies. Land use impacts may be considered significant if the project would:

- Involve the conversion of Farmland
  - 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 non-agricultural use.
  - Conflict with existing zoning for agricultural use or a Williamson Act contract.
  - Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural uses.
- Physically disrupt or divide an established community.
- Conflict with any applicable habitat conservation plan or natural community conservation plan.
- Preclude, interfere with, or unduly restrict existing or future permitted uses.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction, or that would normally have jurisdiction, over the project. This includes, but is not limited to, a General Plan, community or specific plan, local coastal program, airport land use compatibility plan, or zoning ordinance.

- Have individual environmental effects which, when considered with other impacts from the same project or in conjunction with impacts from other closely related past, present, and reasonably foreseeable future projects, are considerable, compound, or increase other environmental impacts.

In general, a power plant and its related facilities may also be incompatible with existing or planned land uses, resulting in potentially significant impacts, if it creates unmitigated noise, dust, or a public health or safety hazard or nuisance; or results in adverse traffic or visual impacts. Please see other sections of this document, as noted, for a detailed discussion of any additional potential project impacts, recommended mitigation, and conditions of certification. **Land Use Table 2** provides a summary of the consistency of the BSEP with the applicable land use LORS adopted by the federal government, the state of California, and Kern County as identified in **Land Use Table 1**. Conditions of certification have been proposed to make the project consistent with the LORS, where necessary.

Based on Energy Commission staff's independent review of the AFC and local Ordinance Code, staff has determined that the project would comply with all land use LORS for Kern County. Energy Commission staff has proposed Condition of Certification **LAND-1** as a means of verifying that the project, if certified, would be built, in accordance with the county's minimum agricultural and building zoning ordinance titles.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Conversion of Farmland

As noted above, the project site was used for intensive agricultural activities. This occurred in the mid 1980s and because no land has been irrigated since 2000, the property is not designated as "farmland" in the Farmland Mapping and Monitoring Program maintained by the California Department of Conservation (CDOC 2008). There are no lands within the project site under the control of the Williamson Act. Neither the construction nor operational activities of the proposed project would result in any impacts to existing agricultural operations or foreseeable future agricultural use. Therefore, the proposed project would not result in the conversion of farmland to non-agricultural use or conflict with existing agricultural zoning or Williamson Act contracts. The existing zoning of the project site allows for solar energy electrical generators. The project would have no impact with respect to farmland conversion.

Physical Division of an Existing Community

The proposed BSEP site is located near the community of Cantil which is designated as a Special Treatment Area as noted in Kern County General Plan Chapter 1.5 (kern County 2004). These areas are generally small rural communities located throughout the county that are historically identifiable as a mixture of residential and supportive commercial and other uses serving the community and the surrounding population. The county is committed to ensuring that these communities retain their unique character and that they are preserved and enhanced by recognizing the scale, density, size, and composition of development. The northern portion of the plant site is within the Cantil Rural Community Area as designated in Map Unit 5.6 of the Residential chapter within

the Special Treatment Areas section of the General Plan. The applicable goal in this chapter is to minimize land use conflicts between residential and resource, commercial, or industrial land uses (Ibid, pg. 35). The applicants Figure 5.7-5 from the AFC shows the project's footprint on the Cantil Community Area is bounded to the north by Richards Avenue and to the west by Sixtieth Street. The BSEP would not divide this community.

Conflict with any Applicable Habitat or Natural Community Conservation Plan

The proposed project site is not subject to any Habitat or Natural Community Conservation Plan or within the boundaries of any wildlife preserve or critical habitat area.

Conflict with any Applicable Land Use Plan, Policy, or Regulation

As required by California Code of Regulations, section 1744, Energy Commission staff evaluates the information provided by the applicant in the AFC to determine if elements of the proposed project would conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project, or that would normally have jurisdiction over the project except for the Energy Commission's exclusive authority. This includes all applicable federal, state, and local laws, ordinances, regulations, and standards, including those adopted by Kern County. From a CEQA perspective, the analysis places particular emphasis on any environmental effect that may be avoided or mitigated by conformity with the applicable LORS.

Kern County General Plan

The BSEP is located within the jurisdiction of Kern County. Land use and zoning designations for the site include agriculture (exclusive and limited), platted lands, and seismic and flood hazards (BSEP 2008a, Figure 5.7-6). The project represents a significant change to the existing use of the property which has been vacant land since the mid-1980s, when intensive agricultural activities ceased operation. Onsite Structures

As shown in Figure 5.7-6, portions of the BSEP site are in seismic (Alquist-Priolo Earthquake Fault Zone) and flood hazard (Pine Creek) areas as described in the Physical and Environmental Constraint chapter of the Land Use, Open Space, and Conservation Element of the General Plan. Policy #10 states that…"the County will allow lands which are within flood hazard areas, other than primary floodplains, to be developed in accordance with the General Plan and Floodplain Management Ordinance, if mitigation measures are incorporated so as to ensure that the proposed development will not be hazardous within the requirements of the Safety Element of the General Plan" (Kern County 2006, pg. 13). The applicant has identified relevant implementation measures from the Physical and Environment Constraint chapter that staff considers reasonable.

A. Development within areas subject to flooding, as defined by the appropriate agency, will require necessary flood evaluations and studies.

B. Designated flood channels and water courses, such as creeks, gullies, and riverbeds, will be preserved as resource management areas.

C. Compliance with the Floodplain Management Ordinance prior to grading or improvement of land for development or the construction, expansion, conversion or substantial improvements of a structure is required.

Staff is aware that the entire length of Pine Tree Creek and an un-named flood wash on the project site will be rerouted to the south and east; and the BSEP would be consistent with implementation measures H,I, and J. Changes to the Federal Emergency Management Agency (FEMA) special flood hazard area (SFHA) would require a Conditional Letter of Map Revision (CLOMR) to address LORS and comply with the Kern County Floodplain Management Ordinance. Because the site is mapped as a Zone A SFHA, BSEP would be required to follow Zone A map revision requirements described in FEMA's Managing Floodplain Development in Approximate Zone A Areas (See Soil and Water Resources sections for more information). As conditioned in Soil and Water 6, and in accordance with Kern County's Floodplain Management Ordinance and 44 CFR 65.12, the project owner shall prepare all necessary engineering plans and documents to support a Conditional Letter of Map Revision (CLOMR) application submittal to FEMA.

The Kern County General Plan also has an Energy Element which has a primary objective of promoting and facilitating energy development. As noted in **Land Use Table 1**, one of the energy related goals is encouraging commercial solar development. Therefore, the project is consistent with the Kern County General plan.

The BSEP power block and solar arrays will occupy 1,266 acres of the 2,012-site while rerouted drainage canal, evaporation ponds, access road, administration buildings and other support facilities, bioremediation areas, and some open areas would take up the rest of the project site (BSEP 2008a, pg. 2-3). Some existing unpaved roadways and future road corridors on the BSEP site would be removed from service but the county has indicated that this impact can be mitigated by an amendment to the Circulation Element of the Kern County General Plan (Ibid pg. 5.7-6). Staff has been advised by Kern County staff that an amendment to the Circulation Element was approved by the Kern County Board of Supervisors at their April 21, 2009 board meeting (Kern County 2009b).

The BSEP is situated on 2,012 acres which is currently undeveloped and consists of approximately 30 underlying parcels created in the past for future rural residential development. With the construction of the power plant and solar array, Energy Commission staff is requesting that the applicant merge the parcels so that all components of the project are located on one parcel, and comply with all applicable provisions of the Subdivision Map Act. Commission staff has proposed Condition of Certification **LAND-3** requiring merger of these parcels to ensure compliance with this chapter.

Offsite StructuresThe new 3.5-mile transmission line route would extend west across SR-14 and would head south and connect with the existing Barren Ridge Switching Station (see **Land Use Figure 1**). The new transmission line would not present a new physical barrier within the community. Activities associated with the existing rights-of-way and installation of the transmission pole upgrades would not block existing transportation corridors and would only result in limited road delays. Arrival and

departure of construction personnel and delivery of materials and supplies would occur along existing roadways and could significantly contribute to existing traffic congestion (see proposed Condition of Certification **TRANS-1** for mitigation discussed in the **TRAFFIC AND TRANSPORTATION** section of this staff assessment). Therefore, implementation of the proposed project would have a less than significant impact on community transportation or interaction and would not divide the community.

Water for a wet cooling tower, process water, industrial uses, and potable uses would be supplied by on-site groundwater wells. A water treatment system would be installed to ensure that water quality meets potable standards and a sanitary septic system and onsite leach field will be used to dispose of sanitary wastewater (Ibid, pg 2.2).

Staff Proposed Water Project Alternatives

Pursuant to the Committee Scheduling Order dated June 18, 2008, staff has evaluated several different alternative cooling water options for the proposed BSEP. Two of those alternatives involve using tertiary treated wastewater, as generally described below.

Rosamond Water Alternative

The Rosamond Community Services District (RCSD) proposes to supply tertiary-treated wastewater for BSEP's facility operations, as an alternative to BSEP's proposal to use potable water as process water. In order to supply water from the RCSD facility to the BSEP site, an underground water pipeline would need to be constructed. Staff has worked with the RCSD to identify a proposed route that follows existing road rights-of-ways.

California City Water Alternative

The city of California City (CA City) proposes to supply tertiary-treated wastewater for BSEP's facility operations, as an alternative to BSEP's proposal to use potable water as process water. In order to supply water from the CA City waste water treatment plant (WWTP) to the BSEP site, an underground water pipeline would need to be constructed along dedicated roadways (i.e., Mendiburu Road and Neuralia Road). CA City staff has proposed a pipeline route that follows existing road right-of-ways.

Because the project is consistent with the local land use designations, there will no adverse land impacts.

Kern County Zoning Ordinance Code

As displayed in the applicant’s Figure 5.7-6, the proposed project site is zoned Exclusive or Limited Agriculture (A and A-1), which is consistent with the Kern County General Plan Land Use designation shown in staff’s **Land Use Figure 1**. Portions of the site are in a Seismic Hazard zone and Flood Zone A (see **Water Resources** section for discussion on requirements for building in a flood zone). In addition, the transmission line would cross over land that is zoned Platted Lands. Title 19 of the Kern County Ordinance Code contains ordinances that deal with planning and zoning standards, requirements, and restrictions. Limited agriculture (A-1) specifically provides for resource extraction and energy development uses including solar energy electrical generators, commercial or domestic, exceeding five kilowatts capacity. Exclusive

agriculture (A) and Recreation-Forestry (RF) also allows for the same solar energy use. Platted lands (PL) allows for utility and communication facilities such as a utility substation. Transmission option 2 would cross over an RF Zone area. Transmission lines are permitted in RF zoned areas. There are no height limitations except in areas of protected military airspace.

Land Use Compatibility

The project would be located within the county of Kern General Plan boundaries, in an area that supports agricultural and resource management activities (see **Land Use Figure 1**). Most of the proposed project site has a General Plan land use designation of extensive or intensive agriculture. The project is consistent with other uses currently permitted within that land use designation. Surrounding properties are proposed primarily for agriculture and resource management.

When a jurisdictional authority, such as the county of Kern, establishes zoning districts, it is that agency's responsibility to ensure the compatibility of adjacent zoning districts and permitted uses, and incorporate conditions and restrictions that ensure those uses will not result in a significant adverse impact ("minimum of detriment") to surrounding properties. Therefore, staff assumes that permitted industrial uses or those deemed equivalent to a permitted use sited on properties zoned agricultural or resource management are compatible with surrounding uses and zoning districts. Those uses operating under a valid use permit would also be considered compatible.

The BSEP site is located within the 20,000-square-mile R-2508 military range complex and, more specifically, is under a "special use airspace" and a "low level flight path". The California Office of Planning and Research has prepared a R-2508 Joint Land Use Study that examines land use issues involved with this military range complex. Staff has reviewed a letter from the R-2508 Complex Sustainability Office that notes that the BSEP underlies several military air routes and special use airspace. However, it has been determined that the project will not have significant impacts on military activities if certain mitigation measures are implemented (NASCWP 2008). The proposed mitigation measures require the project owner to advise R-2508 officers information on planned use of the electronic spectrum (frequencies) during construction activities. In addition, the Kern County Planning Department has adopted a Military Readiness Element as part of the General Plan. This consultation is also required by Policy 1.7c of the Kern County Airport Land Use Compatibility Plan as noted in **Land Use Table 1.**

Staff's proposed Condition of Certification **LAND-2** would ensure that the project owner advise Department of Defense (DOD) representatives about the radio transmission frequencies used during the project's construction and operation. This would allow DOD representatives an opportunity to determine if project radio transmissions would interfere with military activities.

Energy Commission staff has determined that, as discussed in other sections of this document, the Beacon Solar Energy project would not result in unmitigated project-related impacts to surrounding properties. (See the **AIR QUALITY, HAZARDOUS MATERIALS, NOISE, PUBLIC HEALTH, TRAFFIC AND TRANSPORTATION,** and **VISUAL RESOURCES** sections of this document for a complete discussion of noise, dust, public health hazards or nuisance; and adverse traffic or visual impacts.)

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "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., title 14, section 15065(a)(3)].

The applicant has identified two additional projects in the general area of the BSEP site. The first is LADWP Barren Ridge-Castaic Transmission Line Project which would begin at the Barren Ridge Switching Station about 1.5 miles south of the project site and would proceed south to Los Angeles County. The second project is the Pine Tree Wind Development which would be located six miles west of the BSEP site (BSEP 2008, pg. 5.7-12). Due to the distance from the BSEP site and the absence of significant land use impacts associated with either project or with the BSEP, cumulative impacts to existing land uses and policies would be less than significant. The Pine Tree site was previously used for grazing and/or was undeveloped land and the new transmission line would be built in an existing transmission corridor (Pine Tree 2008, LADWP 2008). No projects have been identified in the project vicinity that would create significant cumulative land use impacts when considered together with the BSEP.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff reviewed a letter from Kern County Planning Department dated April 22, 2008 which opined that a zoning change would be needed related to Estate zone lots affected by the project. However, as shown on Land Use **Figure** 1, there are no Estate zone lots affected by the BSEP and a zoning change was not required. Staff has also reviewed the county of Kern's proposed change to the verification for Condition of Certification **LAND-1** and believes it is reasonable. This involves the applicant submitting proposed development plans to two additional County divisions, The verification has been amended as requested. The County also recommended that the power plant be consolidated onto one legal lot to clear the property from potentially conflicting uses. Staff's proposed Condition of Certification **Land 3** would ensure that this consolidation takes place. Finally, Kern County staff advised staff that the Circulation Element of the General Plan has been amended to allow existing unpaved roadways and future road corridors on the project site to be removed from service (Kern County 2009e). Staff is unaware of any other agency or public comments related to land use.

CONCLUSIONS AND RECOMMENDATIONS

The Kern County General Plan allows for industrial and renewable energy development in agricultural and resource management areas. The Kern County General Plan encourages safe and orderly commercial solar development in the desert and valley planning areas. Furthermore, the Beacon Solar Energy project meets the following criterion:

- The BSEP would not physically disrupt or divide an established community or conflict with any applicable habitat conservation plan or natural community

conservation plan; result in any impacts to existing agricultural operations or future use; convert farmland to non-agricultural use; or conflict with existing agricultural zoning or Williamson Act contracts.

- The proposed project is consistent with the Kern County 2007 General Plan policies the Zoning Ordinance and the project's proposed location is zoned agricultural with a geologic hazard, which is consistent with the agricultural land use designation.
- The BSEP would not have significant impacts regarding the military R-2508 Complex Sustainability operations or mission (see proposed Condition of Certification **LAND-2**; and
- Full implementation of proposed Conditions of Certification **LAND-1 & 2** would make the project consistent with applicable LORS.

Staff recommends that the Commission adopt the following conditions of certification if it approves the project.

PROPOSED CONDITIONS OF CERTIFICATION

LAND-1 The project owner shall design and construct the project in accordance with the applicable standards found in the Kern County Ordinance Code (Title 17) which includes the following:

- Building and grading codes ;
- Floodplain management and Storm Water Pollution Prevention Plan;
- Mechanical and electrical code; and
- Energy code.

Verification: At least 90 calendar days prior to the start of construction, including any grading or site remediation on the power plant project site or its associated easements, the project owner shall submit the proposed development plan to the Kern County Planning Department, Kern County Engineering and Survey Services Department Building Inspection Division and Kern County Engineering and Survey Services Department/Floodplain Management Division for review and comment and to the CPM for review and approval. The project owner shall also provide the CPM with a copy of the transmittal letter to the Kern County Planning Department, Kern County Engineering and Survey Services Department Building Inspection Division and Kern County Engineering and Survey Services Department/Floodplain Management Division.

At least 30 calendar days prior to site mobilization, the project owner shall provide copies of any comment letters received from the Kern County Departments, along with any changes to the proposed development plan, to the CPM for review and approval.

LAND-2 The project owner shall notify the Department of Defense (DOD) about the radio frequencies that would be used during the BSEP's operation. This would allow the DOD to determine if the project's use of those radio frequencies would interfere with military activities within the R-2508 Military Complex area.

Verification: At least 30 days prior to site mobilization, the project owner shall provide DOD representatives with information about the specific radio frequencies to be used during project construction and operation. As needed, the project owner will modify the radio frequencies per DOD requirements. These modifications must be confirmed in writing from the DOD and shall be submitted to the CPM for review and approval.

LAND-3 The project owner shall adjust the boundaries of all parcels or portions of parcels that constitute the BSEP site as necessary to merge all properties into a single parcel, under single ownership, within the jurisdiction of the Kern County Planning Department, in accordance with provisions and procedures set forth in the County's Municipal Code, Title 17 (Subdivision Ordinance).

Verification: At least 30 days prior to site mobilization, the project owner shall submit evidence to the CPM, indicating approval of the merger of parcels by the Kern County Planning Department. The submittal to the CPM shall include evidence of compliance with all conditions and requirements associated with the approval of the Certificate of Merger and/or Notice of Lot Line Adjustment by the city. If all parcels or portions of parcels are not owned by the project owner at the time of the merger, a separate deed shall be executed and recorded with the County recorder, as required by the Kern County Land Division Ordinance Section §§18.25.030 (c). A copy of the recorded deed shall be submitted to the CPM, as part of the compliance package.

REFERENCES

BS 2008a - FPL Energy/ M. O'Sullivan (tn 45646). Application for Certification, dated March 13, 2008. Submitted to CEC/Docket Unit on 3/14/08.

BS 2008c – Beacon Solar, LLC/G (tn 45972) AFC Volume 3 - Data Adequacy Supplement, dated 4/18/2008. Submitted to CEC/Docket Unit on 4/21/08.

BS 2008f - FPL Energy/ M. O'Sullivan (tn 46698). Applicants Slide Presentation,dated 6/11/ 2008. Submitted to CEC/Docket Unit on 6/16/08.

CDOC 2008 - California Department of Conservation. Personal communication between Molly Penberth and James Adams, CEC, on 9/22/2008.

CEC 2009x – California Energy Commission/ J. Adams (tn 52868). ROC with Kern County Planning Department, dated 8/13/09. Submitted to CEC/Docket Unit on 8/13/09.

DB 2009r – Downey Brand/S. Rowlands (tn 52116). Applicant Project Design Refinements, dated 6/22/2009. Submitted to CEC/Docket Unit on 6/22/09.

KC 2005 - County of Kern Ordinance Zone, Titles 17 and 19, effective February 2005.

KC 2006 – County of Kern Airport Land Use Compatibility Plan, last amended on June 13, 2006.

KC 2007 - General Plan, effective April 12, 2007.

KC 2008c - County of Kern/ L. Oviatt (tn 46004), Preliminary Agency Comments on Review of the AFC, dated 4/22/08. Submitted to CEC/Docket Unit on 4/23/08

KC 2008f - County of Kern/ L. Oviatt (tn 48129) Kern County Planning Department Comments and Requests for Conditions, dated 9/16/2008. Submitted to CEC/Docket Unit on 9/22/08.

KC 2009e - Kern County Planning Department (tn 51135). Kern County Comments on Preliminary Staff Assessment, dated 4/13/2009. Submitted to CEC/Docket Unit on 4/17/09.

KC 2009g - Personal communication between Lorelei Oviatt and James Adams on 5/6/2009.

LADWP 2008 - Los Angeles Department of Water and Power 2008. News Release- *LADWP Launches Environmental Study of Transmission Project to Access Renewable Energy in Tehachapi/Mojave Area*, dated 4/7/2008.

NASCWD 2008 - Naval Air Systems Command Weapons Division. Letter from A. M. Parisi, Complex Sustainability Officer, to Gary Palo, BSEP Project Manager, dated 2/19/ 2008.

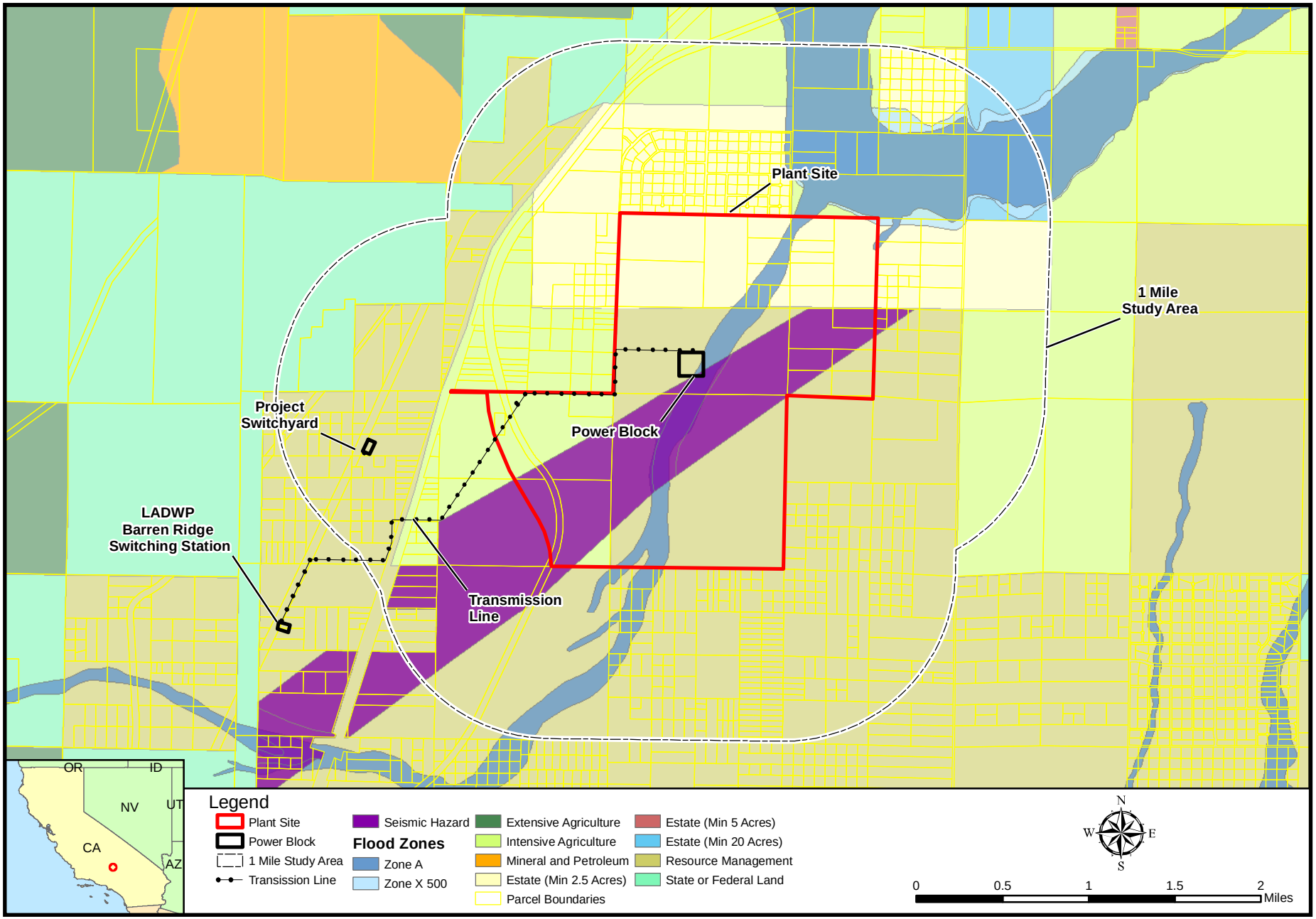
Pine Tree Wind Development Project 2008 - Environmental Assessment/Final EIR, approved by the Kern County Board of Supervisors on 7/26/2008.

PRC 2005 - Public Resources Code §25000 et seq (Division 15 - Warren-Alquist State Energy Resources Conservation and Development Act), Chapter 6 - Power Facility and Site Certification, §§25500-25543; September 2005.

R-2508 2008 - R-2508 Joint Land Use Study, Executive Summary, April 2008.

LAND USE - FIGURE 1

Beacon Solar Energy Project - Kern County General Plan Land Use Designations



SOURCE: AFC Figure 5.7-4

NOISE AND VIBRATION

Testimony of Erin Bright and Steve Baker

SUMMARY OF CONCLUSIONS

California Energy Commission staff concludes that the Beacon Solar Energy Project can be built and operated in compliance with all applicable noise and vibration laws, ordinances, regulations, and standards and, if built in accordance with the conditions of certification proposed below, would produce no significant adverse noise impacts on people within the affected area, either direct, indirect, or cumulative.

INTRODUCTION

The construction and operation of any power plant creates noise, or unwanted sound. The character and loudness of this noise, the times of day or night that it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts. In some cases, vibration may be produced as a result of power plant construction practices, such as blasting or pile driving. The groundborne energy of vibration has the potential to cause structural damage and annoyance.

The purpose of this analysis is to identify and examine the likely noise and vibration impacts from the construction and operation of the Beacon Solar Energy Project (Beacon) and to recommend procedures to ensure that the resulting noise and vibration impacts would be adequately mitigated to comply with applicable laws, ordinances, regulations, and standards (LORS) and to avoid creation of significant adverse noise or vibration impacts. For an explanation of technical terms and acronyms employed in this section, please refer to **Noise Appendix A** immediately following.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Noise Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal (OSHA): 29 U.S.C. § 651 et seq.	Protects workers from the effects of occupational noise exposure.
State (Cal/OSHA): Cal. Code Regs., tit. 8, §§ 5095–5099	Protects workers from the effects of occupational noise exposure.
Local Kern County General Plan Noise Element Policies (5)(a) and (5)(b)	Policy (5) prohibits new noise-sensitive land uses in noise-impacted areas unless effective mitigation measures are incorporated to (a) reduce noise levels in outdoor activity areas to 65 dBA L_{dn} or less, and (b) reduce interior noise levels to 45 dBA L_{dn} or less.

FEDERAL

Under the Occupational Safety and Health Act of 1970 (29 USC § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration (OSHA) has adopted regulations designed to protect workers against the effects of occupational noise exposure (29 CFR § 1910.95). These regulations list permissible noise exposure levels as a function of the amount of time during which the worker is exposed (see **NOISE Appendix A, Table A4** immediately following this section). The regulations further specify a hearing conservation program that involves monitoring the noise to which workers are exposed, assuring that workers are made aware of overexposure to noise, and periodically testing the workers' hearing to detect any degradation.

There are no federal laws governing off-site (community) noise.

The only guidance available for evaluation of power plant vibration is guidelines published by the Federal Transit Administration (FTA) for assessing the impacts of groundborne vibration associated with construction of rail projects. These guidelines have been applied by other jurisdictions to assess groundborne vibration of other types of projects. The FTA-recommended vibration standards are expressed in terms of the "vibration level," which is calculated from the peak particle velocity measured from groundborne vibration. The FTA measure of the threshold of perception is 65 VdB,[1] which correlates to a peak particle velocity of about 0.002 inches per second (in/sec). The FTA measure of the threshold of architectural damage for conventional sensitive structures is 100 VdB, which correlates to a peak particle velocity of about 0.2 in/sec.

STATE

California Government Code section 65302(f) encourages each local governmental entity to perform noise studies and implement a noise element as part of its General Plan. In addition, the California Office of Planning and Research has published guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure.

The California Occupational Safety and Health Administration (Cal/OSHA) has promulgated Occupational Noise Exposure Regulations (Cal. Code Regs., tit. 8, §§ 5095–5099) that set employee noise exposure limits. These standards are equivalent to the federal OSHA standards (see the **Worker Safety and Fire Protection** section of this document, and **NOISE Appendix A, Table A4**).

LOCAL

Kern County General Plan Noise Element

Two policies enunciated in this noise element (Kern County 2007) impact the construction and operation of a project such as Beacon. Policy (5)(a) prohibits new noise-sensitive land uses in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels in outdoor activity areas to 65 dBA L_{dn} or less. Policy (5)(b) prohibits new noise-sensitive land uses in noise

[1] VdB is the common measure of vibration energy.

impacted areas unless effective mitigation measures are incorporated into the project design to reduce interior noise levels within living spaces or other noise sensitive interior spaces to 45 dBA L_{dn} or less. It should be noted that there are no current noise ordinances in Kern County.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified and that such impacts be eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA Guidelines (Cal. Code Regs., tit. 14, App. G) sets forth some characteristics that may signify a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

1. exposure of persons to, or generation of, noise levels in excess of standards established in the local General Plan or noise ordinance or applicable standards of other agencies;

2. exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

3. substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or

4. substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The Energy Commission staff, in applying item 3 above to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by 5 dBA or more at the nearest sensitive receptor.

Staff considers it reasonable to assume that an increase in background noise levels up to 5 dBA in a residential setting is insignificant; an increase of more than 10 dBA is considered significant. An increase between 5 and 10 dBA should be considered adverse, but may be either significant or insignificant, depending on the particular circumstances of the case.

Factors to be considered in determining the significance of an adverse impact as defined above include:

1. the resulting combined noise level;[2]

[2] For example, a noise level of 40 dBA would be considered quiet in many locations. A noise limit of 40 dBA would be consistent with the recommendations of the California Model Community Noise Control Ordinance for rural environments and with industrial noise regulations adopted by European jurisdictions. If the project would create an increase in ambient noise no greater than 10 dBA at nearby sensitive

2. the duration and frequency of the noise;
3. the number of people affected;
4. the land use designation of the affected receptor sites; and
5. public concern or controversy as demonstrated at workshops or hearings or by correspondence.

Noise due to construction activities is usually considered to be insignificant in terms of CEQA compliance if:

- the construction activity is temporary;
- use of heavy equipment and noisy activities are limited to daytime hours; and
- all industry-standard noise abatement measures are implemented for noise-producing equipment.

Staff uses the above method and threshold to protect the most sensitive populations, including the minority population.

SETTING

Beacon would be constructed on a 2,012 acre site approximately 4 miles northwest of California City in eastern Kern County. The site and surrounding land are largely vacant, with the exception of the Honda Proving Center located approximately 0.8 miles to the east (BS 2008a, AFC § 2.3).

The ambient noise regime in the project vicinity consists of highway traffic, train traffic and the Honda Proving Center. The nearest sensitive noise receptor is a residence 0.3 miles southeast of the project site (BS 2008a, AFC Table 5.8-4).

Ambient Noise Monitoring

In order to establish a baseline for comparison of predicted project noise to existing ambient noise, the applicant has presented the results of an ambient noise survey (BS 2008a, AFC § 5.8.2; Tables 5.8-4 and 5.8-5). The survey was conducted on December 3 and 4, 2007, and monitored existing noise levels at the following locations, shown on **Noise and Vibration Figure 1**:

1. Measuring Location 1: Near a residence located approximately 1,700 feet southeast of the project site where the project site boundary turns west. This represents the nearest sensitive receptor, the one most likely to be impacted by project noise. Long-term (25-hour) monitoring showed ambient noise levels typical of a desert environment.

receptors, and the resulting noise level would be 40 dBA or less, the project noise level would likely be insignificant.

2. Measuring Location 2: Near a residence located on the west side of SR-14 approximately 2,500 feet from the western edge of the project site. Long-term (25-hour) monitoring showed ambient noise levels higher than those at M-1 due to traffic on SR-14.

Noise Table 3 summarizes the ambient noise measurements (BS 2008a, AFC Table 5.8-4):

Noise Table 3
Summary of Measured Ambient Noise Levels

Measurement Location	Measured Noise Levels, dBA		
	L_{eq} – Daytime[1]	L_{eq} – Nighttime[2]	L_{90} – Nighttime[3]
Location 1: East Residence	39	35	33
Location 2: West Residence	55	57	23

Source: BS 2008a, AFC Table 5.8-4
[1] Staff calculations of average of 15 daytime hours
[2] Staff calculations of average of 9 nighttime hours
[3] Staff calculations of average of 4 consecutive quietest hours of the nighttime

DIRECT IMPACTS AND MITIGATION

Noise impacts associated with the project can be created by short-term construction activities and by normal long-term operation of the power plant.

Construction Impacts and Mitigation

Construction noise is usually considered a temporary phenomenon. Construction of Beacon is expected to occur over a period of 25 months (BS 2008a, AFC § 5.8.3.2).

Compliance with LORS

Construction of an industrial facility such as a power plant is typically noisier than permissible under usual noise ordinances. In order to allow the construction of new facilities, construction noise during certain hours of the day is commonly exempt from enforcement by local ordinances. It should be noted that there are no specific LORS limiting construction noise in Kern County.

CEQA Impacts

Power Plant Site

To evaluate construction noise impacts, staff compares the projected noise levels to the ambient. Since construction noise typically varies continually with time, it is most appropriately measured by, and compared to, the L_{eq} (energy average) metric.

The Applicant has predicted the noise impacts of project construction on the nearest sensitive receptors (BS 2008a, AFC § 5.8.3.2). Assuming peak construction activity, a maximum noise level of 75 dBA L_{dn} is estimated to occur at a distance of 50 feet from the acoustic center of the construction activity (most often the power block) and

attenuate to 40 dBA L_{dn} or less at project site boundaries. Noise levels at the nearest residence, Location 1 (to the east), are thus projected to reach approximately 31 dBA L_{eq} for peak construction (BS2008a, AFC § 5.8.2.2, Figure 5.8-2; and staff calculations) compared to daytime and nighttime average ambient background noise levels there of 39 and 35 dBA L_{eq}, respectively. For lack of equivalent noise level values for construction noise data, staff assumes that construction noise for this project would be relatively constant and the 40 dBA L_{dn} estimated for construction noise would therefore equate to 34 dBA L_{eq} at site boundaries. Given this assumption, construction noise would be unnoticeable at the nearest receptor during both daytime and nighttime hours.

Noise Table 4
Predicted Power Plant Construction Noise Impacts

Receptor	Highest Construction Noise Level[1] (dBA L_{eq})	Measured Existing Ambient[2] (dBA L_{eq})	Cumulative (dBA L_{eq})	Change (dBA)
Location 1 — Nearest residence (east)	31	39 daytime	40 daytime	+1 daytime
		35 nighttime	36 nighttime	+1 nighttime
Location 2 — Residences to west	30	55 daytime	55 daytime	+0 daytime
		57 nighttime	57 nighttime	+0 nighttime

1 Source: BS 2008a, AFC § 5.8.3.2 and staff calculations
2 Source: BS 2008a, AFC Table 5.8-4 and staff calculations of average of daytime and nighttime hours.

In the event that actual construction noise should annoy nearby residents, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2**, which would establish a Notification Process to make nearby residents aware of the project, and a Noise Complaint Process that requires the applicant to resolve any problems caused by noise from the project.

Linear Facilities

Linear facilities include new electrical transmission lines interconnecting to the transmission system to the west of the project site, extending past the project site boundaries (BS 2008a, AFC Figure 2.1). While the construction noise levels for the linears would be noticeable, construction on linears proceeds rapidly, so no particular area is exposed to noise for more than a few days.

Steam Blows

Typically, the loudest noise encountered during construction, inherent in building any project incorporating a steam turbine, is created by the steam blows. After erection and assembly of the feedwater and steam systems, the piping and tubing that comprises the steam path has accumulated dirt, rust, scale and construction debris such as weld

spatter, dropped welding rods and the like. If the plant were started up without thoroughly cleaning out these systems, all this debris would find its way into the steam turbine, quickly destroying the machine.

In order to prevent this, before the steam system is connected to the turbine, the steam line is temporarily routed to the atmosphere. High pressure steam is then raised in a heat recovery steam generator (HRSG) or a boiler and allowed to escape to the atmosphere through the steam piping. This flushing action, referred to as a steam blow, is quite effective at cleaning out the steam system. A series of short steam blows, lasting two or three minutes each, is performed several times daily over a period of two or three weeks. At the end of this procedure, the steam line is connected to the steam turbine, which is then ready for operation.

These steam blows can produce noise as loud as 130 dBA at a distance of 100 feet. This would attenuate to about 93 dBA, an exceedingly disturbing level, at the nearest residence (BS 2008a, AFC § 5.8.2.2; Figure 5.8-2). In order to minimize disturbance from steam blows, the steam blow piping can be equipped with a silencer that will reduce noise levels by 20 to 30 dBA, or to a level of 63 to 73 dBA at the nearest residence. This is still an annoying noise level; staff proposes that any high pressure steam blows be muffled with an appropriate silencer, and be performed only during restricted daytime hours (see proposed Conditions of Certification **NOISE-6** and **NOISE-8** below) in order to minimize annoyance to residents.

Alternatively, the Applicant may elect to employ a new, quieter steam blow process, variously referred to as QuietBlow™ or Silentsteam™. This method utilizes lower pressure steam over a continuous period of approximately 36 hours. Resulting noise levels reach only about 80 dBA at 100 feet; noise levels at the nearest residence would thus be about 43 dBA, much closer to the ambient background noise levels.

Regardless which steam blow process the Applicant chooses, staff proposes a notification process (see proposed Condition of Certification **NOISE-7** below) to make neighbors aware of impending steam blows. This should help ensure the process is at least tolerable to residents.

The applicant submitted a comment to staff's Preliminary Staff Assessment requesting changes to proposed Condition of Certification **NOISE-6**. Specifically, the applicant wishes staff to remove specific requirements for steam blow silencing; and to ease the restrictions on permissible noise levels from the process by specifying maximum noise levels of 110 dBA measured at 100 feet from the project boundary, rather than 100 feet from the source of the noise. Staff agrees to remove specific requirements for silencing, but does not agree to the change in permissible noise levels. At least two sensitive receptors (residences east of the project site and at Location 1, southeast of the project site) are relatively distant from the power block, where steam blow noise would originate, but are much nearer the project boundary. The applicant's requested change in measurement of noise levels could result in intolerable noise impacts at these receptors.

Pile Driving

The applicant does not discuss whether pile driving would be necessary for construction of Beacon. If pile driving is required for construction of the project, the noise from this operation could be expected to reach 104 dBA at a distance of 50 feet. Pile driving noise would thus be projected to reach levels of 61 dBA at Location 1, the nearest residential receptor (staff calculation). Added to the existing daytime ambient level of 39 dBA L_{eq}, this would combine to produce 61 dBA, an increase of 22 dBA over ambient noise levels (see **NOISE Table 5,** below). While this would produce a noticeable impact, staff believes that limiting pile driving to daytime hours, in conjunction with its temporary nature, would result in impacts tolerable to residents. Staff proposes condition of certification **NOISE-8** to ensure that pile driving noise, should it occur, would be limited to daytime hours.

Noise Table 5
Pile Driving Noise Impacts

Receptor	Pile Driving Noise Level (dBA L_{eq})	Daytime Ambient Noise Level (dBA L_{eq})	Cumulative Level (dBA)	Change (dBA)
Location 1	61	39	61	+22
Location 2	60	55	61	+6

1 Source: BS 2008a, AFC Table 5.8-4 and staff calculations

Vibration

The only construction operation likely to produce vibration that could be perceived off site would be pile driving, should it be employed. Vibration attenuates rapidly; it is likely that no vibration would be perceptible at any appreciable distance from the project site. Staff therefore believes there would be no significant impacts from construction vibration.

Worker Effects

The applicant has acknowledged the need to protect construction workers from noise hazards and has recognized those applicable LORS that would protect construction workers (BS 2008a, AFC § 5.8.3.2). To ensure that construction workers are, in fact, adequately protected, staff has proposed Condition of Certification **NOISE-3**, below.

Operation Impacts and Mitigation

The primary noise sources of Beacon include the steam turbine generators, cooling tower, start-up boiler, and various pumps and fans (BS 2008a, AFC § 5.8.3.3; Table 5.8-8). Staff compares the projected noise with applicable LORS. In addition, staff evaluates any increase in noise levels at sensitive receptors due to the project in order to identify any significant adverse impacts.

The applicant included the following noise mitigation measures in performing computer modeling of noise impacts from project operation (BS 2008a, AFC § 5.8.3.3; Table 5.8-8):

- metal acoustical steam turbine enclosure; and

- 25-foot high solar mirror arrays surrounding the power block.

Compliance with LORS

The applicant performed noise modeling to determine the project's noise impacts on sensitive receptors (BS 2008a, AFC § 5.8.3.3). Project operating noise levels are expected to attenuate to less than 40 dBA L_{dn} before reaching project site boundaries. This figure complies with the noise level limits specified in the Kern County General Plan Noise Element; see **Noise Table 6**.

Noise Table 6
Plant Operating Noise LORS Compliance

Receptor	LORS	LORS Limit	Projected Noise Level
Location 1 (closest residence)	Kern County General Plan Noise Element	65 dBA L_{dn} daytime 45 dBA L_{dn} nighttime	40 dBA L_{dn}

Source: Kern County 2007 and BS 2008a, AFC § 5.8.3.3.

CEQA Impacts

Power plant noise is unique. Essentially, a power plant operates as a steady, continuous, broadband noise source, unlike the intermittent sounds that comprise the majority of the noise environment. As such, power plant noise contributes to, and becomes part of, the background noise level, or the sound heard when most intermittent noises cease. Where power plant noise is audible, it will tend to define the background noise level. For this reason, staff compares the projected power plant noise to the existing ambient background (L_{90}) noise levels at the affected sensitive receptors. If this comparison identifies a significant adverse impact, then feasible mitigation must be incorporated in the project to reduce or remove the impact.

In many cases, a power plant will be intended to operate around the clock for much of the year. As a solar thermal generating facility, Beacon would operate only during the daytime hours, typically 15 hours per day during the summer (with fewer hours during the fall, winter, and spring), when sufficient solar insolation is available. Nighttime operation would be limited to the auxiliary boilers for the steam seal system of the steam turbine (BS 2008a, AFC § 2.5.2).

Typically, daytime ambient noise consists of both intermittent and constant noises. The noise that stands out during this time is best represented by the average noise level, or L_{eq}. Staff's evaluation of the above noise surveys shows that the daytime noise environment in the Beacon project area consists of both intermittent and constant noises. Thus, staff compares the project's daytime noise levels to the daytime ambient L_{eq} levels at the project's noise-sensitive receptors.

As seen in **Noise Table** 7, power plant noise levels are predicted to be less than 40 dBA L_{dn} (34 dBA L_{eq}) at all sensitive receptors during daytime operation and less than 22 dBA L_{max} at night.

Noise Table 7
Power Plant Noise Impacts at Nearest Sensitive Receptor

Location 1 (East Residence)	Power Plant Noise Level, dBA L_{eq}[1]	Ambient Noise Level, dBA	Cumulative Noise Level, dBA	Change from Ambient Level dBA
Daytime	31	39 L_{eq}[2]	40	+1
Nighttime	21	33 L_{90}[3]	33	+0

[1] Source: BS 2008a, AFC § 5.8.3.3, Table 5.8-8 and staff calculations.
[2] Source: BS 2008a, AFC Table 5.8-4 and staff calculations of average of fifteen consecutive daytime hours.
[3] Source: BS 2008a, AFC Table 5.8-4 and staff calculations of average of four quietest consecutive nighttime hours.

When projected plant noise is added to the daytime ambient value (as calculated by staff), the cumulative level is higher than the ambient value at Location 1 by an inaudible amount (see **NOISE Table 7**). No change in ambient noise at Location 1 at night would result from plant operation.

Pursuant to the Committee Scheduling Order dated June 18, 2008, staff has evaluated several different alternative cooling options for Beacon, including the feasibility of utilizing an air cooled condenser (ACC) for steam condensing rather than the wet cooling tower described in the AFC (see the **Alternatives** section of this document). Assuming that the cooling system is the leading noise factor of project operation (the steam turbine generator being enclosed and the noise produced thereby being mitigated), and given an estimated operating noise of 64 dBA L_{eq} at 400 ft for an ACC with low-noise fans (CEC 2009w), power plant noise at Location 1 would increase to 40 dBA L_{eq} during the daytime if such a dry cooling system were to be installed. When this projected plant noise is added to the daytime ambient value, the cumulative level, 43 dBA Leq, would be 4 dBA higher than ambient; a less than significant change. Nighttime project noise would most likely not be affected by a change in cooling systems given operating hours (as discussed above). Therefore, the suggested cooling system alternative would most likely not result in significant noise impacts to the nearest sensitive receptors.

Tonal Noises

One possible source of disturbance would be strong tonal noises. Tonal noises are individual sounds (such as pure tones) that, while not louder than permissible levels, stand out in sound quality. The applicant can to avoid the creation of annoying tonal (pure-tone) noises by balancing the noise emissions of various power plant features during plant design. To ensure that tonal noises do not cause annoyance, staff proposes Condition of Certification **NOISE-4**, below.

Linear Facilities

Noise effects from the electrical interconnection line typically do not extend beyond the right-of-way easement of the line and would thus be inaudible to any receptors (BS 2008a, AFC § 5.8.3.3).

Vibration

Vibration from an operating power plant could be transmitted by two chief means; through the ground (groundborne vibration) and through the air (airborne vibration).

The operating components of the Beacon project consist of a high-speed steam turbine generator and various pumps and fans. All of these pieces of equipment must be carefully balanced in order to operate; permanent vibration sensors are attached to the turbines and generators. Based on experience with numerous previous projects employing similar equipment, Energy Commission staff believes that ground borne vibration from Beacon would be undetectable by any likely receptor.

Airborne vibration (low frequency noise) can rattle windows and objects on shelves and can rattle the walls of lightweight structures. None of the project equipment is likely to produce low frequency noise; this makes it highly unlikely that Beacon would cause perceptible airborne vibration effects.

Worker Effects

The applicant has acknowledged the need to protect plant operating and maintenance workers from noise hazards and has committed to comply with applicable LORS (BS 2008a, AFC § 5.8.3.3). Signs would be posted in areas of the plant with noise levels exceeding 85 dBA (the level that OSHA recognizes as a threat to workers' hearing), and hearing protection would be required. To ensure that plant operation and maintenance workers are, in fact, adequately protected, Energy Commission staff has proposed Condition of Certification **NOISE-5**, below.

CUMULATIVE IMPACTS AND MITIGATION

Section 15130 of the CEQA Guidelines (Cal. Code Regs., tit. 14) requires a discussion of cumulative environmental impacts. Cumulative impacts are two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts. The CEQA Guidelines require that the discussion reflect the severity of the impacts and the likelihood of their occurrence, but need not provide as much detail as the discussion of the impacts attributable to the project alone.

The applicant has identified two projects in the vicinity of Beacon, the Pine Tree Wind Development and the Barren Ridge-Castaic Transmission Project. Due to their distance from Beacon, neither project poses a potential for cumulative noise impacts (BS 2008a, AFC § 5.8.3.4).

FACILITY CLOSURE

In the future, upon closure of Beacon, all operational noise from the project would cease, and no further adverse noise impacts from operation of Beacon would be possible. The remaining potential temporary noise source is the dismantling of the structures and equipment and any site restoration work that may be performed. Since this noise would be similar to that caused by the original construction, it can be treated similarly. That is, noisy work could be performed during daytime hours, with machinery and equipment properly equipped with mufflers. Any noise LORS that were in existence at that time would apply. Applicable conditions of certification included in the Energy Commission decision would also apply unless modified.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No comments on Noise and Vibration were received from agencies or the public.

CONCLUSIONS AND RECOMMENDATIONS

Construction of Beacon could create significant noise impacts on nearby sensitive noise receptors if steam blows are not adequately mitigated. Consequently, staff recommends that silencing equipment for steam blow piping be employed in the construction of the facility. Staff proposes conditions of certification to ensure this (below). Beacon, if built and operated in conformance with these proposed conditions of certification, would comply with all applicable noise and vibration LORS for both operation and construction and would produce no significant adverse noise impacts on people within the affected area, directly, indirectly, or cumulatively.

PROPOSED CONDITIONS OF CERTIFICATION

NOISE-1 At least 15 days prior to the start of ground disturbance, the project owner shall notify all residents within one-half mile of the site, by mail or other effective means, of the commencement of project construction. At the same time, the project owner shall establish a telephone number for use by the public to report any undesirable noise conditions associated with the construction and operation of the project and include that telephone number in the above notice. If the telephone is not staffed 24 hours per day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been operational for at least one year.

Verification: Prior to ground disturbance, the project owner shall transmit to the Compliance Project Manager (CPM) a statement, signed by the project owner's project manager, stating that the above notification has been performed and describing the method of that notification, verifying that the telephone number has been established and posted at the site, and giving that telephone number.

NOISE COMPLAINT PROCESS

NOISE-2 Throughout the construction and operation of Beacon, the project owner shall document, investigate, evaluate, and attempt to resolve all project-related noise complaints. The project owner or authorized agent shall:

- Use the Noise Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to the CPM, to document and respond to each noise complaint;
- Attempt to contact the person(s) making the noise complaint within 24 hours;
- Conduct an investigation to determine the source of noise related to the complaint;

- Take all feasible measures to reduce the noise at its source if the noise is project related; and
- Submit a report documenting the complaint and the actions taken. The report shall include: a complaint summary, including final results of noise reduction efforts, and if obtainable, a signed statement by the complainant stating that the noise problem is resolved to the complainant's satisfaction.

Verification: Within five days of receiving a noise complaint, the project owner shall file a copy of the Noise Complaint Resolution Form with the CPM, documenting the resolution of the complaint. If mitigation is required to resolve a complaint, and the complaint is not resolved within a three-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is implemented.

NOISE-3 The project owner shall submit to the CPM for review and approval a noise control program and a statement, signed by the project owner's project manager, verifying that the noise control program will be implemented throughout construction of the project. The noise control program shall be used to reduce employee exposure to high noise levels during construction and also to comply with applicable OSHA and Cal/OSHA standards.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall submit to the CPM the noise control program and the project owner's project manager's signed statement. The project owner shall make the program available to Cal/OSHA upon request.

NOISE RESTRICTIONS

NOISE-4 Within 30 days of the project first achieving a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey, utilizing the same monitoring sites employed in the pre-project ambient noise survey as a minimum. The survey shall also include the octave band pressure levels to ensure that no new pure-tone noise components have been introduced. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints. Steam relief valves shall be adequately muffled to preclude noise that draws legitimate complaints. If the results from the survey indicate that the project noise levels are in excess of 34 dBA L_{eq} at the residence east of the project site, additional mitigation measures shall be implemented to reduce noise to a level of compliance with this limit. If the project should be equipped with an air cooled condenser, project noise levels shall be restricted to 40 dBA L_{eq} at the residence east of the project site.

Verification: Within 30 days after completing the survey, the project owner shall submit a summary report of the survey to the CPM. Included in the report will be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limits, and a schedule, subject to CPM approval, for implementing these measures. Within 30 days of completion of installation of these measures, the project owner shall submit to the CPM a summary report of a new noise survey, performed as described above and showing compliance with this condition.

NOISE-5 Following the project's first achieving a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct an occupational noise survey to identify the noise hazardous areas in the facility.

The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations sections 5095–5099 and Title 29, Code of Federal Regulations section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure.

The project owner shall prepare a report of the survey results and, if necessary, identify proposed mitigation measures that will be employed to comply with the applicable California and federal regulations.

Verification: Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and Cal/OSHA upon request.

STEAM BLOW RESTRICTIONS

NOISE-6 If a traditional, high-pressure steam blow process is employed, the project owner shall perform the steam blow in such a way that noise from steam blows is no greater than 110 dBA measured at a distance of 100 feet. The project owner shall conduct steam blows only during the hours of 8 a.m. to 5 p.m., unless the CPM agrees to longer hours based on a demonstration by the project owner that offsite noise impacts will not cause annoyance. If a low-pressure continuous steam blow process is employed, the project owner shall submit a description of this process, with expected noise levels and projected hours of execution, to the CPM.

Verification: At least 15 days prior to the first high-pressure steam blow, the project owner shall submit to the CPM a projection of the noise levels expected, and a description of the steam blow schedule. At least 15 days prior to any low-pressure continuous steam blow, the project owner shall submit to the CPM drawings or other information describing the process, including the noise levels expected and the projected time schedule for execution of the process.

NOISE-7 At least 15 days prior to the first steam blow(s), the project owner shall notify all residents or business owners within one-half mile of the site of the planned steam blow activity, and shall make the notification available to other area residents in an appropriate manner. The notification may be in the form of letters to the area residences, telephone calls, fliers or other effective means. The notification shall include a description of the purpose and nature of the steam blow(s), the proposed schedule, the expected sound levels, and the explanation that it is a one-time operation and not a part of normal plant operations.

Verification: Within five (5) days of notifying these entities, the project owner shall send a letter to the CPM confirming that they have been notified of the planned steam blow activities, including a description of the method(s) of that notification.

CONSTRUCTION TIME RESTRICTIONS

NOISE-8 Heavy equipment operation and noisy construction work relating to any project features shall be restricted to the times of day delineated below:

Pile driving and high-pressure steam blows:	8 a.m. to 5 p.m.
Other noisy work	7 a.m. to 10 p.m.

Haul trucks and other engine-powered equipment shall be equipped with mufflers that meet all applicable regulations. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

Verification: Prior to ground disturbance, the project owner shall transmit to the CPM a statement acknowledging that the above restrictions will be observed throughout the construction of the project.

EXHIBIT 1 - NOISE COMPLAINT RESOLUTION FORM

Beacon Solar Energy Project
(08-AFC-2)

NOISE COMPLAINT LOG NUMBER _____

Complainant's name and address:

Phone number: _____

Date complaint received: _____
Time complaint received: _____

Nature of noise complaint:

Definition of problem after investigation by plant personnel:

Date complainant first contacted: _____

Initial noise levels at 3 feet from noise source _____ dBA Date: _____

Initial noise levels at complainant's property: _____ dBA Date: _____

Final noise levels at 3 feet from noise source: _____ dBA Date: _____

Final noise levels at complainant's property: _____ dBA Date: _____

Description of corrective measures taken:

Complainant's signature: _____ Date: _____

Approximate installed cost of corrective measures: $ _____
Date installation completed: _____
Date first letter sent to complainant: _____ (copy attached)
Date final letter sent to complainant: _____ (copy attached)

This information is certified to be correct:

Plant Manager's Signature: _____

(Attach additional pages and supporting documentation, as required).

REFERENCES

Kern County. 2007. Kern County General Plan, Noise Element. March 13, 2007.

BS 2008a - FPL Energy/M. O'Sullivan (tn 45646). Application for Certification, dated 03/13/08. Submitted to CEC/Docket Unit on 03/14/08.

DB 2009o – Downey Brand/S. Rowlands (tn 51406). Applicant's Comments on the Preliminary Staff Assessment, dated 5/1/09. Submitted to CEC/Docket Unit on 5/4/09.

CEC 2009w - California Energy Commission (tn 52714). CEC Information on Dry Cooling , Noise and Visual, dated 7/30/09. Submitted to CEC/Docket Unit on 8/5/09.

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NOISE APPENDIX A

FUNDAMENTAL CONCEPTS OF COMMUNITY NOISE

To describe noise environments and to assess impacts on noise sensitive area, a frequency weighting measure, which simulates human perception, is customarily used. It has been found that “A-weighting” of sound intensities best reflects the human ear’s reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. **NOISE Table A1** provides a description of technical terms related to noise.

Noise environments and consequences of human activities are usually well represented by an equivalent A-weighted sound level over a given time period (L_{eq}), or by average day and night A-weighted sound levels with a nighttime weighting of 10 dBA (L_{dn}). Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. Outdoor day-night sound levels vary over 50 dBA depending on the specific type of land use. Typical L_{dn} values might be 35 dBA for a wilderness area, 50 dBA for a small town or wooded residential area, 65 to 75 dBA for a major metropolis downtown (e.g., San Francisco), and 80 to 85 dBA near a freeway or airport. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, those higher levels nevertheless are considered to be levels of noise adverse to public health.

Various environments can be characterized by noise levels that are generally considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise, which does not decrease relative to daytime levels, are often considered objectionable. Noise levels above 45 dBA at night can result in the onset of sleep interference effects. At 70 dBA, sleep interference effects become considerable (U.S. Environmental Protection Agency, Effects of Noise on People, December 31, 1971).

To help the reader understand the concept of noise in decibels (dBA), **NOISE Table A2** illustrates common noises and their associated sound levels, in dBA.

NOISE Table A1
Definition of Some Technical Terms Related to Noise

Terms	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this testimony are A-weighted.
L_{10}, L_{50}, & L_{90}	The A-weighted noise levels that are exceeded 10%, 50%, and 90% of the time, respectively, during the measurement period. L_{90} is generally taken as the background noise level.
Equivalent Noise Level, L_{eq}	The energy average A-weighted noise level during the noise level measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 4.8 decibels to levels in the evening from 7 p.m. to 10 p.m., and after addition of 10 decibels to sound levels in the night between 10 p.m. and 7 a.m.
Day-Night Level, L_{dn} or DNL	The Average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10 p.m. and 7 a.m.
Ambient Noise Level	The composite of noise from all sources, near and far. The normal or existing level of environmental noise at a given location.
Intrusive Noise	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Pure Tone	A pure tone is defined by the Model Community Noise Control Ordinance as existing if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or by 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.

Source: Guidelines for the Preparation and Content of Noise Elements of the General Plan, Model Community Noise Control Ordinance, California Department of Health Services 1976, 1977.

NOISE Table A2
Typical Environmental and Industry Sound Levels

Noise Source (at distance)	A-Weighted Sound Level in Decibels (dBA)	Noise Environment	Subjective Impression
Civil Defense Siren (100')	140-130		Pain Threshold
Jet Takeoff (200')	120		Very Loud
Very Loud Music	110	Rock Music Concert	
Pile Driver (50')	100		
Ambulance Siren (100')	90	Boiler Room	
Freight Cars (50')	85		
Pneumatic Drill (50')	80	Printing Press Kitchen with Garbage Disposal Running	Loud
Freeway (100')	70		Moderately Loud
Vacuum Cleaner (100')	60	Data Processing Center Department Store/Office	
Light Traffic (100')	50	Private Business Office	
Large Transformer (200')	40		Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing

Source: Handbook of Noise Measurement, Arnold P.G. Peterson, 1980

Subjective Response to Noise

The adverse effects of noise on people can be classified into three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction.
- Interference with activities such as speech, sleep, and learning.
- Physiological effects such as anxiety or hearing loss.

The sound levels associated with environmental noise, in almost every case, produce effects only in the first two categories. Workers in industrial plants can experience noise effects in the last category. There is no completely satisfactory way to measure the subjective effects of noise or of the corresponding reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual tolerance of noise.

One way to determine a person's subjective reaction to a new noise is to compare the level of the existing (background) noise, to which one has become accustomed, with the level of the new noise. In general, the more the level or the tonal variations of a new noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

With regard to increases in A-weighted noise levels, knowledge of the following relationships can be helpful in understanding the significance of human exposure to noise.

1. Except under special conditions, a change in sound level of 1 dB cannot be perceived.

2. Outside of the laboratory, a 3-dB change is considered a barely noticeable difference.

3. A change in level of at least 5 dB is required before any noticeable change in community response would be expected.

4. A 10-dB change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response (Kryter, Karl D., The Effects of Noise on Man, 1970).

Combination of Sound Levels

People perceive both the level and frequency of sound in a non-linear way. A doubling of sound energy (for instance, from two identical automobiles passing simultaneously) creates a 3-dB increase (i.e., the resultant sound level is the sound level from a single passing automobile plus 3 dB). **NOISE Table A3** indicates the rules for decibel addition used in community noise prediction.

NOISE Table A3
Addition of Decibel Values

When two decibel values differ by:	Add the following amount to the larger value
0 to 1 dB	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0
Figures in this table are accurate to ± 1 dB.	

Source: Architectural Acoustics, M. David Egan, 1988.

Sound and Distance

Doubling the distance from a noise source reduces the sound pressure level by 6 dB.

Increasing the distance from a noise source 10 times reduces the sound pressure level by 20 dB.

Worker Protection

OSHA noise regulations are designed to protect workers against the effects of noise exposure and list permissible noise level exposure as a function of the amount of time to which the worker is exposed, as shown in **NOISE Table A4**.

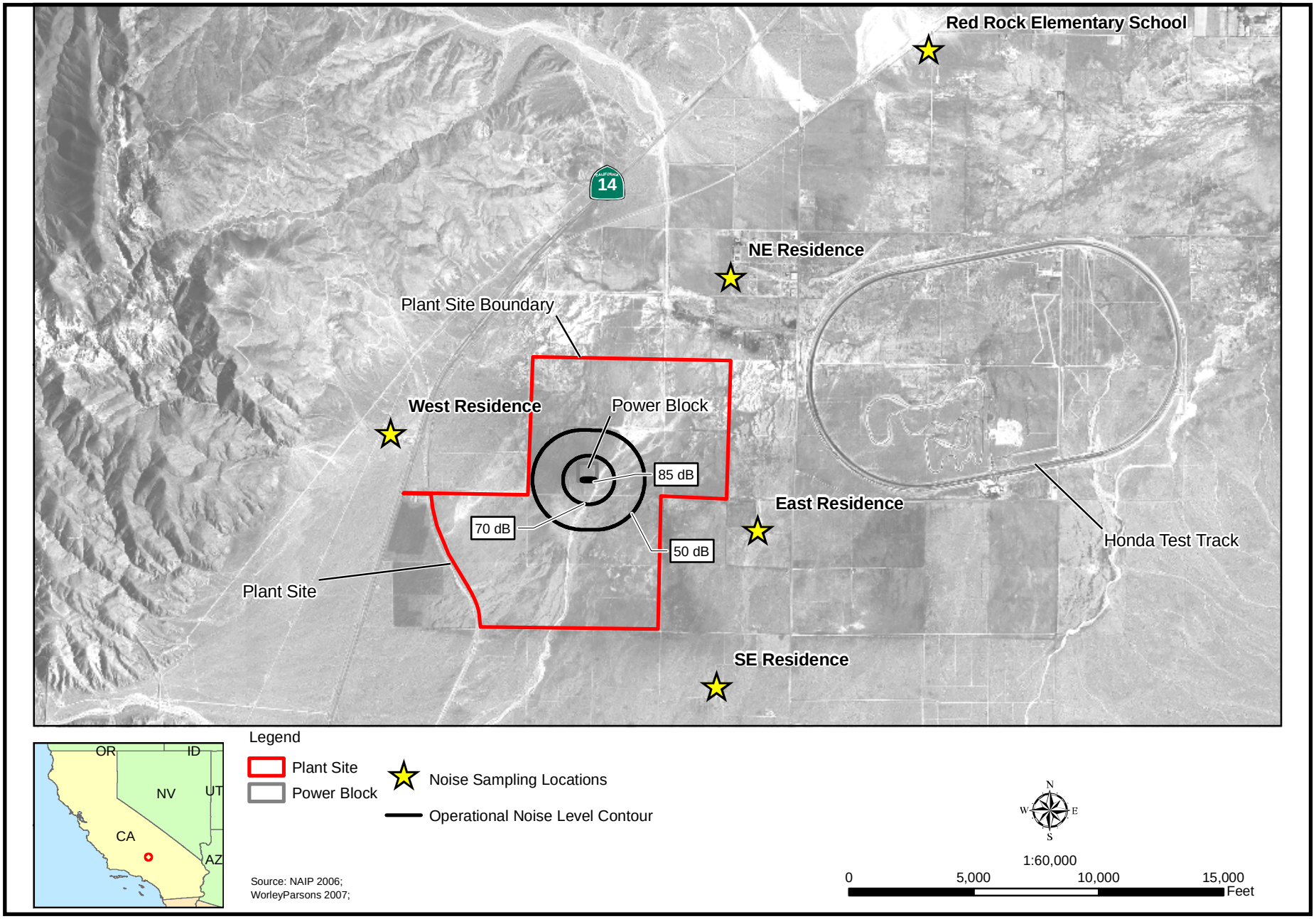
NOISE Table A4
OSHA Worker Noise Exposure Standards

Duration of Noise (Hrs/day)	A-Weighted Noise Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115

Source: 29 CFR § 1910.95.

NOISE AND VIBRATION - FIGURE 1

Beacon Solar Energy Project - Operational Noise Contour Map -(Off-Site Receptors)



Source: NAIP 2006;
WorleyParsons 2007;

SOURCE: 08-AFC-2 Figure 5.8-2

PUBLIC HEALTH

Testimony of Obed Odoemelam, Ph.D.

SUMMARY AND CONCLUSIONS

Staff has analyzed the potential public health risks from the toxic pollutants associated with construction and operation of the proposed Beacon Solar Energy Project (BSEP) and does not expect there to be any significant cancer or short- or long-term noncancer health effects requiring further mitigation than proposed by the applicant, Beacon Solar, LLC (Beacon Solar). Staff worked with the applicant to conduct specific risk assessments establishing the facility priority rating for this type of facility as a source of toxic pollutants while also obtaining numerical estimates of the cancer and noncancer risks from the facility as proposed to be built and operated. These analyses have allowed staff to ensure the same level of review for BSEP and other solar projects.

The toxic (*noncriteria)* pollutants considered in this analysis are pollutants for which there are no established air quality standards. If the proposed project is approved, staff would recommend the condition of certification **PUBLIC HEALTH-1** to address the risk from Legionella in the cooling tower. The potential for significant public health impacts from emissions of other groups of pollutants for which there are specific air quality standards (*criteria pollutants*) is addressed in the **AIR QUALITY** section of this report.

INTRODUCTION

The purpose of this **PUBLIC HEALTH** analysis is to determine if toxic emissions from the proposed Beacon Solar Energy Project could produce significant adverse public health impacts or violate standards for public health protection in the project area thereby requiring mitigation beyond what the applicant (Beacon Solar) proposes. BSEP is proposed to use solar thermal technology to provide almost 100 percent of the input to the electric generation power block. The project therefore, belongs in a category of energy facilities with a renewable energy source (the sun) with minimal associated combustion by-products. The only non-solar energy source would be the two auxiliary boilers that would use natural gas to produce the energy needed to reduce startup times and also maintain the temperature of the facility's solar heat transfer fluid (Therminol) above its relatively high freezing point of 54°F. The combustion-related pollutants would thus be produced in much smaller amounts than from using natural gas for all the generated electricity. The project also includes a wet cooling tower and an emergency diesel-fired fire pump engine.

Toxic pollutants are pollutants for which there are no specific air quality standards and are known as *noncriteria pollutants*. The other pollutants for which there are specific air quality standards are known as *criteria pollutants*. If significant health impacts are identified as possible from exposure to the noncriteria pollutants considered in this analysis, staff would evaluate the need for the more refined analysis necessary to identify further mitigation measures to reduce those impacts to less-than-significant levels.

Although compliance with air quality standards is addressed in the **AIR QUALITY** section for the criteria pollutants, staff has included **Attachment A** at the end of this **PUBLIC HEALTH** section to provide specific information on the nature of the health effects of these criteria pollutants. The related **AIR QUALITY** discussion mainly focuses on the potential for exposure at levels above ambient air quality standards and the regulatory measures to mitigate that exposure, with particular emphasis on ozone and particulate matter where area levels exceed their respective air quality standards. Staff considers it necessary to mitigate the impacts of both criteria and noncriteria pollutants to ensure overall public health protection while any project is operating. The impacts on public and worker health from accidental releases of hazardous materials are examined in the **HAZARDOUS MATERIALS MANAGEMENT** section, while the health and nuisance effects from electric and magnetic fields are addressed in the **TRANSMISSION LINE SAFETY AND NUISANCE** section. Pollutants released from the project in wastewater streams are discussed in the **SOILS AND WATER RESOURCES** section. Facility releases in the form of hazardous and non-hazardous wastes are addressed in the **WASTE MANAGEMENT** section.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

Public Health Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
Clean Air Act section 112 (42 U.S. Code section 7412)	Requires new sources which emit more than 10 tons per year of any specified hazardous air pollutant (HAP) or more than 25 tons per year of any combination of HAPs to apply Maximum Achievable Control Technology (MACT).
State	
California Health and Safety Code sections 39650 et seq.	These sections mandate the California Air Resources Board (CARB) and the Department of Health Services to establish safe exposure limits for toxic air pollutants and identify pertinent best available control technologies (BACT). They also require that the new source review rule for each air pollution control district include regulations that require new or modified procedures for controlling the emission of toxic air contaminants.
Title 17 California Code of regulations (CCR), Section 93115, Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines	Establishes emission limits and operating limits on stationary compression ignition engines, including emergency fire pump engines
California Health and Safety Code section 41700	This section states that “no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property.”
Local	
Kern County Air Pollution Control District (KCAPCD) Rule 210.9.	Requires safe exposure limits for Toxic Air Pollutants (TACs), use of best available control technology, new source review (NSR), and implements the state’s Airborne Toxic Measure (ACTM) for Stationary Compression Ignition Engines including emergency fire pump engines as required by Title 17 CCR.

ASSESSMENT OF IMPACTS

This section describes the method used by staff and the applicant to assess the potential for health impacts from toxic pollutants from a source such as BSEP and the need for mitigation beyond the measures proposed by the applicant.

METHOD OF ANALYSIS

The toxic emissions addressed in this **PUBLIC HEALTH** section are those to which the public could be exposed during both project construction and routine operation. If these toxic contaminants are released into the air or water, individuals may come into contact with them through inhalation, dermal contact, or ingestion via contaminated food or water.

Ambient air quality standards for the criteria pollutants such as ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide ensure the safety of everyone, including those with heightened sensitivity to the effects of environmental pollution. Since noncriteria pollutants do not have such standards, a process known as a health risk assessment (HRA) is typically used to evaluate the potential for public exposure to unhealthy levels and establish the degree of mitigation necessary. A typical risk assessment procedure consists of the following steps:

- Identification of the types and amounts of hazardous substances that a source could release to the environment;
- Estimation of worst-case concentrations of project emissions in the environment;
- Estimation of the amounts of pollutants to which humans could be exposed through inhalation, ingestion, and dermal contact; and
- Characterization of the potential health risks by comparing worst-case exposures to safety standards that are based on known health effects.

When noncriteria, or toxic substances are found in emissions, a screening-level analysis could be conducted to (a) obtain a numerical estimate of the potential cancer or noncancer risk or, as with BSEP (b) assign a priority score to the facility to assess the need for more refined analysis and additional mitigation measures. The priority scoring method used by the applicant utilizes facility-related parameters (emission rates, pollutant potency, and proximity to potentially exposed humans) that conservatively assume that the pollutant would not be diluted after release, while the multi-pathway health risk assessment (for numerical risk estimation), uses the Hotspots Analysis and Reporting Program (HARP) model (which factors in meteorological conditions) to determine the rates of pollutant dilution and resulting exposure levels.

Screening-level analyses for priority scoring or numerical risk estimation could initially be performed using simplified assumptions intentionally biased toward protecting public health. In other words, the analysis would be designed to overestimate the potential public health impacts from exposure to emissions. Therefore, in reality, it is likely that the actual risks from the project would be much lower than the risks estimated by the screening-level assessments. A screening-level impact assessment would at a minimum, include the potential health effects of inhaling hazardous substances. The multi-pathway component is included for cases of substances that could present a health hazard from non-inhalation pathways such as soil ingestion, dermal exposure, and mother's milk (see California Air Pollution Control Officers Association, CAPCOA 1990 and 1993).

For the numerical risk estimation process, this overestimation is generated by identifying the meteorological and other environmental conditions that could lead to the

highest or worst-case risks, and then assuming those conditions in the study. The process involves the following:

- Using the highest levels of pollutants that could be emitted from the source;
- Assuming weather conditions that would lead to the maximum ambient concentration of pollutants;
- Using the type of air quality computer models that predict the greatest plausible impacts;
- Calculating health risks at the location where the pollutant concentrations are estimated to be highest;
- Using health-based standards designed to protect the most sensitive members of the population - including the young, elderly, and those with respiratory illnesses; and
- Assuming that an individual's exposure to cancer-causing agents would occur over a 70-year lifetime

These impact assessment processes address three categories of health impacts: acute (short-term) health effects, chronic (long-term) health effects, and cancer risk (also long-term). Acute health effects result from short-term (one-hour) exposure to relatively high concentrations of pollutants. These effects are temporary in nature, and include symptoms such as irritation of the eyes, skin, and respiratory tract. Chronic health effects result from long-term exposure to lower concentrations of pollutants. This exposure period is defined as being from approximately 10 to 100 percent of a lifetime (from 7 to 70 years). Chronic health effects include reduced lung function and heart disease.

The numerical estimates of the noncancer health effects for BSEP were obtained using a method that compares the maximum project contaminant exposure levels to safe levels called *reference exposure levels* (RELs). These are the amounts of the toxic substances to which even sensitive people could be exposed without suffering adverse health effects (CAPCOA 1993, p. III-36). This means that exposure limits serve to protect even sensitive individuals including infants, children, the aged, and people suffering from illnesses or diseases that make them more susceptible to the effects of toxic substance exposure. The RELs are based on the most sensitive adverse health effects reported in the medical and toxicological literature, and include specific margins of safety that address the uncertainties associated with inconclusive scientific and technical information available at the time standards were set. Margins of safety provide a reasonable degree of protection against hazards that research has yet to identify. Each margin of safety is designed to prevent pollution levels demonstrated to be harmful, as well as to prevent lower pollutant exposure that may pose an unacceptable risk of harm, even when the risk is not precisely identified by nature or degree. Health protection can be expected if the estimated worst-case exposure is below the relevant REL. In such a case, an adequate margin of safety would be assumed to exist between the predicted exposure and the estimated threshold of toxicity.

Exposure to multiple toxic substances may result in health effects that are equal to, less than, or greater than effects resulting from exposure to the individual chemicals. Only a

small fraction of the thousands of potential combinations of chemicals have been tested for the health effects of combined exposures. In conformance with CAPCOA guidelines, the health risk and facility prioritization assessments assume that the effects of the individual substances are additive for a given organ system (CAPCOA 1993, p. III-37). In cases where the actions could be synergistic (that is where the effects are greater than the sum), this approach may underestimate the health impact in question. Where the action is antagonistic, the approach may overestimate the impacts

For carcinogenic substances, the health assessment estimates the risk of developing cancer and conservatively includes the assumption that the individual would be continuously exposed over a 70-year lifetime. The calculated risk is not necessarily meant to project the actual expected incidence of cancer, but rather a theoretical upper-bound estimate based on worst-case assumptions.

Cancer risk is expressed in chances per million of developing cancer, and is a function of the maximum expected pollutant concentration, the probability that a particular pollutant will cause cancer (known as its *potency factor* and established by the California Office of Environmental Health Hazard Assessment, OEHHA), and the length of the exposure period. Cancer risks for individual carcinogens are added together to yield the total cancer risk from the source being considered. The conservative nature of these screening assumptions means that actual cancer risks would likely to be considerably lower than their estimates.

In the HRA process conducted for BSEP after the priority scoring process, the cancer and noncancer risk estimates were compared against specific significance thresholds to assess the need for and extent of further mitigation. For the facility prioritization procedure, the potential for significant impacts was calculated using the same toxicity factors and emission rates but the result was expressed as specific facility scores that describe the source as high priority, intermediate priority, or low priority as also established by comparison with specific significance thresholds. For KCAPCD and other air districts, high priority sources require an HRA to establish the numerical risks to the potentially exposed community. Those of intermediate priority are regarded as tracking facilities which are then required to submit a complete toxics inventory at specified time intervals. Facilities ranked as low priority are exempt from reporting and further mitigation because of the low potential for impacts of potential significance. Staff required an HRA for BSEP in spite of its low priority ranking to allow for consistency and direct risk comparison with similar projects.

SIGNIFICANCE CRITERIA

For the HRA process, California Energy Commission staff generally evaluates the health effects of exposure to toxic emissions by first considering their impacts on the maximally exposed individual (MEI). This individual is a person who would hypothetically be exposed to project emissions at a location where the highest ambient impacts were calculated using worst-case assumptions as previously noted. If the potential risk to this individual is determined to be below established levels of significance, staff would consider the potential risk to be less than significant anywhere else in the project area. The facility prioritization method calculates impacts at the nearest identified sensitive receptor, not a hypothetical MEI. As described earlier, noncriteria pollutants are evaluated for short-term (acute) and long-term (chronic)

noncancer health effects, as well as for cancer (long-term) health effects. The potential significance of project-related health impacts is determined separately for each of the three categories of health effects.

Acute and Chronic Noncancer Health Effects

For the employed HRA process, staff and the state's air pollution control districts (air districts) assess the significance of noncancer health effects by calculating a *hazard index* for the exposure being considered. A hazard index is a ratio obtained by comparing the exposure from facility emissions to the reference (safe) exposure level for a specific toxicant. A ratio of less than 1 signifies a worst-case exposure below the safe level. The hazard indices for all toxic substances with the same types of health effects are then added together to yield a total hazard index for the source being evaluated. This total hazard index is calculated separately for acute and chronic effects. A total hazard index of less than 1 indicates that the cumulative worst-case exposure would be within safe levels. Under these conditions, health protection would be assumed even for sensitive members of the population. In that case, staff would assume that there would be no significant noncancer public health impacts from project operations.

For the facility prioritization procedure, staff and the air districts utilize the same emission rates (without dispersion modeling) together with the applicable RELS or toxicity factors, and proximity to human receptors, to calculate a total facility score for noncancer effects.

Cancer Risk

For the HRA process, staff relies upon the regulations developed to implement provisions of Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986 (Health & Safety Code, §§ 25249.5 et seq.) for guidance in establishing the level of significance for cancer risks. Title 22, California Code of Regulations, section 12703(b) states that "the toxic exposure which represents no significant health hazard shall be one calculated to result in one excess case of cancer in an exposed population of 100,000, assuming lifetime exposure." This hazard reflects a cancer risk of 10 in 1,000,000, which is often written as 10×10^{-6}. An important distinction from the provisions in Proposition 65 is that its significance level applies separately to each cancer-causing substance, while staff determines significance based on the total risk from all cancer-causing chemicals from the source in question. The manner in which the significance level is applied by staff is therefore more conservative (or health-protective) than the provisions of Proposition 65.

As noted earlier, the initial risk analysis for a project is normally performed at a screening level, which is designed to overstate the actual risk. When a screening analysis in the HRA process shows numerical cancer risks to be above the significance level, refined assumptions would likely result in a lower, more representative risk estimate. If facility risk, based upon refined assumptions, were to exceed the significance level of 10 in 1,000,000, staff would require appropriate measures to reduce that risk to less than significant. If, after all risk reduction measures have been

considered, a refined analysis still identifies a cancer risk of greater than 10 in 1,000,000, staff would deem that risk to be significant, and would not recommend approval for the project.

For the facility prioritization process, staff and the air districts utilize the same emission rates for the HRA, the applicable cancer potency values, and distance to the nearest human receptor, to obtain a carcinogenic score for the source. The carcinogenic and non-carcinogenic scores are calculated using methods that allow for direct comparison of effects as either cancer or noncancer. The following thresholds are utilized in the prioritization scheme:

Total Facility Score	Category
More than 10	High Priority
1 -10	Intermediate Priority
<1	Low Priority

SETTING

This section describes the environment in the vicinity of the proposed project site from a public health perspective. Features of the natural environment, such as meteorology and terrain, affect a project's potential to impact public health. An emission plume from a facility may affect elevated areas before lower areas because of a reduced opportunity for atmospheric mixing. Consequently, areas of elevated terrain can often experience increased pollutant impacts. Also, the types of land use near a site influence population density and therefore the number of individuals potentially exposed to a project's emissions. Additional factors affecting potential public health impacts include existing air quality and environmental site contamination.

SITE AND VICINITY DESCRIPTION

According to information from the applicant (Beacon Solar 2008a, pp. 1-1, 1-2, 2-1, 5.2-13, and 5.7-10), the proposed project site is on a 2,012-acre parcel in eastern Kern County California approximately four miles north-northeast of California City's northern boundary, approximately 15 miles north of the town of Mojave, and approximately 24 miles northeast of the City of Tehachapi. The site is relatively vacant and disturbed from past agricultural activities and with several abandoned structures in a relatively small area immediately to the west. The rest of the area is essentially desert land with few scattered residences the nearest of which is 0.3 miles from the nearest plant site boundary.

The relative lack of population centers was suggested by the applicant (Beacon 2008a, pp. 5.7-11 and 5.10-6) as due to the relative lack of water supplies, occasional flooding, and harshness of climate. There are no community facilities with sensitive receptors (such as schools, hospitals and play grounds) located within a three-mile radius of the site. Sensitive receptor locations are those that house sensitive individuals including the elderly, children, and individuals with respiratory diseases who, as previously noted, are usually more sensitive to the effects of environmental pollutants than the general public. In most cases these locations include schools, pre-schools, daycare centers, nursing

homes, medical centers, hospitals, and colleges. The nearest developed area with a full range of community services is California City (Beacon Solar 2008a, p. 5.7-10).

As noted by the applicant (Beacon Solar, 2008a, p. 5.11-29), information from Census 2000 shows the area's minority population to vary from 17.4 to 40.1 % within a six-mile radius of the proposed site. The percentage of the low-income was shown to vary from 8.5% to 27.0%.

METEOROLOGY

Meteorological conditions, including wind speed, wind direction, and atmospheric stability affect the extent to which pollutants are dispersed into the air as well as the direction of pollutant transport. This, in turn, affects the level of public exposure to emitted pollutants and associated health risks. An emission plume from a given facility may impact elevated areas before the lower-lying areas because of reduced opportunity for atmospheric mixing. When wind speeds are low and the atmosphere is stable, dispersion is reduced and localized exposure may be increased.

As more fully discussed by the applicant (Beacon Solar 2008a, pp. 5.2-13 and 5.2-13), the project area is located in the Mojave Desert which is classified as "High Desert" with characteristic climatic conditions of extreme daily temperature changes, low annual precipitation, strong seasonal winds and mostly clear skies. The temperature is hot in summer, with a maximum that exceeds 100°F degrees in July and August. Winter temperatures are more moderate with mean maxima in the 60s and low 30s. The average annual precipitation is less than six inches 78 percent of which falls between November and March. However, summer thunderstorms occur between July and September with attendant flash flooding in many areas. These climatic conditions are produced by the large-scale warming and sinking of the air in the semi-permanent subtropical high-pressure center over the Pacific Ocean. This high-pressure system helps block out most mid-latitude storms except in the winter when most of the area's rainfall occurs, as noted. The presence of a low thermal pressure above the Mojave Desert promotes air movement that transports pollutants from the Los Angeles air basin to the project area. As discussed in the **AIR QUALITY** section, such pollution transport is largely responsible for the area's relatively high levels of ozone and particulate matter even though there generally are no local emission sources.

Atmospheric stability is a measure of the turbulence that influences pollutant dispersion. Mixing heights (the height above ground level below which the air is well mixed and in which pollutants can be effectively dispersed) are lower during the morning hours because of temperature inversions, which are followed by temperature increases in the warmer afternoons. Staff's **AIR QUALITY** section presents a more detailed discussion of the area's meteorology as related to pollutant dispersion.

EXISTING AIR QUALITY

By examining average toxic concentration levels from representative air monitoring sites in California with cancer risk factors specific to each contaminant, a lifetime cancer risk can be calculated to provide a background risk level for inhalation of ambient air. For comparison purposes, it should be noted that the overall lifetime cancer risk for the average American is about 1 in 3, or 330,000 in 1,000,000

As noted by the applicant (Beacon Solar 2008a, p. 5.10-6), there have been no specific studies within KCAPCD to assess the health status of residents or measure the area's toxic pollutant levels. In the case of San Joaquin Valley Air Pollution Control District, an adjacent district with a relatively similar setting, the year 2000's background air toxics levels were reported as posing a background cancer risk of 225 in 1,000,000 (ARB 2002). The pollutants 1, 3-butadiene, and benzene emitted primarily from mobile sources were reported as the two highest contributors to the risk and together accounted for over half of the total. The risk from 1, 3-butadiene was about 73 in 1,000, 000 while the risk from benzene was 68 in 1,000,000. Formaldehyde from motor vehicles and other combustion sources accounted for about 12 % of the percent of the ambient cancer risk. The use of reformulated gasoline, beginning in the second quarter of 1996, as well as other toxics reduction measures, have led to a decrease in ambient levels of air toxics and associated cancer risk in California over the past few years.

The toxic pollutant-related background risk estimates can be compared with the noted normal background lifetime cancer risk (from all cancer causes) of 1 in 3, or 330,000 in 1,000,000. The potential risk from BSEP and similar sources should be assessed within the context of their potential additions to these background risk levels. As noted by the applicant (Beacon Solar 2008a p. 5.10-5), KCAPCD does not require an HRA for a facility assigned a low facility score through the facility prioritization process. Staff's requirement for such HRA in all cases allows for comparison with staff's significant criteria and with similar projects.

The criteria pollutant impacts for the project area are assessed in the **AIR QUALITY** section by adding existing levels (as measured at area monitoring stations), to the project-related emissions, then comparing the results with applicable air quality standards. Protection from exposure to criteria pollutants is achieved through imposition of specific technical and administrative measures ensuring that the project does not create or contribute to violations of air quality standards when being built or operated It is this combination of measures that is addressed in the **AIR QUALITY** section.

IMPACTS

POTENTIAL IMPACTS OF PROJECT'S NON-CRITERIA POLLUTANTS

The health impacts of BSEP's noncriteria pollutant emissions can be assessed separately for construction-phase impacts or operational-phase impacts.

Construction Phase Impacts

Possible construction-phase impacts, as noted by the applicant (Beacon Solar 2008a, pp. 5.2-38 and 5.2-40, and Appendix E.2), are from human exposure to wind-blown dust from site excavation and grading, and emissions from construction equipment. These dust-related impacts may result from either exposure to the dust itself as particulate matter of less than 10 microns in diameter (PM10), particulate matter of less than 2.5 microns in diameter (PM 2.5), or exposure to any toxic contaminants that might be adsorbed on to the dust particle. As more fully discussed in the **WASTE MANAGEMENT** section, the applicant's site contamination assessments (Beacon Solar

2008a, p 5.16-10 and Appendix I) found no signs of pollutants that could constitute a health hazard to humans, meaning that construction activities would not pose a contaminant-related risk to human health.

The applicant has specified the mitigation measures necessary to minimize construction-related fugitive dust as required by KCAPCD Rules 402, 404.1, 405, 407 and 409 (Beacon Solar 2008a, pp. 5.2-8 and 5.2-9). The only soil-related construction impacts of potential significance would be from the possible impacts of PM10 or PM 2.5 as a criteria pollutant for the 25-month construction period. As mentioned earlier, the potential for significant impacts from criteria pollutants is assessed in the **AIR QUALITY** section, where the requirements for mitigation measures are presented as specific conditions of certification.

The exhaust from diesel-fueled vehicular and non-vehicular equipment has been established as a potent human carcinogen. Thus, construction-related emission levels could possibly add to the carcinogenic risk in this analysis. The state's air pollution control districts have relied on the risk assessments by OEHHA in establishing specific control measures for the use of diesel-fueled equipment in construction activities. The applicant has presented the diesel emissions from the different types of equipment to be used in the construction phase together with the emission control measures required by KCAPCD for the proposed and similar projects in compliance with the noted requirements in the LORS Table (Beacon Solar 2008a, p 5.2-29 and 5.2-30 and Appendix E.2). The recommended control measures specified in **AIR QUALITY** section as conditions of certification AQ-SC1through AQ-SC5 would be adequate to reduce any exposure to levels not posing a significant cancer risk, especially in this relatively short construction period.

Operational Impacts

The emissions of most concern from routine BSEP operation would originate from its auxiliary boilers with limited hours of operation, limited testing of the emergency diesel firewater pump engine, the evaporative cooling tower, and the Therminol decomposition products (biphenyl and benzene) from vents for the expansion tanks.

Potential Use of the Rosamond Water Alternative

The Rosamond Community Services District (RCSD) proposes to supply tertiary-treated wastewater for facility operations as an alternative to the applicant's proposal to use potable water as process water (RCSD 2009a). The Service District provided specific data on the chemical quality of the water in a June 30, letter to the Energy Commission's Project Manager for BSEP. Staff's assessment of the provided water quality data points to a potential lack of a health hazard from its use in the cooling tower operations. Staff therefore considers this "Rosamond Water" as a potentially safe alternative to the applicant's proposal to use potable water as process water at BSEP.

Potential Use of the California City Water Alternative

California City (CofC), has also proposed to supply teriary-treated water as an alternative to the applicant's proposed use of portable water for its operations (CofC 2009b and CofC 2009c). Staff's assessment of the provided water quality data shows the water as not posing a health hazard from its use within BSEP.

In addition to the toxic substances that are possible from the cooling towers, there is specific concern that bacterial growth could lead to potentially adverse human health effects from such water use. This is discussed below in the section on cooling tower operation and the risk of Legionnaires' disease.

Public Health Table 1 lists the project's toxic pollutants of potential concern and shows how each could contribute to the risk reflected by the project's priority ranking. For example, the first row shows that oral exposure to benzene is not of concern but, if inhaled, may have cancer and chronic (long-term) non-cancer health effects, as well as acute (short-term) effects.

As noted in a publication by the South Coast Air Quality Management District (SCAQMD 2000, p 6), one property that differentiates the air toxics from the criteria pollutants is their tendency to be highest in close proximity to the source and quickly drop off with distance. This means that the levels of BSEP's air toxic contaminants would be highest in the immediate area and decrease rapidly with distance. The issue of concern is the potential for significant effects at expected ambient concentrations.

Public Health Table 2
Types of Health Impacts and Exposure Routes Attributed to Toxic Emissions

Substance	Oral Cancer	Oral Non-Cancer	Inhalation Cancer	Non-cancer (Chronic)	Non-cancer (Acute)
Benzene			✔	✔	✔
Biphenyl				✔	
Chloroform			✔	✔	
Dichlorobenzene				✔	✔
Diesel Particulate Matter			✔	✔	
Formaldehyde			✔	✔	✔
Hexane				✔	
Naphthalene	✔	✔	✔	✔	
Benzo(a)pyrene		✔		✔	✔
Naphthalene				✔	
Benzofluoranthrene			✔	✔	✔
Polynuclear Aromatic Hydrocarbons (PAHs)	✔	✔	✔	✔	
Dibenzo (a, h) anthracene				✔	
Indole(1,2,3-cd) pyrene			✔	✔	✔
7, 12-Dimethyl(a) anthracene				✔	✔
Phenol				✔	✔
Toluene				✔	

Source: Prepared by staff using reference exposure levels and cancer unit risks from CAPCOA Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment guidelines, October 1993, SRP 1998, Office of Environmental Health Hazard Assessment Air Toxics Hot Spots Program Risk Assessment guidelines, and Beacon Solar 2008a, p. 5.10-1.

The applicant's assumption of minimal BSEP contribution to the area's carcinogenic and non-carcinogenic pollutants derives from the low facility scores (calculated according to procedures specified in the previously noted 1990 CAPCOA guidelines) and the magnitude of the cancer and non-cancer risk estimates from the HRA. The results from the facility prioritization assessment (summarized in staff's **Public Health Table 3**) and the HRA (summarized in Public health **Table 4**) were provided to staff along with documentation of the assumptions used (Downey Brand/S. Rowland 2009o, Beacon Solar 2008a pp. 5.10-9 through 5.10-15 and Appendix E.2). This documentation included:

- Pollutants considered;
- Emission levels assumed for the pollutants involved;

- Exposure pathways considered;
- The carcinogenic scoring estimation process;
- The non-carcinogenic scoring process; and
- Priority ranking process.

Staff finds these assumptions to be acceptable for use in this mitigation-related analysis, and agrees with the applicant's findings with regard to the priority ranking of BESP, its related health risk estimates, and the related need for mitigation beyond the levels the applicant proposes.

As shown in **Public Health Table 3**, the total project score for carcinogenic effects is 0.23 and 0.10 for non-carcinogenic effects. As specified in the CAPCOA guidelines, the higher of the two scores (0.23) is specified as the facility's priority score. This score is well below KCAPCD's other air district's and staff's significant threshold of 1.0 suggesting that the pollutants in question are unlikely to pose a significant risk of either chronic or acute non-cancer health effects anywhere in the project area.

Public Health Table 3
Beacon Solar Energy Project's Toxic Air Pollutant Prioritization Scores

Type of Health Impact	Priority Score	Significance Threshold	Significant?
Noncancer	0.10	1.0	No
Individual Cancer	0.23	1.0	No

Staff's summary of information from Beacon Solar 2008a, pp. 5.10-6 through 5.10-14.

The summary in **Public Health Table 4** of the results of the applicant's HRA reflects the potential magnitude of the risks of cancer and noncancer impacts from facility operations. As shown in the table, the chronic hazard index for the maximally exposed individual is 0.0003 while the maximum hazard index for acute effects is 0.0004. These values are well below staff's significance criterion of 1.0 suggesting that the pollutants in question are unlikely to pose a significant risk of chronic or acute noncancer health effects anywhere in the project area. The cancer risk to the maximally exposed individual from normal project operations is 0.57 in 1,000,000 which is well below staff's significance criterion of 10.in 1,000,000. Thus, project-related cancer risk from routine operations would be less than significant for all individuals in the project area.

Public Health Table 4
Beacon Solar Energy Project's Operation Hazard/Risk

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
Acute Noncancer	0.0004	1.0	No
Chronic Noncancer	0.00023	1.0	No
Individual Cancer	0.57×10^{-6}	10.0×10^{-6}	No

The conservatism in these assessments is reflected in the noted fact that (a) the individual considered is assumed to be exposed at the highest possible levels to all the carcinogenic pollutants from the project for a 70-year lifetime, (b) all the carcinogens are assumed to be equally potent in humans and experimental animals, even when their cancer-inducing abilities have not been established in humans, and (c) humans are assumed to be as susceptible as the most sensitive experimental animal, despite knowledge that cancer potencies often differ between humans and experimental animals. Only a relatively few of the many environmental chemicals identified so far as capable of inducing cancer in animals have been shown to also cause cancer in humans.

Since there are no major population centers within the project's area of potential impacts, there would be no environmental justice concerns related to minority or poverty status. Furthermore, staff's analysis has established that no significant health impacts would result anywhere around the project area meaning that the issue of environmental injustice from significant impacts would not arise during operations.

Cooling Tower-Related Risk of Legionnaires disease

Legionella is a bacterium that is ubiquitous in natural aquatic environments and widely distributed in man-made water systems. It is the principal cause of legionellosis, more commonly known as Legionnaires' disease, which is similar to pneumonia. Transmission to people results mainly from the inhalation or aspiration of aerosolized contaminated water. Untreated or inadequately treated cooling systems, such as industrial cooling towers and building heating, ventilating, and air conditioning systems have been associated with outbreaks of legionellosis since cooling water systems and their components can amplify and disseminate aerosols that contain Legionella. The related controls include the use of chlorine or other biocides to minimize the growth of Legionella and other microorganisms.

Legionella can grow symbiotically with other bacteria and infect protozoan hosts. This provides Legionella with protection from adverse environmental conditions, including making it more resistant to water treatment with chlorine, biocides, and other disinfectants. Staff notes that most cooling tower water treatment programs are designed to minimize scale, corrosion, and biofouling, but not necessarily to control Legionella.

Effective mitigation measures should include a cleaning and maintenance program to minimize the accumulation of bacteria, algae, and protozoa that may contribute to the nourishment of Legionella. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE 1998) emphasizes the need for such programs in its specifications for Legionellosis prevention. Also, the Cooling Tower Institute has issued guidelines for the best practices for control of Legionella (CTI 2000). Preventive maintenance includes effective drift eliminators, periodically cleaning the system as appropriate, maintaining mechanical components, and maintaining an effective water treatment program with appropriate biocide concentrations.

Staff's recommended Condition of Certification **PUBLIC HEALTH-1** is intended to ensure the effective maintenance and bactericidal action necessary during the operation of BSEP's cooling tower using the applicant's proposed potable water or staff's

recommended Rosamond alternative. This condition would specifically require the project owner to prepare and implement a cooling water management plan to ensure that bacterial growth is kept to a minimum in the cooling tower. With the use of an aggressive antibacterial program, coupled with routine monitoring and biofilm removal, the risk associated with bacterial growth and dispersal would be reduced to less than significant.

CUMULATIVE IMPACTS

As reflected in BSEP's prioritization score, and results of its health risk assessment, construction and operation would generate toxic pollutants at levels considered insignificant by KCAPCD, the other air districts, and staff in assessing potential compliance with applicable LORS and related need for further mitigation. This low priority score and numerical health risk estimates mean that the project would not significantly add to the lifetime risk of cancer and noncancer effects in any individual in the project area. The applicant (Beacon Solar 2008a p. 5.10-6) identified two future area projects that could add to the combined impacts of pollutants from BSEP and background levels. As further discussed by the applicant, these two projects (the Pine Tree Wind project and a transmission project), would be located too far from BSEP to significantly add to any pollution-related impacts from BSEP.

Given the identified lack of significant emissions from construction and operation of BSEP, staff agrees with the applicant that further mitigation would not be necessary to ensure compliance with the health and safety LORS of concern in this analysis. The relative lack of construction and operational impacts means that there would be no environmental justice concerns related to public health.

COMPLIANCE WITH LORS

The toxic pollutant-related prioritization scoring and results of the health risk assessment for BSEP reflect the likely effectiveness of the mitigation measures specified by the applicant to control toxic emissions from the project's main sources. The construction-related measures include the use of effective controls against particulate matter, diesel exhaust from construction activities and use of the project's fire water pump. The operations-related measures include the use of cleaner-burning natural gas and an oxidation catalyst in the auxiliary boilers, limiting the hours of operations for these boilers, and use of a non-combustion source (sun energy) for electricity generation. Since (a) the calculated prioritization score is below the air districts' and staff's significance levels, and (b) the health risk estimates from construction and operation would be way below staff's significance criteria, staff concludes that the proposed construction and operational plan would comply with the health and safety LORS of concern in this analysis.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Comment:

In its April 30, 2009 comments on the preliminary staff assessment for BSEP, the California Union for Reliable Energy (CURE) characterized staff's recommended Public

Health Condition of Certification (Public Health-1) as inadequate for ensuring specific input from the public and other interested parties in assessing the adequacy of the related Cooling Water Management Plan as mitigation against Legionella and other bacteria growth in the cooling tower.

Staff's Response:

Staff is in agreement with CURE on the need for input from the general public and other interested parties but disagrees with CURE that the recommended approval process would not allow adequate consideration of such input by the Compliance Project Manager (CPM). We note in this regard that, after the plan is received by the CPM, it would be docketed for review by all interested parties whose comments and recommendations would be considered by the CPM in the adequacy assessment process.

CONCLUSIONS AND RECOMMENDATIONS

Staff has determined that the toxic air emissions from the construction and operation of this proposed solar-powered would be at levels that do not require mitigation beyond the specific emission control measures noted above and therefore, proposes no further mitigation in this regard.

Implementation of staff's proposed condition of certification regarding Legionella or other bacterial growth would prevent the risk of human infection during operations. The conditions for ensuring compliance with all applicable air quality standards are specified in the **AIR QUALITY** section for the area's criteria pollutants.

PROPOSED CONDITION OF CERTIFICATION

PUBLIC HEALTH-1 The project owner shall develop and implement a Cooling Water Management Plan that is consistent with either staff's *Cooling Water Management Program Guidelines* or the Cooling Technology Institute's *Best Practices for Control of Legionella* guidelines.

Verification: At least 30 days prior to the commencement of cooling tower operations, the Cooling Water Management Plan shall be provided to the Compliance Project Manager for review and approval.

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ATTACHMENT A - CRITERIA POLLUTANTS

OZONE (O_3)

Ozone is not directly emitted from specific sources but is formed when reactive organic compounds (VOCs) interact with nitrogen oxides in the presence of sunlight. Heat speeds up the reaction, typically leading to higher concentrations in the relatively hot summer months. Ozone is a colorless, reactive gas with oxidative properties that allow for tissue damage in the exposed individual. The effects of such damage could be experienced as respiratory irritation that could interfere with normal respiratory function. Ozone can also damage plants and other materials susceptible to oxidative damage.

The U.S. EPA revised its federal ozone standard on July 18, 1997 (62 Fed. Reg. 38856), based on health studies that became available since the standard was last revised in 1979. These new studies showed that adverse health effects could occur at ambient concentrations much lower than reflected in the previous standard, which was based on acute health effects experienced during heavy exercise. In proposing the new standard, the EPA identified specific health effects known to have been caused by short-term exposures (of one to three hours) and prolonged exposure (of six to eight hours) (61 Fed. Reg. 65719). However, a 1999 federal court ruling blocked implementation of the ozone 8-hour standard, which is yet to be implemented.

Acute health effects from short-term exposures include a transient reduction in pulmonary function, and transient respiratory symptoms including cough, throat irritation, chest pain, nausea, and shortness of breath with associated effects on exercise performance. Other health effects of short-term or prolonged O_3 exposures include increased airway responsiveness (which predisposes the individual to bronchioconstriction induced by external stimuli such as pollen and dust), susceptibility to respiratory infection (through impairment of long defense mechanisms), increased hospital admissions and emergency room visits, and transient pulmonary inflammation.

Generally, groups considered especially sensitive to the effects of air pollution include persons with existing respiratory diseases, children, pregnant women, and the elderly. However, controlled exposure data on people in clinical settings have indicated that the population at greatest risk of acute effects from ozone exposures as children and adults engaged in physical exercise. Children are most at risk because they are active outside, playing and exercising, during summer when ozone levels are highest. Adults who are outdoors and engaging in heavy exertion in the summer months are also among the individuals most at risk. This happens because such exertion increases the amount of O_3 entering the airways and can cause O_3 to penetrate to peripheral regions of the lung where lung tissue is more likely to be damaged. These individuals, as well as those with respiratory illnesses such as asthma, can experience a reduction in lung function and increased respiratory symptoms, such as chest pain and cough, when exposed to relatively low ozone levels during periods of moderate exertion.

CARBON MONOXIDE (CO)

Carbon monoxide is a colorless, odorless gas which is a product of inefficient combustion. It does not persist in the atmosphere, being quickly converted to carbon dioxide. However, it can reach high levels in localized areas, or "hot spots".

CO reduces the oxygen carrying capacity of the blood, thereby disrupting the delivery of oxygen to the body's organs and tissues. Persons sensitive to the effects of carbon monoxide include those whose oxygen supply or delivery is already compromised. Thus, groups potentially at risk to carbon monoxide exposure include persons with coronary artery disease, congestive heart failure, obstructive lung disease, vascular disease, and anemia, and the elderly, newborn infants, and fetuses (CARB 1989, p. 9). In particular, people with coronary artery disease were found to be especially at risk from carbon monoxide exposure (CARB 1989, p. 9). Tests conducted on patients with confirmed coronary artery disease indicated that exposure to low levels of carbon monoxide during exercise can produce significant cardiac effects. These effects include chest pain (angina) and electrocardiographic changes indicative of effects on the heart muscle (CARB 1989, p. 6). Such changes can limit the ability of patients with coronary artery disease to exert themselves even moderately. Therefore, the statewide carbon monoxide one-hour and eight-hour standards were adopted in part to prevent aggravation of chest pain. Additionally, however, the standards are intended to prevent decreased exercise tolerance in persons with peripheral vascular disease and lung disease, impaired central nervous system functions, and effects on the fetus (Cal. Code Regs. Tit. 17, sec. 70200).

PARTICULATE MATTER (PM)

Particulate matter is a generic term for particles of various substances, which occur as either liquid droplets or small solids of a wide range of sizes. Particles with the most potential to adversely affect human health are those less than 10 micrometers (millionths of a meter) in diameter (known as PM10), which may be inhaled and deposited within the deep portions of the lung (PM10). PM may originate from anthropogenic or natural sources such as stationary or mobile combustion sources or windblown dust. Particles may be emitted directly to the atmosphere or result from the physical and chemical transformation of gaseous emissions such as sulfur oxides, nitrogen oxides, and volatile organic compounds. PM10 may be made up of elements such as carbon, lead, and nickel; compounds such as nitrates, organics, and sulfates; and complex mixtures such as diesel exhaust and soil fragments. The size, chemical composition, and concentration of ambient PM10 can vary considerably from area to area and from season to season within the same area.

PM10 can be grouped into two general sizes of particles, fine and coarse, which differ in formation mechanisms, chemical composition, sources, and potential health effects. Fine-mode particles are those with a diameter of 2.5 micrometers or less (PM2.5), while the coarse-mode fraction of PM consists of particles ranging from 10 micrometers down to 2.5 micrometers in diameter.

Coarse-mode PM10 is formed by crushing, grinding, and abrasion of surfaces, and in the course of reducing large pieces of materials to smaller pieces. Coarse particles consist mainly of soil dust containing oxides of silicon, aluminum, calcium, and iron; as well as fly ash, particles from tires, pollen, spores, and plant and insect fragments. Coarse particles normally have shorter lifetimes (minutes to hours) and only travel over short distances (of less than tens of kilometers). They tend to be unevenly distributed across urban areas and have more localized effects than the finer particles.

PM2.5 is derived both from combustion by-products, which have volatilized and condensed to form primary PM2.5, and from precursor gases reacting in the atmosphere to form secondary PM2.5. Components include nitrates, organic compounds, sulfates, ammonium compounds, and trace elements (including metals) as well as elemental carbon such as soot. Major sources of PM2.5 are fossil fuel combustion by electric utilities, industry and motor vehicles, vegetation burning, and the smelting or other processing of metals. Dry deposition of fine mode particles is slow allowing such particles to often exist for long periods of time (from days to weeks) in the atmosphere and travel hundreds to thousands of kilometers. They tend to be uniformly distributed over urban areas and larger regions and are removed from the atmosphere primarily by forming cloud droplets and falling out within raindrops.

The health effects of PM10 from any given source usually depend on the toxicity of its constituent pollutants. The size of the inhaled material usually determines where it is deposited in the respiratory system. Coarse particles are deposited most readily in the nose and throat area while the finer particles are more likely to be deposited within the bronchial tubes and air sacs, with the greatest percentage deposited in the air sacs. Until recently, PM10 particles had been considered to be the major fraction of airborne particulates responsible for various adverse health effects. The PM10 fraction is known to be capable of penetrating the thoracic and alveolar regions of the human and animal lungs. The PM2.5 fraction, however, was found to pose a significantly higher risk for health. This is due to their size and associated deposition and retention characteristics in the respiratory tract, enabling it to penetrate and deposit within the deeper alveolar regions of the lung. The following aspects of PM2.5 deposition all contribute to the more serious health effects attributed to smaller particles:

- The deposition of PM2.5 favors the periphery of the lungs, which is especially vulnerable to injury for anatomical reasons.
- Clearance of the PM2.5 from within the deeper reaches of the lungs is a much slower process than from the upper regions. Consequently, the residence time is longer, implying longer exposure, and hence greater risk.
- The human anatomy further allows the penetration of the superficial tissues by PM2.5 and entry into the bodily circulation without much effort in the periphery of the lungs.

Many epidemiological studies have shown exposure to particulate matter capable of inducing a variety of health effects, including premature death, aggravation of respiratory and cardiovascular disease, changes in lung function and increases in existing respiratory symptoms, effects on lung tissue structure, and impacts on the body’s respiratory defense mechanisms. The underlying biological mechanisms are still poorly understood. Based on their review of a number of these epidemiological studies (as published after 1987 when the federal standards were revised), together with suggestion of PM2.5 concentrations as a more reliable surrogate for the health impacts of the finer fraction of PM than PM10, the U.S. EPA concluded that the then-current standards were not sufficiently stringent to protect against significant effects in exposed humans. Therefore, federal PM standards were revised on July 18, 1997 (62 Fed. Reg. 38652) to add new annual and 24-hour PM2.5 standards to the existing annual and 24-hour PM10 standards. Taken together, these new standards were meant to provide

additional protection against a wide range of PM-related health effects, including premature death, increased hospital admissions and emergency room visits, primarily among sensitive individuals such as the elderly, children and individuals with cardiopulmonary diseases such as asthma. Other impacts include decreased lung function (particularly in children and asthmatics) and alterations in lung tissue and structure.

California has also had 24-hour and annual standards for PM10 (CARB 1982, pp. 81, 84). These standards were set to protect against asthma, premature death and bronchitis-related symptoms within the general population as well as sensitive individuals such as patients with respiratory disease, declines in pulmonary function, especially as related to children (Tit. 17, Cal. Code Regs. §70200). These standards were set to be more stringent than the federal standard, which the CARB regarded as inadequate for the protection desired (CARB 1991, p. 26).

On June 20, 2002, the CARB approved the adoption of a lower annual state standard for PM10, as well as a new annual standard for PM2.5 (CARB 2002). The new standards took effect on July 5, 2003. The 24-hour PM10 standard was not changed. The standards were established to prevent excess death, illnesses such as respiratory symptoms, bronchitis, asthma exacerbation, and cardiac disease, and restrictions in activity from short- and long-term exposures (Title 17, Cal. Code Regs. §70200).

NITROGEN DIOXIDE (NO_2)

Nitrogen dioxide is formed either directly or indirectly when oxygen and nitrogen in the air combine together during the combustion. It is a relatively insoluble gas, which can penetrate deep into the lungs, its principal site of toxicity. Its toxicity is thought to be due to its capacity to initiate free radical-mediated reactions while oxidizing cellular proteins and other biomolecules (CARB 1992, Appendix A, p. 4).

Sub lethal exposures in animals usually produce inflammations and varying degrees of tissue injury characteristic of oxidant damage (Evans in CARB 1992, Appendix A, and p 5). The changes produced by low-level acute or sub chronic exposures appear to be reversible when the animal study subject is allowed to recover in clean air. Health effects of particular concern in relation to low-level nitrogen dioxide exposure include: (1) effects of acute exposure on some asthmatics and possibly on some persons with chronic bronchitis, (2) effects on respiratory tract defenses against infection, (3) effects on the immune system, (4) initiation or facilitation of the development of chronic lung disease, and (5) interaction with other pollutants (CARB 1992, Appendix A, p. 5).

Several groups, which may be especially susceptible to nitrogen dioxide-related health effects have been identified from human studies (CARB 1992, Appendix A, and p. 3). These include asthmatics, persons with chronic bronchitis, infants and young children, cystic fibrosis and cancer patients, people with immune deficiencies, and the elderly.

Studies involving brief, controlled exposures on sensitive individuals have shown an increase in bronchial reactivity or airway responsiveness of some asthmatics, as well as decreased lung function in some patients with chronic obstructive lung disease (CARB 1992, Appendix A, p. 2). In general, bronchial hyper reactivity (an increased tendency of the airways to constrict) is markedly greater in asthmatics than in non-asthmatics upon

exposure to initiating respiratory irritants (CARB 1992a, p. 107). At exposure concentrations of specific relevance to the current one-hour ambient standard, there appears to be little, if any, effect on respiratory symptoms of asthmatics (CARB 1992a, p. 108).

SULFUR DIOXIDE (SO_2)

Sulfur dioxide is formed when any sulfur-containing fuel is burned. SO_2 is highly soluble and consequently absorbed in the moist passages of the upper respiratory system. Exposure to sulfur dioxide can lead to changes in lung cell structure and function that adversely affect a major lung defense mechanism known as mucociliary transport. This mechanism functions by trapping particles in mucus in the lung and sweeping them out via the cilia (fine hair-like structures) also in the lung. Slowed mucociliary transport is frequently associated with chronic bronchitis.

Exposure to sulfur dioxide can produce both short- and long-term health effects. Therefore, California has established sulfur dioxide standards to reflect both short- and long-term exposure concerns. Based on controlled exposure studies of human volunteers, investigators have found that asthmatics comprise the group most susceptible to adverse health effects from exposure to sulfur dioxide (CARB 1994, p. V-1).

The primary short-term effect is bronchioconstriction, a narrowing of the airways, which results in labored breathing, wheezing, and coughing. The short-term (one-hour) standard is based on bronchioconstriction and associated symptoms (such as wheezing and shortness of breath) in asthmatics and is designed to protect against adverse effects from five to ten minute exposures. In the opinion of the California Office of Environmental Health Hazard Assessment, the short-term ambient standard is likely to afford adequate protection to asthmatics engaged in short periods of vigorous activity (CARB 1994, Appendix A, p. 16).

Longer-term exposure is associated with increased incidence of respiratory symptoms (such as coughing and wheezing) or respiratory disease, decreases in pulmonary function, and an increased risk of premature mortality (CARB 1991a, p. 12). The long-term (24-hour) standard is based upon increased incidence of respiratory disease and premature mortality. The standard includes a margin of safety based on epidemiological studies, which have shown adverse respiratory effects at levels slightly above the standard. Some of the studies indicate a sulfur dioxide threshold for effects, suggesting that no significant effects are expected from exposures to concentrations at the state standard (Ibid.).

ATTACHMENT A - REFERENCES

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SOCIOECONOMICS

Testimony of Marie McLean

SUMMARY OF CONCLUSIONS

Staff found either no or less than significant socioeconomic impacts from the construction and operation of the Beacon Solar Energy Project (BSEP), a 250 MW solar facility to be constructed in Kern County. See **Socioeconomics Table 2**, "CEQA Environmental Checklist Form."

No environmental justice issues exist in the area of socioeconomics.

Staff identified the following economic benefits from the project: capital costs; construction and operation payroll; property and sales taxes; and school impact fees.

INTRODUCTION

In this analysis California Energy Commission (Energy Commission) staff presents its analysis of the estimated impacts and benefits resulting from the construction and operation of the BSEP. In addition, staff provides information about the Energy Commission's demographic screening (environmental justice) procedures related to this project.

In preparing its analysis, staff evaluated changes to public services and infrastructure according to *California Environmental Quality Act, Appendix G,* "Environmental Checklist Form: Population and Housing; Public Services; and Recreation." See "Assessment of Impacts," in this document. Staff also evaluated project-induced fiscal changes as reported by the applicant. See "Noteworthy Public Benefits," in this document.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

SOCIOECONOMICS Table 1 contains all applicable socioeconomics laws, ordinances, regulations, and standards (LORS) applicable to the proposed BSEP.

Socioeconomics, Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

House Resolution (HR)1424, Emergency Economic Stabilization Act of 2008	Extends for eight years the 30 percent federal investment tax credit for both residential and commercial installations. Applies to property placed in service after December 31, 2008.
California Education Code, Section 17620	Authorizes the governing board of any school district to levy a fee, charge, dedication, or other requirement for the purpose of funding the construction or reconstruction of school facilities.
California Government Code Sections 65995–65997	Authorizes school districts to levy fees against development projects according to *Education Code* 17620. Conversely, public agencies at the state and local level may not impose fees, charges, or other financial requirements to offset the cost for school facilities except for those fees established according to *Education Code* 17620.
California Revenue and Taxation Code Section 70-74.7	Currently, property taxes are not assessed on solar components. That law will be in effect until January 1, 2010 (2008-2009 property tax lien) unless extended by the Legislature.

SETTING

The Beacon Solar Energy Project (BSEP), a 250 MW solar facility, is located approximately four miles north-northwest of California City's northern boundary; 15 miles north of Mojave; and 24 miles northeast of Tehachapi. Koehn Lake is located approximately five miles to the east; Red Rock Canyon State Park, approximately four miles north. An automotive test track facility, Honda Proving Center, is located about 0.8 miles to the east.

Kern County is bordered on the north by Kings County, Tulare County, and Inyo County; south by Los Angeles County; west by San Bernardino County; and east by San Luis Obispo County. Kern County consists of approximately 222 cities, towns, and US Census-designated places, including the following eleven incorporated cities: Arvin, Bakersfield, California City, Delano, Maricopa, McFarland, Ridgecrest, Shafter, Taft, Tehachapi, and Wasco.

Construction is scheduled to begin in fourth quarter 2010, with a project completion and operational date in first quarter 2013. The project's life is estimated to be 30 years.

DEMOGRAPHIC SCREENING

Staff's demographic screening analysis is designed to determine the existence of a minority or below-poverty-level population or both within a six-mile area of the project site.

The demographic screening process is conducted based on information contained in two documents: *Environmental Justice: Guidance Under the National Environmental*

Policy Act (Council on Environmental Quality, 1997) and *Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (National Council on Environmental Quality, 1998). The Energy Commission's screening process relies on Year 2000 U.S. Census data to determine levels of minority and below-poverty-level populations.

Minority Populations

According to *Environmental Justice: Guidance Under the National Environmental Policy Act*, minority individuals are defined 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, for the purposes of environmental justice, is identified when the minority population of the potentially affected area is (1) greater than 50 percent; (2) meaningfully greater than the percentage of the minority population in the general population or other appropriate unit of geographical analysis; or (3) when one or more U.S. Census blocks in the potentially affected area have a minority population of greater than 50 percent.

For the Beacon Solar Energy Project, the total population within the six-mile radius of the proposed site is 256 persons; and the total minority population is 45 persons or 17.57 percent of the total population (see **Socioeconomics Figure 1**). However, U.S. Census blocks with minority populations greater than 50 percent exist within the six-mile radius. Therefore, staff in several technical areas identified in the Executive Summary have considered environmental justice in their environmental impact analyses.

Below-Poverty-Level Populations

Staff has also identified the current below-poverty-level population based on Year 2000 U.S. Census block group data within a six-mile radius of the project site. The below-poverty-level population within a six-mile radius of the Beacon Solar Project consists of 779 people or 19.46 percent of the total population in that area.[1]

ASSESSMENT OF IMPACTS

This section includes information about the following:

1. Method and threshold for determining significance
2. Direct/indirect/induced impacts and mitigation

[1] U.S. Census blocks are the smallest geographic unit used by the U.S. Census Bureau to tabulate data. Census block groups represent a cluster of census blocks having the same first digit of their four-digit identifying numbers within a census tract. For example, a block group 3 (BG 3) within a census tract includes all blocks numbered from 3000 to 3999. Block groups generally contain between 500 and 3000 people with an optimum size of 1,500 people. Consequently, some census block groups may extend outside the six-mile radius used by the Energy Commission to determine below-poverty-level populations. Hence, some below-poverty-level populations residing outside the six-mile radius may be included in the below-poverty-level figure.

3. Cumulative impacts and mitigation

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Socioeconomics is concerned with population, housing, public services, recreation, and finance and the impacts they have people's daily lives. To determine a project's potentially significant environmental impacts as they relate to socioeconomics, Energy Commission staff reviews the project according to "Guidelines for the Implementation of the California Environmental Quality Act; Appendix G, "Environmental Checklist Form, Population and Housing; Public Services; and Recreation."

As required by the guidelines, staff determines a project's potentially significant impact on population and housing, public services, and recreation by evaluating the impact of the project on those three areas. See **Socioeconomics Table 2**, CEQA Environmental Checklist Form.

To conduct this evaluation and arrive at the conclusions contained **Socioeconomics Table 2**, staff analyzed the current status of population, housing, public services, and recreation to determine if project-related impacts would significantly strain or degrade those services. In addition, staff:

1. Reviewed the BSEP Application for Certification (AFC)

2. Researched, collected, and analyzed socioeconomic data from various governmental agencies, trade associations, and public interest research groups.

As indicated in **Socioeconomics Table 2**, staff found the project to have no impact on population and housing; less than significant impact on fire and police protection; no impact on schools, parks, and other public facilities; and no impact on recreation. If staff had found the project to have a significant effect on population and housing, public services, or recreation, staff would propose mitigation.

Conversely, the project could have beneficial fiscal and nonfiscal effects on the project area. For example, property taxes, sales taxes, or local school impact or development fees resulting from the construction and operation of the project could help local governments augment needed public services. Consequently, in this socioeconomic analysis, staff:

1. Examined the beneficial impacts on local finances from property and sales taxes and other sources of revenue.

2. Included information about the project's economic benefits in this section. See **Socioeconomics Table 5**, "Noteworthy Public Benefits Related to Beacon Solar Energy Project," at the end of this document.

DIRECT/INDIRECT/INDUCED IMPACTS AND MITIGATION

Information about direct, indirect, and induced impacts and proposed mitigation is included in this section and grouped according to the questions found in **Socioeconomics Table 2**, which follows.

SOCIOECONOMICS Table 2
CEQA Environmental Checklist Form

	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact
POPULATION AND HOUSING —Would the project:				
A. Induce substantial population growth in a new area, either directly or indirectly				X
B. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
C. Displace substantial numbers of people, necessitating construction of replacement housing elsewhere?				X
PUBLIC SERVICES —Would the project:				
A. Result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new of physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service rations, response times, or other performance objectives for any of the public services:				
			X	
Fire protection			X	

Police protection Schools Parks Other public facilities			X X X	
RECREATION—Would the project:				
A. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated				X

Induce Substantial Population Growth

For the purpose of this analysis, *induce substantial population growth* is defined as people permanently moving into the area because of the construction and operation of the Beacon Solar Energy Project, thereby encouraging the construction of new homes and businesses or the extension of roads or other infrastructure. Based on that definition, BSEP will not encourage people to permanently move into the area. Consequently, the BSEP will have no direct or indirect impact on substantial population growth in a new area.

However, the construction of the BSEP will result in the influx of temporary workers to the area during the two-year construction period, which begins in fourth quarter 2010 and is expected to be completed within 25 months of the start date. The plant is expected to be operational during first quarter, 2013. Once operational, the plant will employ approximately 66 workers, most of whom would already reside in the area.

The peak number of temporary workers needed for the project is 836 and the average number of workers per day, 477. Those workers, who will likely come from the following counties: Kern, Los Angeles, and San Bernardino and commute to the project site.[2] For those workers, who will return home for the weekends, approximately 792 hotel and motel rooms are available near the BSEP site, including rooms in California City, Mojave, Rosamond, and Ridgecrest. In addition, at least five RV sites are located within 25 miles of the BSEP site. **Socioeconomics Table 3**, "Population, Housing Units, and Unemployment Rates," which follows, includes information designed to provide a snapshot view of the areas affected by the construction of the BSEP.

[2] According to *Socioeconomics of Power Plants*; Electric Power Research Institute, 1982, construction workers will travel two hours each way to a job site rather than relocate.

SOCIOECONOMICS Table 3
Population, Housing Units, and Unemployment Rates
for Kern, Los Angeles, and Riverside Counties

County	Population (January 2008)	Unemployment Rate (Percent, Seasonally Unadjusted) (July 2008)	Vacant Housing Units/ Percent Vacant (January 2008)
Kern (Bakersfield Metropolitan Statistical Area California City (Closest to Site)	817,517 14,365	9.9 7.7	272,602/ 9.84
Los Angeles (Los Angeles-Long Beach Metropolitan Division)	10,363,850	8.1	3,403,489 4.2
San Bernardino (Riverside-San Bernardino-Ontario Metropolitan Statistical Area)	2,088,302	8.5	685,642 11.61

Source: California Department of Finance; California Employment Development Department

According to data available from the California Employment Development Department, those three counties will be able to provide the number of workers needed. See **SOCIOECONOMICS Table 4,** "Available Labor, by Skill, in Kern, Los Angeles, and San Bernardino Counties, 2004–2014, and Maximum Number of Workers Needed by Project," which follows.

SOCIOECONOMICS Table 4
Available Labor by Skill in Kern, Los Angeles, and San Bernardino Counties, 2004–2014, and Maximum Number of Workers Needed by Project

Craft	**Kern County** (Bakersfield Metropolitan Statistical Area)	**Los Angeles County** (Los Angeles-Long Beach-Metropolitan Division	**San Bernardino County** (Riverside-San Bernardino-Ontario Metropolitan Statistical Area)	**Maximum Number of Workers Needed by Project**
Boiler Makers	150	190	7	11
Carpenters	1,990	23,620	28,050	72
Cement Masons	780	2,770	5,170	10
Construction Staff	N/AV	N/AV	N/AV	44
Construction Trade Workers	3,500	24,820	20,010	44
Electricians	1,590	6,690	6,730	253
Foreperson	800	10,770	4,080	18
Insulation Workers	4,300	420	220	56
Ironworkers	50	2,640	930	57
Laborers	13,140	13,520	20,010	100
Mechanics	560	2,720	1,120	4
Millwrights	N/AV	950	120	23
Operating Engineers	550	4,080	3,980	108
Painters	70	3,990	7,570	15
Pipefitters	1,080	12,580	4,660	339
Solar Field Subs	N/AV	N/AV	N/AV	7
Subcontractors	N/AV	N/AV	N/AV	8
Teamsters (Truck Drivers, Heavy and Tractor-Trailer	4,280	33,310	20,020	14
Technical Advisors	N/AV	N/AV	N/AV	6
Welders	810	8,250	3,950	36

Source: State of California Employment Development Department, Occupational Employment Projections, Occupation Profile; and Beacon Solar Energy Project AFC.
* Not Available (N/AV)

Displace Existing Housing, Necessitating New Construction

This project will be constructed on a vacant, 2,012-acre site in eastern Kern County. Consequently, the project will not displace existing housing.

Displace Substantial Numbers of People

This project will be constructed on a vacant, 2,012-acre site in eastern Kern County. Consequently, the project will not displace substantial numbers of people.

Result in Substantial Adverse Physical Impacts to Government Services

This project will not cause significant impacts on service ratios, response times, or other performance objectives relating to law enforcement, medical services, police protection; schools; and other public facilities. Staff's analysis follows.

Law Enforcement

Located at 1771 Highway 58 in Mojave, 16 miles from the proposed site, the Kern County Sheriff's Department would provide services for the project, including traffic and neighborhood police control, emergency calls, and crime prevention. The substation's response area—1,320 square miles—is one of the largest response areas in Kern County. The department's average response time is 23 minutes, 54 seconds for a Type 1 and Type 2 incident (Personal communication (e-mail) to Marie McLean from Francis Moore, Commander, Kern County Sheriff's Office).

The state highways and roads near the BSEP are patrolled by the California Highway Patrol (CHP). The CHP enforces applicable laws; controls traffic; investigates accidents; and manages hazardous materials spills.

Population wise, the demand for law enforcement will not be significantly increased because most of the labor force would be commuting. For the operational phase, the change in population would be slight or nonexistent. Consequently, the project will result in a less than significant impact on law enforcement services.

Medical Services

Staff finds a less than significant impact on medical services, including emergency services, associated with the construction and operation of the BSEP. Four hospitals are located within the BSEP area. Those hospitals include Ridgecrest Regional Hospital, Ridgecrest; Antelope Valley Hospital, Lancaster; and the Kern Medical Center, Bakersfield. In addition, Lancaster is also home to the Drummond Medical Group, which offers limited emergency and outpatient surgical services, and the LAC/High Desert Hospital, a short-term, 28-bed intensive care facility.

Three hospitals located less than 50 miles of the proposed site operate a 24-hour emergency room: (1) Antelope Valley Hospital, a 420-bed, acute-care facility in Lancaster, with a medical staff of 450 staff physicians; (2) Lancaster Community Hospital, Lancaster, a 117-bed, acute-care facility; and (3) Ridgecrest Regional Hospital, Ridgecrest, an 80-bed facility located in Ridgecrest.

Located approximately 70 miles from the project site in Bakersfield, the Kern Medical Center, a 222-bed, acute-care teaching hospital, operates the county's only trauma center. Owned and operated by Kern County and staffed by 65 physicians, Kern

Medical Center works with the Kern County's Emergency Medical Services (EMS) Department, area hospitals, and ambulance companies to provide medical services necessary for critically injured patients in Kern County.

For additional information about medical services, please see the following sections of this assessment: **Worker Safety** and **Hazardous Materials**.

Schools and Other Public Facilities

Staff finds that a less than significant impact on schools or other public facilities such as libraries, community centers, and day-care facilities would occur during the construction and operation of the BSEP.

Construction workers would most likely commute to the project site. If the BSEP were to employ nonlocal construction workers, those workers would not likely relocate family members for the relatively short construction period. Instead, they would likely stay in local hotels, motels, or RV parks during the week and return home on weekends. Consequently, their use of public facilities is limited.

Increase Use of Existing Recreational Facilities

Two county recreational areas and one state recreational area are located in the vicinity of the BSEP site: the 5,000-acreTehachapi Mountain Park; the 1,102-acre Kern River County Park, with two picnic areas and golf course; and Red Rock Canyon State Park. All require advance reservations, either for campsites or picnic grounds. However, hiking trails at Tehachapi Mountain Park and Red Rock Canyon State Park may be accessed without reservations (Kern County Parks and Recreation, www.co.**kern**.ca.us/**parks**/).

The 25,665-acre Red Rock Canyon State Park is the closest recreational facility to the site—approximately four miles north—and is open sunrise to sunset for day use. Its 50-space campground, open 24 hours, is first-come, first-served. According to the Department of Parks and Recreation, the campground may fill up on weekends in spring and fall (California Department of Parks and Recreation, "Red Rock Canyon State Park, www.parks.ca.gov/default.asp?page_id=631).

The construction and operation of the BSEP would have no impact on existing county and state parks in the area, including Red Rock Canyon State Park for the following reasons:

1. Most workers would be commuting daily to and from their homes. The few who chose not to commute and instead stay in nearby hotels for the week would be returning home for the weekend.

2. Workers who chose not to return home for the weekend would need to make reservations to use facilities at each park. That reservation system is designed to prevent significant impacts on the parks.

3. Workers who chose not to return home for the weekend but instead wished to take advantage of the hiking trails could do so without resulting in a significant impact on

the parks. The size of the parks—from 25,665 to 1,102 acres—are large enough to accommodate the small number of temporary workers who may want to use the trails without resulting in a significant impact.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in significant adverse cumulative impacts when its effects are cumulatively considerable; that is, when the incremental effects of an individual project are significant when viewed in connection with the effects of (1) past projects; (2) other current projects; and (3) probable future projects [*Public Resources Code* Section 21083; *California Code of Regulations*, Title 14, Sections 15064(h); 15065 (c); 15130; and 15355]. Mitigation requires taking feasible measures to avoid or substantially reduce the impacts.

In a socioeconomic analysis, cumulative impacts could occur when more than one project in the same area has an overlapping construction schedule, thus creating a demand for workers that cannot be met locally. That increased demand for labor could result in an influx of non-local workers and their dependents, resulting in a severe strain on housing, schools, parks and recreation, law enforcement, and medical services.

The construction schedule of a Los Angeles Department of Water and Power (LADWP) renewable energy project—Barren Ridge-Castaic Transmission Project—will overlap with the construction schedule of the BSEP. The Barren Ridge-Castaic Transmission Project will begin at the Barren Ridge Switching Station north of Mojave and end at the Castaic Power Plant in northwest Los Angeles County.

The influx of workers for both the BSEP and the Barren Ridge-Castaic Transmission Project could result in fewer rooms available for BSEP workers, thus contributing to a significant cumulative impact.

Consequently, staff analyzed the cumulative impacts resulting from the overlapping schedules. The results of the analysis, arranged according to construction schedules; housing agreements; cumulative impacts; and mitigation follows.

Construction Schedules

According to the applicant, construction of the BSEP is scheduled to begin in fourth quarter 2010 and continue through first quarter 2013. As reported by LADWP, construction on the Barren Ridge-Castaic Transmission Project is expected to begin in mid-2010 and continue through mid-2013, approximately one month before construction on the BSEP is completed. Consequently, the construction schedules of the BSEP and the Barren Ridge-Castaic Transmission Project will overlap for approximately 23 months.

Housing Arrangements

The influx of workers for both the BSEP and the Barren Ridge-Castaic Transmission Project, could result in a significant cumulative impact. Because of the overlapping construction schedules of the LADWP project and the BSEP, staff analyzed the cumulative impacts of the overlapping construction schedules.

Cumulative Impacts

The construction schedule the Barren-Ridge-Castaic Transmission Project will overlap for about 23 months. However, cumulative impacts resulting from the overlapping schedules will not result in a significant cumulative impact for the following reasons:

1. For the BSEP, the average number of workers per day is expected to be 477. Those workers will likely commute from Kern, Los Angeles, and San Bernardino counties. For workers who wish to stay in the area, a sufficient number of rooms are available See Item 3, below.

2. The Barren Ridge-Castaic Transmission Project, which will span 75 miles from the Mojave Desert to San Fernando Valley, will be built in stages. Hence, workers will be working in an area ranging from Kern County to northwest Los Angeles County during the three-year construction period. Those workers are also likely to commute from Kern, Los Angeles, and San Bernardino counties.

3. Staff has identified at least 792 hotel and motel rooms in the area, including rooms in California City, Mojave, Rosamond, and Ridgecrest. In addition, at least five RV sites are located within 25 miles of the BSEP site. Consequently, a sufficient number of rooms exist in the area to accommodate workers from both projects who wish to remain in the area and not commute. However, those workers will not relocate to the area with their families. Instead, they are likely to return home on weekends.

Mitigation

Staff found no socioeconomic cumulative impacts associated with the construction and operation of the BSEP. Therefore, mitigation measures were not required.

NOTEWORTHY PUBLIC BENEFITS

Noteworthy public benefits include the direct, indirect, and induced impacts of a proposed power plant. Determining and reporting those impacts is a primary task in developing a socioeconomic analysis. [3]

[3] The dollars spent on or resulting from the construction and operation of the BSEP will have a ripple effect on the local economy. For example, BSEP owners employ workers, both temporary and permanent; and purchase supplies and services for the life of the plant. Employees use salaries and wages to purchase goods and services from other businesses. Those businesses make their own purchases and hire employees, who also spend their salaries and wages throughout the local and regional economics. This chain reaction of indirect (jobs, sales, and income generated, for example) and induced (employees' spending for local goods and services, for example) spending continues with subsequent rounds of additional spending, which is gradually diminished through savings, taxes, and expenditures made outside the area. This ripple effect is measured by an "Input-Output" economic model. The model relies on a series of multipliers to provide estimates of the number of times each dollar of input or direct spending cycles through the economy in terms of indirect and induced output, or additional spending, personal income, and employment. Several input-output models are commonly used by economists, including the IMPLAN input-output model used the applicant. IMPLAN multipliers indicate the ratio of direct impacts to indirect and induced impacts. Staff reviewed the results of the IMPLAN model and found them to be reasonable considering data provided by the applicant as well as data obtained by staff from governmental agencies, trade associations, and public interest research groups.

For purposes of this analysis, direct impacts were said to exist if the project resulted in permanent jobs and wages; indirect impacts, if jobs, wages, and sales resulted from constructing the project; induced impacts, from the spending of wages and salaries on food, housing, and other consumer goods. See **Socioeconomics Table 5**, "Noteworthy Public Benefits Related to Beacon Solar Energy Project," which follows. Information in this table is based on a 30-year project life.

SOCIOECONOMICS Table 5
Noteworthy Public Benefits
Related to Beacon Solar Energy Project
(2008 dollars)

Fiscal Benefits	
Estimated annual property taxes (with solar tax credit)	$440,000
Estimated annual property taxes (without solar tax credit)	$4.24—$4.90 million
State and local sales taxes: Construction	$90,145,000
State and local sales taxes: Operation	$435,000 per year
School Impact Fee	$10,400
Gas franchise fees	$345,090
Gas franchise fees surcharge	$336,330
Non-Fiscal Benefits	
Total capital costs	$180 million
Construction payroll	$165.5 million
Operations payroll	$7 million to $8 million
Construction materials and supplies	$14.5 million
Operations and maintenance supplies	$6 million per year
Direct, Indirect, and Induced Benefits	
Estimated Direct Employment	
Construction and commissioning (average)	477 jobs
Operation	66 jobs
Estimated Secondary Employment	
Construction and Commissioning	298 jobs
Operation	98 jobs
Estimated Secondary Income	
Construction and Commissioning	$124 million
Operation	$1.6 million

RESPONSE TO COMMENTS

No comments were received on this project.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed for this project.

REFERENCES

Beacon Solar Energy Project: Application for Certification; Beacon Solar LLC, March 2008.

Council on Environmental Quality, Environmental Justice; Guidance Under the National Environmental Policy Act; 1997.

Electric Power Research Institute, *Socioeconomics of Power Plants*, 1982.

"Red Rock Canyon State Park, www.**park**s.ca.gov/default.asp?page_id=631).

Kern County Parks and Recreation, www.co.**kern**.ca.us/**parks**/.

Personal communication (e-mail) of Marie McLean with Francis Moore, Commander, Kern County Sheriff's Office, September 3, 2008.

Public Resources Code; Section 21083; *California Code of Regulations*, Title 14, Sections 15064(h); 15065 (c); 15130; and 15355.

State of California, Department of Finance, State of California, Department of Finance, E-4 Population Estimates for Cities, Counties and the State, 2001-2008, with 2000 Benchmark. Sacramento, California, May 2008. (www.dof.ca.gov/research/demographic/reports/estimates/e-4_20o01-2007)

State of California, Employment Development Department, www.calmis.ca.gov/file/lfmonth/countyur-400c.pdf

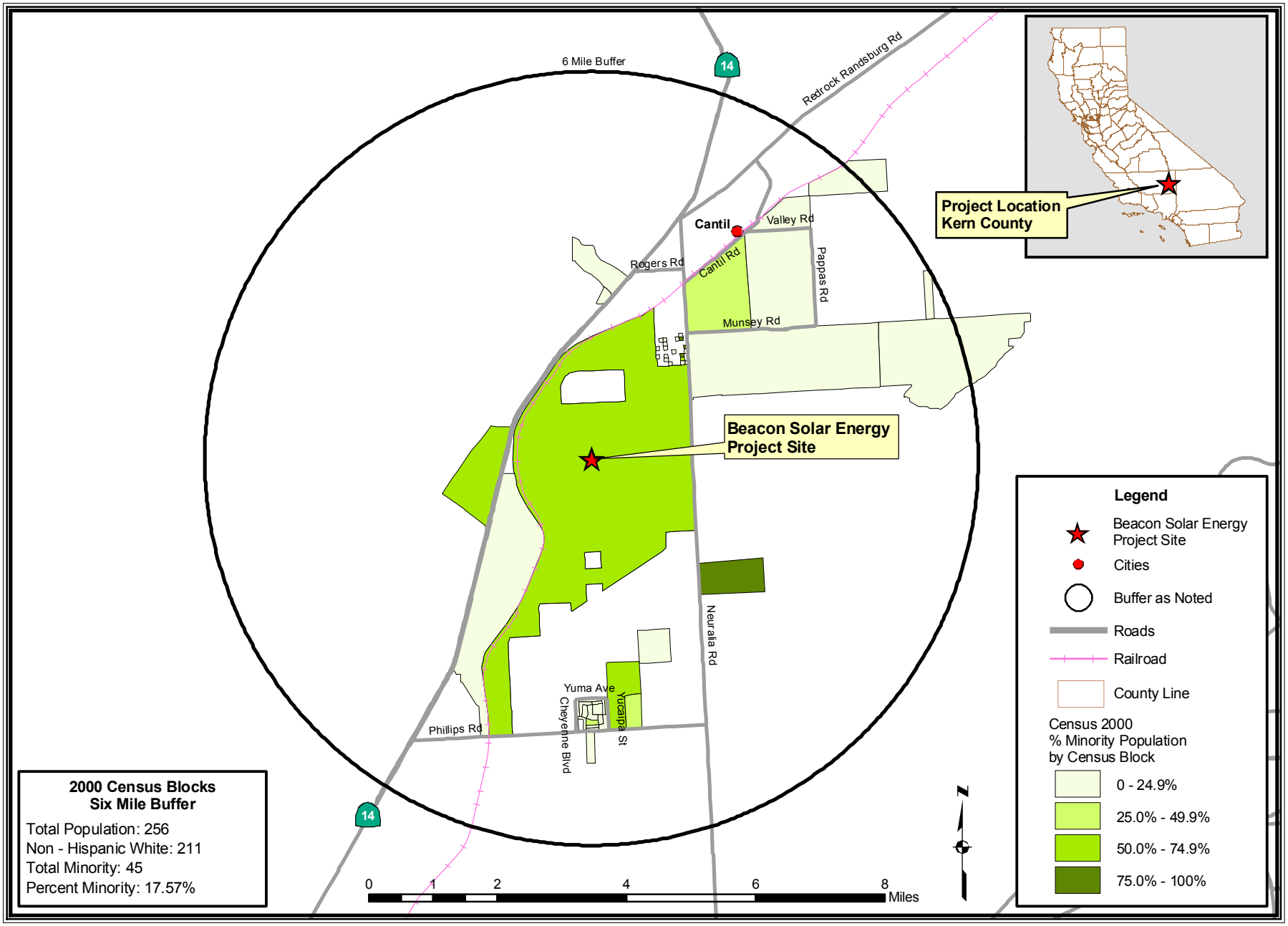
State of California, Employment Development Department, www.labormarketinfo.edd.ca.gov/?pageid=1006.

State of California Resources Agency, CEQA: Appendix G, "Environmental Checklist Form," December 1, 2005; (ceres.ca.**g**ov/topic/env_law/ceqa/**g**uidelines/**Appendix_G**.html)

U.S. Environmental Projection Agency, "Final Guidance for Incorporating Environmental Justice Concers in EPA's NEPA Compliance Analyses; 1988.

SOCIOECONOMICS - FIGURE 1

Beacon Solar Energy Project - Census 2000 Minority Population by Census Block - Six Mile Buffer



CALIFORNIA ENERGY COMMISSION, ENERGY FACILITIES SITING DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission Statewide Power Plant Maps 2008 - Census 2000 PL 94-171 Data - Matrix PL2

SOIL AND WATER RESOURCES

Casey Weaver, P.G., Vince Geronimo, P.E., John L. Fio, and Michael N. DiFilippo

SUMMARY OF CONCLUSIONS

As proposed, the project does not comply with all LORS and existing water policies. A summary of staff conclusions is presented below.

- Ownership of, and the potential for the Beacon Solar Energy Project (BSEP) to use, groundwater underlying the site is disputed and undetermined.
- The proposed use of high quality fresh groundwater for power plant cooling is in conflict with State Water Resources Control Board and Energy Commission policies.
- There is no compelling evidence that using the lowest quality water supply reasonably available (recycled wastewater produced by Rosamond Community Services District and/ or California City) would be environmentally undesirable or economically unsound.
- There is no compelling evidence that alternative cooling technologies (specifically dry cooling) would be environmentally undesirable or economically unsound.
- There is general uncertainty in hydrogeologic conditions and future groundwater levels. Modeling shows that under a conservative set of assumptions there is potential for significant drawdown that could impact nearby wells. Monitoring and mitigation for impacts should be required if the applicant is permitted to use groundwater for power plant cooling.
- The project site is bisected by a mapped FEMA Special Flood Hazard Area (SFHA). The applicant is proposing to construct a diversion channel to reroute the design discharge of 28,000 cubic feet per second around the project site and reduce flood impacts to less than significant levels. The project owner is required to follow the FEMA CLOMR/LOMR application process to remap the SFHA around the solar field.
- The diversion channel may require sediment removal to maintain channel capacity for the design discharge. Sediment removal and other maintenance activities should be the responsibility of BSEP in perpetuity.
- Implementation of Best Management Practices during BSEP construction in accordance with effective Storm Water Pollution Prevention Plans and a Drainage, Sedimentation and Erosion Control Plan would avoid significant adverse effects that could otherwise result in significant transport of sediments or contaminants from the site by wind or water erosion.
- The proposed use of a partial Zero-Liquid-Discharge system to recycle waste water is consistent with state water use and conservation policies.

INTRODUCTION

This section analyzes potential impacts to soil and water resources from the construction and operation of the Beacon Solar Energy (BSEP) project. The analysis specifically focuses on the potential for BSEP to:

- cause accelerated wind or water erosion and increased sedimentation;
- exacerbate flood hazards in the vicinity of the project;
- adversely affect surface or groundwater supplies;
- degrade surface water or groundwater quality; and
- comply with all applicable laws, ordinances, regulations, and standards (LORS) and state policies.

Where the potential for significant adverse impacts are identified, staff has proposed mitigation measures to reduce the significance of the impact, if possible, and has recommended conditions of certification.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following federal, state, and local environmental Laws, Ordinances, Regulations, and Standards (LORS) are applicable to the BSEP. BSEP's compliance with LORS ensures the most appropriate use and management of both soil and water resources. The requirements of these LORS are intended to protect human health and the environment.

Soil & Water Table 1
Laws, Ordinances, Regulations, and Standards

Federal LORS	
Clean Water Act (33 U.S.C. Section 1251 et seq.)	The Clean Water Act (33 USC § 1257 et seq.) requires states to set standards to protect water quality, which includes regulation of storm water and wastewater discharges during construction and operation of a facility. California established its regulations to comply with the Clean Water Act under the Porter-Cologne Water Quality Control Act of 1967. The Clean Water Act also establishes protection of navigable waters through Section 401. Section 401 certification through the Army Corps of Engineers and Regional Water Quality Control Board (RWQCB) is required if there are potential impacts to surface waters of the State and/or Waters of the United States, such as perennial and ephemeral drainages, streams, washes, ponds, pools, and wetlands. Section 401 requires impacts to these waters to be quantified and mitigated.
Resource Conservation and Recovery Act	The Resource Conservation Recovery Act (RCRA) of 1976 (40 CFR Part 260 et seq.) seeks to prevent surface and groundwater contamination, sets guidelines for determining hazardous wastes, and identifies proper methods for handling and disposing of those wastes.
Title 44 of the Code of Federal Regulations (44 CFR) Part 65	44 CFR contains the basic policies and procedures of the Federal Emergency Management Agency (FEMA) for adoption of rules. Part 65 - Identification and mapping of special hazard areas requires development in areas identified as a FEMA Special Flood Hazard Area to meet the requirements of Title 44 of the Federal Code of Regulations (44CFR)
State LORS	
California Constitution, Article X, Section 2	This section requires that the water resources of the State be put to beneficial use to the fullest extent possible and states that the waste, unreasonable use or unreasonable method of use of water is prohibited.
The Porter-Cologne Water Quality Control Act of 1967, Water Code Sec 13000 et seq.	Requires the State Water Resources Control Board (SWRCB) and the nine RWQCBs to adopt water quality criteria to protect state waters. Those regulations require that the RWQCBs issue Waste Discharge Requirements specifying conditions for protection of water quality as applicable.
California Water Code (CWC) Section 13146	Requires that state offices, departments and boards in carrying out activities, which affect water quality, shall comply with state policy for water quality control unless otherwise directed or authorized by statute, in which case they shall indicate to the SW RCB in writing their authority for not complying with such policy.
California Water Code Section 13551	Requires the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such water is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.

Recycling Act of 1991 (Water Code 13575 et. seq)	States that retail water suppliers, recycled water producers, and wholesalers should promote the substitution of recycled water for potable and imported water in order to maximize the appropriate cost-effective use of recycled water.
SWRCB Water Quality Order 99-08	The SWRCB regulates storm water discharges associated with construction projects affecting areas greater than or equal to 1 acre to protect state waters. Under Order 99-08, the SWRCB has issued a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges associated with construction activity for which applicants can qualify if they meet the criteria and upon preparing and implementing an acceptable SWPPP and notifying the SWRCB with a Notice of Intent.
California Code of Regulations, Title 22, Division 4, Chapter 15	This Chapter specifies Primary and Secondary Drinking Water Standards in terms of Maximum Contaminant Levels (MCLs). These MCLs include total dissolved solids (TDS) ranging from a recommended level of 500 milligrams per liter (mg/l), an upper level of 1,000 mg/l and a short term level of 1,500 mg/l. Other water quality MCLs are also specified, in addition to MCLS specified for heavy metals and chemical compounds.
California Code of Regulations, Title 23, Division 3, Chapter 15	This Chapter requires the Regional Board to issue Waste Discharge Requirements specifying conditions for protection of water quality as applicable.
California Code of Regulations, Title 23, Division 3, Chapter 30	This Chapter requires the submission of analytical test results and other monitoring information electronically over the internet to the SWRCB's Geotracker data base.
California Water Code Section 13260	Requires filing with the appropriate Regional Board a report of waste discharge that could affect the water quality of the state, unless the requirement is waived pursuant to Water Code section 13269.
The California Safe Drinking Water and Toxic Enforcement Act	The California Health & Safety Code Section 25249.5 et seq. prohibits actions contaminating drinking water with chemicals known to cause cancer or possessing reproductive toxicity. The RWQCB administers the requirements of the Act.
Local LORS	
Kern County Ordinance Code, Title 4, Chapter 14.08 – Water Supply Systems	Regulates permitting, siting, construction and destruction of groundwater wells.
Kern County Environmental Health Services Department, Chapter II, Section 602, Sewage Disposal by Individual Soil Absorption Systems	Regulates construction of on-site sewage disposal systems.

Kern County Uniform Plumbing Code, Chapter 17	Regulates installation and requires inspection for locating disposal/leach fields and seepage pits.
Kern County Division Four, Standards for Drainage	Provides standards for drainage of waters generated by storms, springs, or other sources that should be mitigated so as to provide reasonable levels of protection for life and property, and the maintenance of necessary access to property or passage of the traveling public on the public highways,.
Kern County Code Of Building Regulations Chapter 17.48 Floodplain Management	Regulates development of projects in special flood hazard areas. These regulations are designed to comply with the National Flood Insurance Program regulations.
State Policies and Guidance	
State Water Resources Control Board (SWRCB) Resolution No. 09-11	State Water Resources Control Board Resolution 09-11 encourages and promotes use of recycled water to replace the use of potable water for non-potable purposes. The policy supports the sustainable use of surface water and groundwater and encourages the use of recycled water where this water is not being put to other beneficial uses. The policy provides for a streamlined permitting process for recycled water use with local Regional Water Quality Control Boards.
SWRCB Resolution No. 75-58	The principal policy of the SWRCB that addresses the specific siting of energy facilities is the Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling (adopted by the Board on June 19, 1976, by Resolution 75-58). This policy states that use of fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound.
2003 Integrated Energy Policy Report (IEPR)	In this report, consistent with SWRCB Policy 75-58 and the Warren-Alquist Act, the Energy Commission adopted a policy stating the Commission will approve the use of fresh water for cooling purposes by power plants only where alternative water supply sources and alternative cooling technologies are shown to be "environmentally undesirable" or "economically unsound."

REGIONAL SETTING

The BSEP would be located in an unincorporated part of eastern Kern County within the Fremont Valley near California City. Fremont Valley is in the northwestern portion of the Mojave Desert where water resources are extremely limited.

REGIONAL WATER RESOURCES

The Fremont Valley Groundwater Basin is located in the South Lahontan Hydrologic Region of the Mojave Desert (DWR 2003). Within the desert environment of the South Lahontan Hydrologic Region (Region), the occurrence and use of water resources are complicated issues. In this Region, groundwater often supplements imported State Water Project or Colorado River water for domestic, agricultural, commercial and industrial water uses. The Region includes approximately 33,100 square miles and is bounded on the west by the crest of the Sierra Nevada; on the north by the watershed divide between Mono Lake and East Walker River drainages; on the east by the California-Nevada border; and on the south by the crest of the San Gabriel, the San

Bernardino mountains and the divide between watersheds draining south toward the Colorado River and those draining to the north. The South Lahontan Hydrologic Region includes the Owens, Mojave, and Amargosa River systems, the Mono Lake drainage system and numerous other internally drained basins.

The South Lahontan Hydrologic Region is subdivided into 76 groundwater basins, one of which is the Fremont Valley Groundwater Basin (RWQCB 1994). The BSEP and surrounding area is underlain by the Fremont Valley Groundwater Basin.

Surface water in the Fremont Valley originates in the surrounding mountains and flows toward Koehn Lake, a dry lake or playa, which is located approximately six miles northeast of the BSEP site. Most of the surface water infiltrates into the alluvium-filled valley and any surface flow that does not infiltrate or evaporate, discharges to Koehn Lake. Koehn Lake is a highly saline wet playa. The playa is a flat, vegetation-free area located at the lowest part of the undrained desert basin. There is no surface water outflow from the Fremont Valley due to low precipitation rates, high soil infiltration rates, high evapotranspiration rates and the topographic low of Koehn Lake.

Fremont Valley Groundwater Basin

The Fremont Valley Groundwater Basin is divided into six sub-basins: California City, Koehn, Chaffee, Gloster, Oak Creek, and Willow Springs (BS 2008a, Figure 5.17-1). The sub-basins are typically separated by faults that form partial barriers to groundwater movement (Bloyd 1967, Koehler 1977, Saint-Armand 1991).

The primary source of water to the Fremont Valley is surface water infiltration and potentially underflow from the Antelope Valley (Muroc sub-basin) located to the southwest (SAMDA 1997). Groundwater recharge resulting from precipitation on the valley floor is considered minimal because direct rainfall is significantly less than the potential evapotranspiration rate and potential soil moisture retention. In portions of the basin where development has occurred, used water may return to the basin's aquifer through discharge of septic systems, and by inefficient irrigation practices.

Koehn Sub-basin

The BSEP is located within the Koehn sub-basin of the Fremont Valley Groundwater Basin. The Koehn sub-basin is bounded by the California City sub-basin to the southeast, the Chaffee sub-basin to the south and the Oak Creek sub-basin to the southwest (BS 2008a, Figure 5.17-1). The physical boundaries of the Koehn sub-basin include the Randsburg-Mojave Fault and Rand Mountains to the south; the El Paso Mountains to the north; the Sierra Nevada Mountains to the west; and the confluence of the El Paso and Rand Mountains to the northeast (Weir et al. 1965, Bloyd 1967, DWR 1968, Moyle et. al.,1985, DWR 2003).

Subsurface alluvial deposits in the Koehn Lake sub-basin vary in thickness between approximately 400 feet thick to over 1,700 feet thick and consist of variable mixtures of sand and gravel with interspersed, non-continuous clay lenses. Depth to groundwater also varies throughout the sub-basin and ranges from more than 300 feet deep away from Koehn Lake to as shallow as approximately 14 feet deep in the immediate vicinity of the lake.

Large scale alfalfa farming began within the sub-basin in the mid-1950's and extended through the mid 1980s. During this time, groundwater pumping lowered the water table several hundred feet, which formed a large groundwater depression and caused land subsidence within the sub-basin. Due to the lowered groundwater elevation, pumping costs increased to a point that farming was no longer profitable and most farming operations ceased (SAMDA 1997).

Groundwater quality in the Koehn sub-basin varies spatially in relationship to Koehn Lake. In the southwest portion of the sub-basin, water quality is of sodium bicarbonate or calcium-sodium bicarbonate types (DWR 2003). Due to evaporative concentration of salts, Total Dissolved Solids (TDS) concentrations increase and water quality decreases toward Koehn Lake. Beneath Koehn Lake, the TDS concentration of the groundwater is as high as 100,000 mg/L (Dockter, 1979, DWR, 2003). Southwest of the lake bed, and near the proposed BSEP site, typical TDS concentrations are reportedly about 500 mg/L.

PROJECT SITE AND VICINITY SETTING

As proposed, the BSEP would be a concentrated thermal solar electric generating facility constructed on an approximately 2,012-acre site in eastern Kern County, California. The project would have a nominal electrical output of 250 megawatts (MW).

BSEP is designed to use a wet cooling tower for power plant cooling. Water for cooling tower makeup, process water makeup, and other industrial uses such as mirror washing, would be supplied from onsite groundwater wells, which also would supply water for employee use (e.g., drinking, showers, sinks, and toilets).

SURFACE WATER

There are three main watersheds that contribute surface water flow in the BSEP site vicinity. These watersheds are the Pine Tree Creek Watershed, Jawbone Creek Watershed and an unnamed watershed located adjacent to the Pine Tree Creek Watershed. Discussion of these watersheds is presented below. Pine Tree Creek, a dry desert wash, that trends from the south-southwest to the north-northeast through the center of the site. The channel is mapped as a 100-year special flood hazard area by the Federal Emergency Management Agency (FEMA) where it crosses the site. The applicant proposes to fill the existing creek channel and reroute Pine Tree Creek around the south and east periphery of the solar facility.

Pine Tree Creek Watershed

Pine Tree Creek originates from the Pine Tree Canyon where the Sierra Nevada Mountain Range becomes the Tehachapi Mountains, west of the BSEP site. The Pine Tree Creek headwaters are located at Cache Peak. Pine Tree Creek descends the flanks of the mountains, forms an alluvial fan, traverses the project site and ultimately discharges to Koehn Lake. The topographical apex of the Pine Tree Creek alluvial fan is located at the mouth of Pine Tree Canyon and was formed from sediment washing out from the canyon. This alluvial fan is evident from topographic and aerial maps reviewed by staff. The alluvial fan is crossed by two Los Angeles Department of Water and Power aqueducts, State Route -14 (SR-14) about a mile downstream from the apex, and the

Southern Pacific Rail Road (SPRR). An existing six cell 8-foot by 8-footReinforced Concrete Box (RCB) culvert passes Pine Tree Canyon flows under SR-14. Downstream of the SPRR, the channel confluences with the Barren Ridge drainage from the south and continues northeasterly toward the BSEP site.

A large portion of the southern half of the Pine Tree Creek watershed includes the sub-watershed area east of Barren Ridge. From a high elevation of approximately 4,200 feet, runoff comes down from the ridge through several small drainage swales to the alluvial area west of SR-14. An engineered drainage ditch along the west side of SR-14 collects the watershed runoff and routes it to a double barrel 8-foot by 6-foot RCB at SR-14. The flow past SR-14 continues northeasterly, beneath the SPRR tracks, and continues along its historic alignment. This sub-watershed eventually confluences with Pine Tree Creek in the alluvial flats about 1,000 feet east of SPRR. Downstream of this location, the channel enters the BSEP property.

The area east of Chuckwalla Mountain drains from an elevation of 4,900 feet toward the BSEP site. Runoff from Chuckwalla Mountain travels through several distributaries before being cut off by SR-14. SR-14 has several existing culverts to convey flows to the east side of the road and past SPRR. Drainage channels are formed downstream of these crossings and are eventually diverted north through ditches outside of the BSEP property boundaries (BS 2008a), apparently deflecting what appears to be the natural drainage path of these channels away from the site.

In the AFC (BS 2008a), the applicant has identified a smaller tributary area located along the BSEP western property boundary between Pine Creek Canyon and the Chuckwalla drainage area (Sheds 1S & 3S). The applicant has identified this “shed” as a nearly 1.5 square-mile basin that currently drains across the site after crossing through an existing SPRR culvert. This drainage area becomes a regulated Water of the State as it crosses the BSEP property.

Jawbone Creek Watershed

The Jawbone Creek Watershed drains several canyons located in the Tehachapi Mountains. These canyons experience climatic conditions similar to Pine Tree Canyon. The names of these canyons are, from south to north, Alphie Canyon, Cottonwood Creek Canyon, Water Canyon, Jawbone Canyon and Red Rock Canyon.

Jawbone Canyon ends at the base of the mountainous and canyon areas. Jawbone Creek leaves the canyon at this location and drains to SR-14 and then to SPRR on the alluvial flats. At the SPRR tracks, the FEMA flood mapping shows a split in Jawbone Creek flow condition. One path leads to the north, and the other south toward the BSEP site. The southern channel bends easterly before reaching the northernmost BSEP property boundary. FEMA delineates this reach as a Special Flood Hazard Area (SFHA); Zone AE, Base Flood Elevations determined. The SFHA is nearly one-mile wide at this location north of the site. The Jawbone Creek flood hazard is not mapped within the BSEP property boundary but is located immediately to the north where the creek flows easterly toward the Honda Proving Center and eventually to Koehn Lake, nearly 6 miles downstream from the site. Near the BSEP site, the watershed area for Jawbone Creek is roughly 280 square miles.

Unnamed Watershed (Adjacent to Pine Tree Creek Watershed)

The unnamed watershed is located immediately east of Pine Tree Creek watershed on the Fremont Valley alluvial plain. The watershed has an area of roughly 8-square-miles and drains across the site to Jawbone Creek at nearly the same location as the confluence of Pine Tree Creek and Jawbone Creek.

SOILS

The majority of project facilities would be located on soil units that have rapid permeability and negligible to low runoff potential **(Soil & Water Table 2)**. The exceptions are areas underlain by the Rosamond clay loams, which have moderate runoff potential. The runoff designation for Cajon loamy sand is low, and the designation for Rosamond clay loam is moderate. In contrast, the Cajon loamy sand has rapid permeability whereas the Rosamond clay loam has a moderate to moderately slow permeability.

Soil & Water Table 2
Soil Types Potentially Affected & Characteristics

Primary Soil Name	Slope Class	Water Erosion Potential	Wind Erosion Potential	Permeability (in/hr)	Shrink-Swell Potential
Cajon Loamy Sand	0 -15%	Slight to Moderate	High	Rapid	Low
Cajon Gravelly Loamy Sand	0 to 15 %	High	High	Rapid	Low
Garlock Loamy Sand	2 to 9 %	Moderate	Moderate	Rapid	Low
Rosamond Clay Loam, Saline-Alkali	0 to 2 %	Moderate	Moderate	Moderate to Moderately Slow	Low to Moderate
Rosamond Clay Loam	0 to 2 %	Moderate	Moderate	Moderate to Moderately Slow	Low to Moderate

Source: U.S. Department of Agriculture's Soil Conservation Service Soil Survey of Kern County, California, Southeastern Part (1981)

BSEP site soils would be subject to wind and water erosion during facility construction and operation activities. Only two soil types would be affected by grading and excavation activities; Cajon loamy sand and Rosamond clay loam. The soils on the project site have a moderate to high hazard for wind erosion.

CLIMATE

The BSEP site is situated in the northwestern portion of the Mojave Desert. The climate in the Mojave Desert is dry and arid and characterized by low precipitation. The region experiences a wide variation in temperature, with very hot summer months (an average maximum temperature of 104 ºF occurring in July) and cold dry winters (average minimum temperature of 28 ºF occurring in December). Annual precipitation in the Mojave Desert ranges from three inches to six inches (U.S. Department of Agriculture 1981). **Soil & Water Table 3** displays the average monthly and annual minimum and

maximum temperatures and total annual precipitation from 1971 to 2000. This data was collected from a gauging station in Cantil (Station 041488), located about one mile north of the Project (BSEP 2008a).

Soil & Water Table 3
Cantil, California Climate and Precipitation Summary[1] 1971 through 2000

Climate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual[2]
Ave Max Temp (°F)	58.9	65.6	71.5	76.2	86.5	97.7	104.3	102.1	93.1	80.2	64.1	58.0	80.1
Ave Min Temp (°F)	28.9	33.9	40.8	46.1	55.0	63.8	69.2	67.1	57.1	44.1	34.7	28.2	47.5
Ave Total Precip (in)	0.71	0.48	0.33	0.09	0.15	0.05	0.10	0.12	0.05	0.06	0.43	0.54	3.05

[1] Source – Western Regional Climate Center, http://www.wrcc.dri.edu/ (Climate Station 041488 – Cantil)
[2] Refers to the annualized average of monthly temperature and precipitation values.

In the lee (downwind side) of the Tehachapi Range, precipitation in the site vicinity averages 3 to 6 inches a year, but is extremely variable. Snow and winter rains result from North Pacific cyclonic storms. Snowfall is infrequent and considered insignificant for staff's review. The remainder of precipitation comes from intense, local thunderstorms and summer tropical storms (FEMA 2008). Local thunderstorms are usually associated with convective (the vertical transport of heat and moisture in the atmosphere) activities and normally occur in the summer. The summer convective storms (thunderstorms) are generally dominant in the southern desert area (West 2007).

STORM WATER

The existing storm water flow across the project site is from southwest to northeast and occurs as sheet flow or shallow flooding. Pine Tree Creek, a dry wash that conveys flash flood flows, bisects the site. The applicant plans to construct the solar power plant on ten individually elevated cut and fill pads or planar “cells”. The site grading slopes southwest to the northeast to direct storm induced sheet flow into transverse intercept trenches that convey collected runoff into proposed onsite retention basins. Following settlement of suspended sediments and attenuation of peak flows in the retention basins or supplemental detention basins, the collected storm water would percolate or evaporate within 48 hours following the precipitation event. Plans provided in the June 2009 project Design Refinements (DB 2009r) indicate that the easternmost retention ponds will be outfitted with stand pipes and subsurface drainage pipes that will convey flows that exceed pond capacity to an outlet in the rerouted Pine Tree Creek Channel. BSEP’s Storm Water Pollution Prevention Plan (SWPPP) and the Drainage Erosion and Sediment Control Plan (DESCP) establish methods of when and how to control and manage storm water flow as it reaches the project, flows across the project, and then leaves the project. Draft plans have been prepared for both the construction and operational phases of the project.

The proposed diversion channel construction would precede excavation and filling of Pine Tree Creek, within the limits of the effective SFHA. Once constructed, the diversion channel would route flood flows around the southern and eastern sides of the project, allowing construction and grading improvements in the existing Pine Tree Creek

floodplain. Following diversion channel construction, the applicant would submit an application for a Letter of Map Revision (LOMR) to FEMA to revise the effective SFHA. Subsequently, the proposed power block would not be located within a FEMA designated floodplain.

In order to comply with the Energy Commission's "in lieu permit" authority established under the Warren-Alquist Act, staff has coordinated joint environmental review with other agencies such as the U.S. Fish and Wildlife Service, California Department of Fish and Game (CDFG), Lahontan Regional Water Quality Control Board (RWQCB) and Kern County. As part of this coordinated review, the applicant submitted a copy of their Conceptual Drainage Study (CDS), which addressed the BSEP's initial storm water plan, to the CDFG, as part of an application for a Streambed Alteration Agreement. Lahontan Regional Water Quality Control Board (LRWQCB) and Kern County also received copies of the CDS for review and comment. These agencies have taken an active role in the certification process. Comments from these agencies provided influence on BSEP's updated site drainage plan, as described in the Project Design Refinements (DB 2009r). Staff recognizes the value of these agency comments and refers to them in the discussion of project impacts, below.

PROJECT WATER SUPPLY

In the AFC and subsequent submittals, the applicant proposes to use high quality fresh groundwater from onsite wells during construction (primarily during grading) and for operations phase water needs (primarily evaporative cooling). Based on information provided in the Project Design Refinements (DB 2009r), the project would consume approximately 1,388 acre-feet per year (AFY) of high quality fresh groundwater. Ownership of site groundwater rights is disputed according to letters submitted by Mr. John Musick and the applicant.

The proposed use of fresh groundwater for power plant cooling is inconsistent with SWRCB and Energy Commission water policies. Given the inconsistency with these policies, staff researched and identified alternative water supplies that could be considered for use in power plant cooling. Staff has identified degraded groundwater in the vicinity of Koehn Lake and recycled municipal wastewater produced by Rosamond Community Services District and California City as possible alternative water supplies. These supplies are briefly discussed below and further analyzed in the LORS Compliance section and Alternatives section of this FSA.

Results of groundwater monitoring conducted by the United States Geological Survey and the California Department of Water Resources since 1955 indicate that groundwater in the vicinity of Koehn Lake contains elevated concentrations of Total Dissolved Solids (TDS). Staff considers groundwater with elevated TDS to be degraded. Power plant use of this degraded groundwater would comply with Energy Commission and State Water Resources Control Board (SWRCB) policies by using the most degraded water available.

Rosamond Community Services District (RCSD) and California City treat municipal wastewater (sewage) at their wastewater treatment plants, providing high quality recycled waste water suitable for industrial use. Both entities have indicated their

willingness and ability to provide BSEP with this recycled wastewater (CofC 2009 b & c, RCSD 2009 a-d). Similar to degraded groundwater, use of recycled wastewater for power plant operations would comply with Energy Commission and SWRCB policies by using the most degraded water available.

Construction Water Use

The AFC states that initially, water requirements would be significant for the first five months as the site is prepared and rough grading conducted (BS2008a). During grading, the AFC indicates that water usage would be between 5 million and 10 million gallons per day (gpd), five days per week for a total period of 22 days per month for five months (or 110 days). Under the above assumptions, between approximately 7,000 and 14,000 gallons per minute (gpm) of water would be required daily from seven wells to support initial construction activities.

Soil & Water Table 4
Proposed Annual Construction Water Demands

Average Daily Use (gallons)	Maximum Daily Use (gallons)	Initial Construction Activities Use (gallons)	Water Supply Source	Delivery Method
1.6 million (5 AF)	10 million (30.7 AF)	1.1 billion (3,375.77 AF)	On-site Groundwater	Existing On-site Wells

Source: BS 2008a

Following the initial five-month grading period, water would be used primarily for dust suppression and used in the construction of the solar field, power block and other site buildings and hydrostatic testing of the facility's pressure vessels and piping. Site construction water use is expected to consume between 10,000 and 400,000 gpd for the remaining 22 months.

In the AFC, the applicant proposed to meet site pre-watering, grading and normal construction activity (e.g., mixing concrete, dust control) water requirements using water supplied from existing onsite wells equipped with temporary pumps.

The AFC states that during construction, potable water use would be limited to drinking water provided in bottles. Waterless portable facilities would be used for sanitary needs.

Operations Water Use

The applicant proposes to use onsite high quality fresh groundwater for all operation water needs. In the project AFC the applicant initially estimated annual maximum water use to be 1,600 AFY. Now with the addition of the partial ZLD, the applicant estimates that 1,388 AF of water would be consumed annually for power plant operation and potable water needs. The onsite well field would include three wells for redundancy should one or more of the onsite wells fail.

A raw water storage tank with a capacity of 2,840,000 gallons capacity would hold 2,480,000 gallons of water for plant operations (a water supply sufficient to cover an 18-hour interruption) and 360,000 gallons of raw water dedicated to the plant's fire protection water system. The water would be treated with a biocide (sodium hypochlorite) prior to storage. There also would be a treated water tank with a capacity of 2,350,000 gallons for raw make-up water in the cooling towers and as support for domestic water use. Plant process water would be treated via ion exchange to reduce scale-forming concentrations entering the cooling water system. In addition, a 150,000-gallon tank would be utilized to store de-mineralized water, and an 80,000-gallon capacity storage tank would be used for neutralization of water treatment wastewater.

During plant operation, the estimated annual potable water demand is 8 AFY. With minimal treatment, groundwater from onsite wells could meet the potable water demands of the BSEP operations workforce. No other source of potable water has been identified by the applicant.

WASTEWATER

Construction Wastewater

During construction, water would be used for one-time hydrostatic testing of pipelines and pressure vessels. The applicant estimates that approximately 360,000 gallons of water will be used for hydrostatic testing. This water will be reused to the extent feasible in accordance with applicable regulations. In addition to hydrostatic test water, a small amount of wastewater will be generated during equipment and vehicle washing. Water that cannot be reused will be discharged to on-site evaporation ponds.

Operation Wastewater

Wastewater generated during power plant operation would be segregated in two separate collection systems, one for industrial streams (including the cooling tower blowdown and raw water treatment effluent) and the other for sanitary waste.

Industrial Wastewater

The industrial wastewater system would collect blowdown from the Solar Steam Generator (SSG), circulating cooling water blowdown, chemical feed area drains, general plant drains and wastewater from the demineralization system and deliver the collected waste to the cooling tower basin.

For disposal of the collected wastewater, the applicant initially proposed to use three double-lined evaporation ponds, each with a nominal surface area of 8.3 acres, for a total of 25 acres. In a March 2009 supplement to the AFC, the applicant redesigned the three evaporation ponds to have a nominal surface area of 40 acres (AECOM 2009c). Then, subsequent to the March 2009 submittal, the applicant redesigned the disposal of the industrial wastewater to include a partial Zero Liquid Discharge (ZLD) system (DB 2009r). The partial ZLD would concentrate the wastewater, liberating some treated

water for industrial reuse and concentrating the remaining wastewater into a smaller volume of high TDS slurry. BSEP now proposes to dispose of the smaller volume of the high TDS slurry into three, 2 acre evaporation ponds, for a combined pond area of 6 acres.

The evaporation ponds are designed with a base layer consisting of either a geosynthetic clay layer or a layer 2 feet thick of onsite soil material with a hydraulic conductivity of less than $1x10^{-6}$ centimeters per second, covered with a 40 mil high density polyethylene (HDPE) liner, that would be covered with an interstitial leak detection and removal system consisting of a geomembrane geonet and collection piping, in turn covered by a 60 mil HDPE liner covered with a hard surface/protective layer with granular fill/free draining sub-base. Multiple ponds are planned to allow plant operations to continue in the event that a pond needs to be taken out of service for maintenance and/or waste removal.

Sanitary Wastewater (septic)

The proposed sanitary wastewater system would collect wastewater from sinks, toilets, and other sanitary facilities and discharge those fluids to an onsite septic system. This sanitary wastewater system will be located in the power block area of the power plant site.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section provides an evaluation of the expected direct, indirect, and cumulative significant impacts to soil and water resources caused by project construction, operation, and maintenance. Staff's analysis consists of a brief description of the project's potential impacts, and application of threshold criteria to determine whether or not the impact is significant. If the impact is significant, then staff provides a summary of the applicant's proposed mitigation and a discussion of the adequacy of the proposed mitigation. If necessary, staff presents additional or alternative mitigation measures which appear at the end of the Soil & Water Resources section as specific Conditions of Certification. The objective of identifying mitigation measures is to reduce potentially significant environmental impacts to a less than significant level.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

To evaluate if significant impacts to soil or water resources would occur, staff assessed:

- Whether the project would violate water quality standards or waste discharge requirements.
- Whether the project substantially depletes groundwater supplies or interferes with groundwater recharge such that there is a net deficit in aquifer volume
- Lowering of the local groundwater table level in nearby pre-existing wells to a level that fails to support permitted existing or planned land uses.
- Whether the project substantially alters existing site or area drainage patterns, including the alteration of stream or river courses, or substantially increases the rate or amount of surface runoff in a manner that results in on- or off-site flooding or substantial erosion or siltation.

- Whether the project would create or contribute runoff water that exceeds existing or planned storm water-drainage system capacity or provides substantial additional sources of polluted runoff.
- Whether the project would place structures within a 100-year flood hazard area and impede or redirect flood flows.
- Whether the project would lower groundwater levels such that protected species or habitats are affected.
- Whether the project would substantially degrade surface water or groundwater quality.

The significance thresholds for soil and water resources are discussed in the analysis below.

DIRECT/INDIRECT ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Project Water Use

Four existing water supply wells (nos. 41, 42, 49 and 63), are proposed to supply water for the operation of the project. The four existing wells are located in the central and southwestern portion of the proposed plant site, and would be used on a rotating basis. When not in use, the offline wells would provide backup for each other in the event of outages or maintenance. Pumping test data provided by ENSR (BS 2008a) has shown water supply wells on the plant site have the capacity to meet BSEP water supply requirements of 3,403 gpm(DB 2009r).

Construction

The AFC stated that, initially, water demand for the project would be significant through the first five months of site preparation and rough grading. Rough grading was estimated to involve moving 5.16 million cubic yards of soil (BS2008a). During initial grading, the applicant estimates that water usage would be between 5 million and 10 million gallons per day (gpd), five days per week for a total period of 22 days per month for five months or 110 days. This initial grading could consume as much as 1.1 billion gallons or 3,376 AF of water (BS 2008a). However, it appears that the applicant did not account for the volume of soil that would be cut and placed as compacted fill during construction of the rerouted Pine Tree Creek Channel. The excavation of the channel will require the removal and relocation of an additional volume of approximately 3.1 million cubic yards of soil (totaling approximately 8.3 million cubic yards of soil). Assuming the same ratio of water to soil used for determining water usage for rough grading (5.16 million cubic yards/3,376 AF), excavation of the rerouted channel will require an additional 2,028 AF of water during construction, for a total of 5,404 AF of water required for rough grading.

Following the five-month long initial grading period, water use is expected to decrease to a rate of approximately 400,000 gpd for a period of 21 months or 462 days. According to the AFC, this decreased construction water use could consume as much as 185 million gallons or 567 AF.

Staff's review of the applicant's geotechnical report indicates that, to attain maximum relative compaction of site soils, the soil must contain 10.7% water by weight. To properly compact 8.3 million cubic yards of soil, it would take approximately 548 AF of water. In addition, the revised design includes the mixing and placement of approximately 249,000 cubic yards of soil cement which would require approximately 55 AF of water.

Potable water demands during construction would be minimal. The applicant proposes to use bottled water to supply drinking water for the construction workforce. Portable facilities would be used for sanitary needs and operate without water. Staff concludes that there would not be significant adverse environmental impacts associated with this potable water supply.

Combining the water use requirements discussed above, staff estimates project construction water use will exceed 6,574 AF. The estimated water requirement is substantially greater than the 3,378 AF presented in the AFC (BS 2008a).

Staff also notes the applicant has indicated groundwater would be used for dust control during grading activities. The applicant's estimated silt content of site soils is approximately 7.5%. This number was used in the applicant's determination of the volume of water required for dust suppression and is reflected in the revised volume discussed above. However, staff's review of the applicant's geotechnical report indicates that silt content of site soils ranges from 5-79%, with an average (19 samples) silt content of 30.4%. This observation indicates that approximately 23% more fine grain material exists in site soils than was presented in the AFC. Staff considers this additional fine grain material will require a volume of water commesurate with the increased silt content to adequately suppress dust during construction. Therefore, staff believes dust suppression will require a volume of water 23% higher than that described above. Using the information provided above, staff believes that project construction will require 8,086 AF.

The additional construction water use will increase drawdown in wells beneath and near the site. The drawdowns are likely short-term however, and after 30-years of project operations, the simulated effect on long-term drawdown is an increase in drawdown of about 1 foot or less. The greater construction water use could alter staff findings (i.e., the number of wells experiencing drawdown may increase), but the conclusions regarding impacts will likely not change substantially. Drawdown from combined construction and operational water use is discussed in detail below under the Groundwater Impacts section.

Groundwater Storage

The volume of groundwater stored in a basin can vary over time because of changes in water inflow and outflow. Groundwater storage and well water levels increase when inflow exceeds outflow. Conversely, groundwater storage and water levels decrease when inflow is less than outflow. Significant adverse impacts can occur when groundwater storage conditions are in a state of perpetual decline, causing increased extraction costs, costs of well deepening or replacement, land subsidence, water quality degradation, and environmental impacts (DWR, 2003).

Staff obtained well water levels from DWR and the USGS, constructed hydrographs and inserted the hydrographs into a map showing the Fremont Groundwater Basin (**Soil & Water-Figure 1**). In **Soil & Water-Figure 1**, simulated water levels from the applicant's groundwater-flow model are also shown with observed water levels. The discussion of simulated water levels is provided in **Soil and Water Resources-Appendix B**.

Observed water levels show variable responses to pumping. Water level declines generally first appeared in the1950s and accelerated during the 1970s due to increased agriculture production. The lowering of the groundwater table caused an increase in pumping costs which affected farming profits resulting in decreased agriculture production (SAMDA 2008). Accordingly, agricultural groundwater consumption in the Koehn Lake Sub-basin decreased dramatically during the late 1980s and 1990s.

For the past 10 to 15 years, groundwater levels have been partially recovering in most wells monitored in the Koehn Sub-basin. The observed water level increase indicates groundwater storage is likely increasing in parts of the Koehn Sub-basin as groundwater flows from surrounding sub-basins to refill the historical depression left over from historical agricultural consumption. In contrast, water levels in other parts of the Fremont Valley continue to decline indicating groundwater storage continues to decrease in most of the remaining areas in the Fremont Valley Groundwater Basin (California City, Chaffee, and Gloster Sub-basins). The decline in water levels is due in part to groundwater outflow from these surrounding Sub-basins into the Koehn Sub-basin and groundwater consumption rates that exceed the rate of groundwater recharge.

From the observed water level data shown in **Soil & Water- Figure 1**, staff prepared **Soil & Water Table 6**. **Soil & Water Table 6** shows historical maximum water levels, historical minimum water levels, most recent water levels (generally observed in 2008), the calculated change between maximum and recent water levels, and the average annual water level recovery trend (generally the water level trend recorded during the period 1986-2006)[1]. The 1986-2006 period is utilized because it generally represents the time between maximum historical drawdown due to agricultural pumping and the subsequent recovery period after pumping was dramatically curtailed. In 2008, the water levels in almost one-half of the Koehn Sub-basin wells monitored were more than 40 feet below their historical maximums. Hence, water levels remain significantly lower than they were prior to consumption by agriculture during the 1970s and early 1980s. Since 1985, water levels in nine of 14 Koehn sub-basin wells showed statistically significant water level increases that range from 0.03 to 5.8 feet per year; two of the wells showed statistically significant downward trends of about 0.5 feet per year, and the trends in the remaining three wells (two downward and one upward) were not statistically significant. The greatest observed water level increases are for wells located

[1] Water level trends were calculated from observations recorded during the recovery period that began after about 1985. Because of gaps in measured water level data or well operations that continued beyond 1985, the trends in some wells are necessarily calculated after 1985. For example, the observed recovery in wells 30S/38E-31C and 29S/39E-33K1 began after 1995, so the trends in these wells were calculated for the period beginning in 1996. Staff employed the Mann-Kendall test to determine statistically significant trends (95% confidence level) and the Sen's nonparametric estimator of slope to determine the water level change per unit time. For each well, the test first determined the slope of water level plotted versus time, then tested whether the slope was significantly non-zero at the 95% confidence level.

within the historical pumping centers (former agricultural areas). The observed water level changes are generally consistent with reduced pumping and subsequent groundwater storage recovery in the Koehn Sub-basin. In contrast, water levels in most Fremont Valley wells located south of the Koehn Sub-basin (10 of 13) indicate statistically significant long-term declines ranging from -0.02 to -9.1 feet per year. These observations are consistent with continued pumping and storage declines in the California City, Chaffee and Gloster Sub-basins of the Fremont Valley.

Soil and Water Table 6
Reported Fremont Valley Basin and Antelope Valley Basin Water Levels

Well Number	Historical Maximum GWE		Historical Minimum GWE		2008 GWE		Change (2008 Maximum)	Recover Trend (ft/yr)		
								alpha = 0.05		
	Year	Elevation	*Year*	Elevation	*Year*	Elevation		Years	Observed	Simulated
KOEHN SUB-BASIN OF FREMONT VALLEY										
29S39E33K001 M	*1958*	1919	*1996*	1797	*2008*	1863	-56	1996-2006	5.8	-1.4
30S37E13C001 M	*1978*	2025	*1998*	2009	*2008*	2011	-14	1986-2006	(-0.1)	1.2
30S37E27H002 M	*1973*	1869	*1984*	1788	*2008*	1849	-20	1985-2006	2.4	4.9
30S37E34H002 M	*2003*	1841	*1984*	1778	*2007*	1838	---	1986-2005	(2.0)	2.7
30S37E36G001 M	*1929*	1950	*1995*	1831	*2008*	1847	-103	1985-2006	0.6	4.8
30S37E36N001 M	*1953*	1948	*1976*	1744	*2008*	1844	-104	1993-2006	3.3	5.3
30S38E03K002 M	*1996*	1881	*1977*	1842	*2008*	1880	-1	1985-2006	0.03	-0.8
30S38E04D002 M	*1979*	1905	*2007*	1897	*2007*	1897	---	1996-2006	(-0.1)	1.0
30S38E24F001 M	*1953*	1928	*2008*	1893	*2008*	1893	-35	1985-2006	-0.4	-1.0
30S38E30P001 M	*1958*	1933	*1977*	1822	*2008*	1844	-89	1985-2006	0.8	3.7
30S38E30Q001 M	*1958*	1942	*1982*	1893	*2008*	1901	-41	1985-2006	-0.5	3.7
30S38E31C001 M	*1986*	1844	*1961*	1794	*2008*	1844	0	1995-2006	2.6	4.6
31S37E04J001 M*	*1974*	1920	*1986*	1700	*1999*	1779	---	1986-2004	5.4	1.4
31S37E04Q001 M*	*1974*	1948	*1985*	1685	*2008*	1819	-129	1985-2006	5.6	1.4

CALIFORNIA CITY, CHAFFEE and GLOSTER SUB-BASINS OF FREMONT VALLEY										
11N11W07A001S	*1958*	2426	*2008*	2417	*2008*	2417	-9	1986-2006	-0.1	---
11N11W09A001S	*1956*	2425	*2008*	2416	*2008*	2416	-9	1986-2006	-0.1	---
11N12W22F002S	*2008*	2423	*1974*	2403	*2008*	2423	0	1985-2006	0.3	---
11N13W19C001S	*1983*	3429	*1992*	3253	*2008*	3270	-159	1992-2006	-9.1	---
11N13W29M001S	*1984*	3072	*2008*	3006	*2008*	3006	-66	1993-2006	-3.9	---
12N12W35R001S	*1957*	2427	*2008*	2417	*2008*	2417	-10	1985-2006	-0.1	---
31S37E33H001M	*1956*	2110	*1990*	2058	*2008*	2064	-46	1985-2006	0.2	-0.6
31S37E35N001M	*1953*	2089	*1969*	2053	*2008*	2066	-23	1985-2006	0.2	-0.7
31S38E18P001M	*1917*	2085	*1983*	2076	*2008*	2077	-8	1986-2006	-0.02	---
32S36E35D001M	*1957*	2428	*2008*	2417	*2008*	2417	-11	1986-2006	-0.1	---
32S37E11N001M	*1953*	2107	*1992*	2078	*2008*	2078	-29	1986-2006	-0.3	---
32S37E12M001M	*1970*	2108	*2008*	2100	*2008*	2100	-8	1986-2006	-0.2	---
32S37E26N001M	*1970*	2095	*2007*	2054	*2008*	2060	-35	1986-2006	-1.2	---
NORTH MUROC SUB-BASIN OF ANTELOPE VALLEY										
10N09W10B001S	*1991*	2183	*2007*	2176	*2007*	2176	---	1991-2005	-0.4	---
11N10W12F001S	*1967*	2179	*2000*	2153	*2002*	2157	---	1985-2002	-0.6	---

Data from: DWR, Groundwater Level Data, March 2009

Trends in parentheses are not significant at the alpha = 0.05 level.

* On-site well

According to DWR (1998) groundwater overdraft occurs when the water withdrawn by pumping exceeds recharge over a period of years during which the water supply conditions approximate average conditions. Overdraft can be characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years. The Fremont Valley Basin exhibits these characteristics of overdraft. Historical water levels show a continuous decline over a period of 20 to 30 years, and 2008 water levels in some wells were more than 100 feet below historical highs and therefore, have not fully recovered.

Volumetric Water Budget

In their Conceptual Hydrogeologic Model, ENSR (BS 2008a) estimated a water budget for the Fremont Valley groundwater basin. There is uncertainty in the water budget components, and assumptions employed in previous budget assessments have provided variable results. Staff developed a water budget approach, reviewed and summarized previous budget study results, and assessed the results to provide insight into the above water level trends.

Fremont Valley Groundwater Basin

Soil & Water- FIGURE 2 summarizes the primary water inflow and outflow components in the Fremont Valley Groundwater Basin.

Conservation of mass requires inflows and outflows balance as represented by Equation (1):

$$\mathbf{R + GW_i = W + LD + GW_o + \Delta S} \qquad (1);$$

where,

- Δ**S** is the change in groundwater storage;
- **R** is groundwater **recharge** from all possible sources (the net result of percolation of rainfall, infiltration of surface water runoff from surrounding mountains and foothills, applied irrigation water, and so forth, less the consumptive use of water by evaporation, native plants and agriculture);
- $\mathbf{GW_i}$ is **subsurface** inflow from the adjoining Antelope Valley Groundwater Basin;
- $\mathbf{GW_o}$ is **subsurface** outflow to the adjoining Antelope Valley Groundwater Basin;
- **W** is **groundwater** extraction by Fremont Valley wells; and,
- **LD** is **groundwater** discharge to Koehn Lake.

Equation (1) is rearranged to solve for Δ**S**:

$$\mathbf{\Delta S = R + GW_i - GW_o - W - LD} \qquad (2).$$

A positive value for Δ**S** indicates inflow is greater than outflow, and storage and water levels increase. Conversely, a negative value for Δ**S** indicates inflow is less than outflow, and storage and water levels decrease.

In the Fremont Valley Basin, under pre- and early development conditions, groundwater extraction by wells and the long-term groundwater storage changes was zero. Constant storage volume is represented by long-term stable (constant) water levels and gradients. Koehn Lake was the only significant natural discharge feature in the basin, and any other subsurface outflows were negligible. Hence, under pre- and early development conditions, Equation (1) is reduced and re-arranged to represent a balance between inflows and outflows:

$$\mathbf{R + GW_i = LD} \quad (3).$$

GSi/water (1993) calculated the potential amount of groundwater discharge into Koehn Lake in the absence of pumping wells at about 18,000 AF/yr. The only significant subsurface inflow was from the Antelope Valley Basin, which reportedly occurs through a gap in the bedrock located southeast of California City. Durbin (1978) estimated this flow at a rate of about 1,000 AF/yr, and Leighton and Phillips (2003) later refined the estimate to consider water level declines occurring in both the Antelope Valley and Fremont Valley basins. Leighton and Phillips (2003) concluded the inflow from Antelope Valley decreased from about 500 AF/yr in 1958 to 200 AF/yr by 1995. These studies suggest long-term, average annual Fremont Valley recharge under pre- and early development conditions ranged from about 17,000 to 17,500 AF/yr, which is at the lower end of the broad range of average annual recharge rates estimated by GSi/water (1993) (4,200 to 42,000 AF/yr).

In the Fremont Valley Basin, the number of wells and extraction rates increased over time and consumed increasing quantities of groundwater. When outflow eventually exceeded recharge, the storage volume and well water levels declined. **Soil & Water Table 7** summarizes the limited available water budget information provided by previous hydrologic studies for these periods.

Soil & Water Table 7
Fremont Valley Basin Water Budget (All Units In AF/yr).

	ΔS	R	$GW_i - GW_o$	W	LD
Early Development	0	17,000 to 17,500 [a]	1000 [b] to 500 [c]	0	18,000 [d]
1958-1976	?	?	400 [c]	?	?
1977-1984	?	?	300 [c]	?	?
1985-1997	10,400 to 15,300 [e]	4,200 to 42,000 [d]	200 [f]	?	?
1998-2007	?	4,200 to 42,000 [d]	100 [f]	?	0 [g]

a) Calculated using Equation (3).
b) Durbin (1978).
c) Leighton and Phillips (2003).
d) GSi/water (1993).
e) EarthSat (1997).
f) Projected from simulated annual trend reported by Leighton and Phillips (2003).
g) BSEP (2009).

Determination of annual groundwater recharge of the Fremont Valley Basin is uncertain, and inflow from the Antelope Valley Basin has been declining with time. Water budget estimates seem to indicate that basin-wide groundwater storage began to increase during the mid-1980's. In contrast, the data reported in **Soil & Water Table 6** indicate rising water levels and groundwater storage increases continued in some parts of the basin, whereas water levels and groundwater storage appeared to have declined in other basin areas. The net volumetric storage change for the Fremont Valley Basin during the 1998-2007 periods has not been estimated, and groundwater-flow modeling completed by the project applicant focused primarily on one sub-basin (the Koehn sub-basin). Considerable uncertainty therefore exists on the relationships between changes in groundwater consumption within individual sub-basins and the overall water balance for the entire Fremont Valley Basin.

Koehn Groundwater Sub-Basin

A budget approach also applies to the Koehn Sub-basin (**Soil & Water Figure 3**):

$$\Delta S^k = R^k + GW^k_i - GW^k_o - W^k - LD \qquad (4).$$

The terms in Equation (4) are similar to Equation (1); however, the components are distinguished by a superscript "k" to clarify they apply specifically to the Koehn Sub-basin. The primary outflow is to Koehn Lake, and conceivably water could flow in or out between the adjoining Oak Creek, Chaffee, and California City sub-basins. Under pre- and early development conditions, any subsurface flow was away from these sub-basins into the Koehn Sub-basin. All water inflow to the Koehn Sub-basin ultimately discharged to Koehn Lake. However, with variable extraction well locations and groundwater consumption rates, the gradients between sub-basins would likely change and conceivably, if drawdown was great enough, gradients could reverse between sub-basins resulting in a net loss of groundwater from the Koehn Sub-basin.

In the Koehn Sub-basin, the number of wells and extraction rates increased with time, consuming greater quantities of groundwater. Several investigations estimated the historical changes in groundwater storage. Koehler (1977) utilized observed water level changes in wells during the period 1958-1976 to estimate the storage change within an area generally coinciding with the Koehn Sub-basin. EarthSat (SAMDA 2008) also utilized water level changes to estimate storage changes during the period 1985-1997 for seven Fremont Valley Basin subareas; the combined area of five subareas generally coincide with the Koehn Sub-basin. ESI (ESI2009) reported the results from a numerical groundwater-flow model of the Koehn Sub-basin, and the model simulated annual storage changes during the period 1958-2007.

Soil & Water Table 8 summarizes Koehn Sub-basin water budget estimates. For the past two decades, the budget data indicate groundwater storage has generally increased by about 10,000 to 15,000 AF/yr. The Koehn Sub-basin is 146,500 acres in area (Bloyd, 1967), and if the estimated storage increases are applied uniformly across the sub-basin and we assume a specific yield of 0.11, this water volume corresponds to average annual water level increases ranging from about 0.6 to 0.9 foot per year. Water level increases of this magnitude are consistent with the lower end of observed trends

depicted in **Soil & Water- Figure 1** and summarized in **Soil & Water Table 6**. The exceptions include (1) water levels in wells located near major historical pumping centers, which exhibit a more rapid water level rise due to subsurface inflow from adjacent areas; and, (2) wells that show declining water level trends.

Soil & Water Table 8
Water Budget Estimates For The Koehn Sub-Basin (All Units In AF/yr).

	Source	ΔS^k	R^k	$GW^k_i - GW^k_o$	W^k	LD^k
Early Development	Equation (4)	0	---	---	0	18,000
1958-1976	Koehler (1977)	-21,800	700	9,500	32,000	n.c.
	ESI (2009)	-20,100	15,600	1,600	31,100	6,200
1977-1984	ESI (2009)	-23,900	15,600	1,300	40,800	0
1985-1997	EarthSat (1997)	9,700 to 14,800	---	---	---	---
	ESI (2009)	-4,100	15,500	1,200	20,800	0
1998-2007	ESI (2009)	11,700	15,500	1,100	4,900	0

n.c. is “not calculated”.

In the Koehn Sub-basin, increasing water levels are the result of recharge from infiltration of rainfall runoff, groundwater inflow from adjacent sub-basins, and subsurface inflows partially re-filling the depression created by historical pumping.

Well Interference

All operating wells within a groundwater basin contribute toward a lowering of water levels at other well locations. The overlap of drawdown among two or more wells is “well interference”, and is significant when it results in a loss of yield or exposes the well screen. The magnitude of drawdown impact is controlled by five factors: (1) the rate of pumping; (2) the duration of pumping; (3) the depth of the well screens (water-intake depth of well); (4) aquifer parameters (hydraulic conductivity and specific yield, which are determined by the aquifer materials); and, (5) aquifer boundary conditions. A loss of yield is appreciable if the interference renders an existing nearby well incapable of meeting 1) maximum daily demand, 2) dry-season demand, or 3) annual demand.

Loss of Yield

The maximum theoretical well yield is the pumping rate supplied by a well without lowering the water level in the well below the pump intake (Freeze & Cherry, 1979). Typically, pump intakes are located near the top of the screened interval because it is

desirable to keep the screen submerged under water; submerging the well screen can minimize chemical clogging and physical deterioration of the well screen (Driscoll, 1995).

Assuming unconfined groundwater conditions, the theoretical relationship between groundwater elevations, aquifer conductivity, well diameter, and discharge at a steady rate Q is described by Equation (1):

$$Q = \pi K (H^2 - h^2) / \ln(R/r) \quad (1)$$

where:

Q is the constant well discharge rate, in ft3/day;
K is the hydraulic conductivity of the aquifer, in ft/day;
H is the groundwater elevation at a distance R from the well, both in ft;
h is the groundwater elevation in the well, in ft;
r is the radius of the well, in ft; and,
π is a constant and equal to the ratio of a circle's circumference to diameter (approximately 3.1416).

Equation (1) assumes (a) groundwater is unconfined; (b) the aquifer is horizontal, infinite and of constant thickness; (c) the water bearing materials are homogeneous and isotropic; and, (d) the groundwater elevation is everywhere uniform prior to pumping (Driscoll, 1995).

Equation (1) indicates the theoretical discharge rate is determined primarily by the hydraulic conductivity and groundwater elevations, and owing to the logarithmic function much less on the distance "R" and well diameter "r". Employing Equation (1) for a specified well-groundwater system (i.e., fixed hydraulic conductivity, well diameter, and groundwater elevation in the well) Equation (1) is re-arranged to solve for the proportional change in discharge [Equation (2)].

$$(Q_1 - Q_2) / Q_1 = (H_1^2 - H_2^2) / (H_1^2 - h^2) \quad (2)$$

where:

Q_1 and Q_2 are constant well discharge rates corresponding to groundwater elevations H_1 and H_2;
H_1 and H_2 are groundwater elevations at a point located the distance R outside the well borehole; and,
h is the groundwater elevation in the well and assumed to be approximately the same for both pumping rates.

Equation (2) indicates the percent change in well discharge is related to the difference in drawdown caused by the well interference. The conductivity, well radius, and distance R are all constant for a given well and therefore, cancel each other in the calculation.

Physical Damage

Exposure of neighboring well screens represents the potential for physical damage to a well. A reasonable threshold of significance is if the project causes static water levels (when the pump is off) at wells to fall below the average depth to the top of the well screen. The average top-of-screen depth may be an appropriate benchmark because it would be unreasonable for the shallowest well in a basin to constrain the use of basin storage by all users. In practice, some wells may have static water levels that are already below the top of the screen. In this case, a small amount of additional drawdown would be of little consequence because the risk of screen collapse due to corrosion is already present. At other wells, pumping water levels (when the pump is on) can be below the top of the screen. Corrosion is not usually a high risk in these situations, and a small increment of additional drawdown would presumably not substantially increase the likelihood for damage to occur. Accordingly, the impact of additional drawdown is considered significant only if static water levels above the screen are caused to fall below the top of the screen because of project pumping.

Staff reviewed the well construction information for water supply wells reported by the applicant (Appendix J of the AFC) and in classified well driller reports provided by the California Department of Water Resources. The well construction data indicate an average well depth of about 480 feet, and the top of the well perforations start at an average depth of 210 feet below land surface. In March of 2008, the average reported depth to water in wells was 200 feet below land surface (standard deviation of 100 feet). Hence, average water depths are within ten feet or more of average well perforation depths.

Thresholds to Determine Significant Impact

For average conditions in the Fremont Valley, the water table is located about 10 feet above the well perforations. Equation (2) indicates a 10 feet decrease in average depth to water, which corresponds to a lowering of the water table to the top of the well screen, results in a 9-percent reduction in theoretical maximum well yield. One threshold therefore could be limiting drawdown to 10 feet below existing conditions. Drawdown of static water levels greater than 10 feet may expose the well screens, making them susceptible to potential corrosion and damage.

Groundwater Impacts

The applicant developed a two-dimensional groundwater-flow model of the Koehn Sub-basin to evaluate potential project-related pumping impacts. Staff's evaluation and conclusions regarding the model are provided in **SOIL and WATER-Appendix B**. In summary, the model appears properly constructed, adequately represents the applicant's stated and/or implied assumptions regarding groundwater-flow conditions, and uses an accepted computer code. All model simulations appear to meet appropriate mass balance errors and head closure criterion.

However, these supportive findings do not necessarily indicate the model accurately simulates historical water levels at all locations or reliably predicts future water level changes due to proposed project pumping. For example, staff compared simulated and observed water level recoveries and noted that at nine locations, the directions of the

trends agree but the simulated recovery rate was usually greater than observed. Additionally, at seven locations simulated and observed water level trends are opposite in direction. At some of these locations, the model simulated increasing water levels when in reality observed water levels are decreasing. At other locations, simulated water levels are decreasing whereas observed water levels are increasing. These findings illustrate that the model is a simplification of the real world system and there likely exist conceptual deficiencies (i.e., important processes may be neglected in the model) and uncertainty in defined stresses (inflows and outflows like recharge and pumping rates are poorly understood). The model results submitted by the Applicant can likely provide useful insight into the probable cause and effect relationships between recharge and pumping, but the accuracy of the results is uncertain and should be interpreted with caution.

The aquifer parameter values and most boundary conditions specified in the model appear generally consistent with the conceptual groundwater system described in previous reports. However, staff's review of published modeling studies and data provided by the project applicant indicate two boundary conditions may actually be different than specified in the model. These conditions are subsurface inflow from the Antelope Valley to the Fremont Valley Basin, and the timing and magnitude of discharge to Koehn Lake. No assessment of model sensitivity to these boundary conditions is reported. It appears to staff that the model also neglects to include historical agricultural return flows, which is a potentially important historical recharge process. Sensitivity testing by the applicant included agricultural return flows with a 10-year delay and the results appeared to significantly alter the timing and magnitude of simulated water level changes. At the end of their "verification" model run, the simulated water levels at some locations were 30 to 50 feet higher in 2007 than their corresponding model run that did not consider return flows.

The applicant reported additional model simulations that considered the sensitivity of model results to uncertainty in aquifer parameters (hydraulic conductivity and storage coefficient), fault hydraulic characteristics, and recharge. The sensitivity test results provided a range in possible simulated Koehn Sub-basin responses to project groundwater pumping and help represent the uncertainty in sub-basin hydrogeologic conditions.

Staff considered the applicant's model and simulation results as part of their evaluation of potential groundwater impacts. Environmental Simulations, Inc. (ESI 2009) modeled the 5-month construction water use scenario to assess pumping effects. The groundwater model simulation assumed seven wells pump continuously during the five-month period at about 5 million to 10 million gpd. This construction scenario pumping was then followed by 30 years of project pumping operations. For project operations, the initial water use estimate of 1,600 AFY of pumping was simulated for a continuous 30-year period (ESI 2009).

Substantial interference with groundwater recharge or depletion of aquifer volume and lowering of the local groundwater table level are considered significant negative impacts. Potential recharge interferences can refer to how a project alters the volume and rate of water percolating into the subsurface and replenishing the aquifer. In the Fremont Valley, recharge from rainfall infiltration on the valley floor is assumed

negligible, so the project itself is not expected to interfere substantially with recharge from rainfall infiltration. Mountain front recharge and recharge from runoff infiltration into stream beds are assumed to continue at historical rates unaltered by the project. The applicant's groundwater-flow modeling results provide insight into project pumping impacts to groundwater supplies.

Soil & Water Figure 4 shows the historical cumulative change in groundwater storage simulated by the applicant's groundwater-flow model for their "verification" run and predicted future storage changes both with and without proposed project pumping. Simulated historical conditions indicated that past agricultural pumping consumed almost 640,000 AF of groundwater storage and since about 1995, simulated storage in the Koehn sub-basin has slowly but steadily recovered at a rate of about 5,300 AF/yr. Even with the proposed project, simulated storage continues to increase but at a slower rate (4,600 AF/yr). After 30 years of simulated project pumping, simulated groundwater storage in the Koehn sub-basin is about 21,000 AF lower than without project pumping.

ESI (ESI2009) also reported the predicted impacts to water levels at 24 well locations within and near the project site. They defined these impacts as the difference between simulated future water levels in the year 2040 with and without project pumping. ESI (ESI2009) also considered the uncertainty in aquifer conditions and report simulated impacts for a range in aquifer conditions defined by the assumed uncertainty in model input. Staff utilized this information to calculate the drawdown in order to compare model results with the thresholds and determine the significance of the impacts. Staff calculated the drawdown by subtracting the simulated water level at the end of 2007 (current conditions) from the predicted water levels in 2040. The calculated drawdowns are summarized below in **Soil & Water Table 9**.

In **Soil & Water Table 9**, positive drawdown indicates simulated future water levels decrease relative to 2007 because of simulated project pumping. Conversely, negative drawdown indicates simulated future water levels increase relative to 2007 water levels (i.e., simulated water levels continue to increase even with project pumping).

Soil & Water Table 9
Maximum Thresholds and Simulated Impacts from Project Pumping.

Well	Distance to Pumping Well (miles)	Threshold (feet)	Simulated Drawdown (feet)			
			Zero Recharge[a]	Base[b]	Sensitivity Tests	
					Maximum Drawdown	Test Name
Pumping Well 63	0.0	10	33.4	-40	-30	K x 0.5
31S37E08C001M	0.6	10	30.0	-43	-36	K x 0.5
31S37E05M01	0.9	10	31.6	-44	-37	K x 0.5
Pumping Well 48	1.0	10	28.3	-44	-38	K x 0.5
31S37E10A01	1.9	10	-11.0	-48	-42	No Cantil Fault
30S37E34H02	2.7	10	24.1	-43	-40	K x 0.5
31S37E14L01	3.0	10	-11.7	-47	-42	No Cantil Fault
30S37E27H002M	3.4	10	24.3	-41	-39	K x 0.5
31S37E30F001M	3.6	10	-2.0	-23	-18	No Cantil Fault
Well 24	4.1	10	-7.9	-46	-43	No Cantil Fault
31S38E06E001M	4.2	10	-9.4	-45	-42	No Cantil Fault
30S37E36G001M	4.3	10	15.1	-44	-43	K x 0.5
31S37E33H001M	4.5	10	9.5	-2	0	No Cantil Fault
31S37E35N001M	5.3	10	9.8	-1	1	No Cantil Fault
30S37E24J001M	5.4	10	11.8	-35	-34	Sy x 0.5
30S38E32D03	5.6	10	-10.9	-40	-38	No Cantil Fault
30S38E19K01	5.9	10	9.1	-33	-32	Sy x 0.5
30S38E03K002M	10.2	10	6.3	-25	-24	Sy x 0.5
30S38E24F001M	10.2	10	-6.3	-19	-18	K x 2
29S39E32E001M	13.6	10	13.5	-22	-22	Sy x 0.5
30S39E08A001M	13.7	10	4.5	-7	-6	K x 2
29S39N29N01	13.9	10	14.8	-22	-22	Sy x 0.5
29S39E33K001M	14.9	10	8.5	-7	-6	K x 2
29S39E28H001M	15.8	10	18.1	-20	-19	K x 2, Sy x 0.5

a) ESI (2009) reported simulated impacts in their Table 4 assuming Zero Recharge (no mountain front recharge or rainfall runoff infiltration), and defined the impact as the predicted water level in 2010 minus the predicted water level in 2040 with project pumping. Negative values indicate that simulated water levels in 2040 are greater than in 2010 (i.e., simulated water levels continue to increase even with project pumping and no mountain front recharge or rainfall runoff infiltration). Positive values indicate water levels decrease because of project pumping and reduced recharge.

b) Drawdown calculated as the simulated 2007 water level minus the simulated 2040 water level with project pumping. Negative values indicate that simulated water levels in 2040 are greater than in 2007 (i.e., simulated water levels continue to increase even with project pumping).

The maximum simulated drawdown utilizing the “base” model ranges from -1 foot to almost -50 feet. Although water levels are lowered by project pumping relative to water levels without project pumping, negative drawdown indicates water levels are higher at the end of the pumping period than in 2007. Therefore, the maximum thresholds are not exceeded utilizing the “base”model, and maximum well yields are expected to increase relative to current conditions as a result of the simulated water level rise.

Sensitivity tests considered potential effects of uncertainty in aquifer parameters, faults, and recharge. The effects are variable between tests and at different well locations, but the conclusions generally agree with the base model run results. On average, reducing hydraulic conductivity and specific yield increases the magnitude of simulated

drawdown, whereas increasing hydraulic conductivity, specific yield, or removing the Cantil Valley Fault decreases the simulated drawdown. In all but two wells, the drawdown is negative indicating simulated future water levels are greater than simulated 2007 levels. Because of the continued simulated water level rise, thresholds are not exceeded at these wells. In the two wells with non-negative drawdown, simulated drawdown is zero and one foot, which are both below the thresholds and indicate no significant impact.

For the "Zero Recharge" analysis, the simulated drawdown without mountain front recharge or infiltration of storm run-off represents the extreme case where Koehn sub-basin groundwater storage changes are due solely to subsurface inflow from adjacent sub-basins (about 1,100 AF/yr) and outflow by pumpage (4,900 AF/yr of pre-existing pumpage shown in **Soil & Water Table 8** and the approximately 1,600 AF/yr additional new pumping for the project). The simulated drawdown at seven locations is negative, indicating that water levels continue to rise in some areas even without future recharge. On the average, the decrease in groundwater recharge reduces the simulated recovery rates by 1.2 ft/yr (almost 30%). The continued increase of water levels is therefore, due partially from groundwater already in storage, and on average 70% of the simulated recovery in these areas is due to the re-distribution of water in storage. In the remaining wells, simulated water levels decrease from about four to more than 33 feet. In 11 wells, the simulated drawdown is greater than 10 feet indicating a significant reduction in theoretical well yield and exposure of the well screens.

About 30% of estimated average annual recharge is currently extracted and consumed by pumping wells in the Koehn sub-basin (**Soil & Water Table 8**), and proposed project pumping represents consumption of an additional 10% of estimated annual recharge (a combined total consumption of 40%). The estimated volumetric water budget for the sub-basin suggests groundwater storage is increasing by 11,700 acre-feet per year, but the increase is not uniform and observed water level declines in some areas indicate groundwater discharge may exceed recharge at least locally (**Soil & Water Table 6**). The applicant's groundwater-flow modeling results indicate observed upward water level trends is not entirely due to the addition of new water from rainfall recharge, but instead is groundwater already in the sub-basin moving into water table depressions created by historical agricultural consumption. In addition, simulated upward water-level trends based on the applicant's recharge values in **Soil & Water Table 6** can be greater than observed water level trends (see **Soil & Water Table 6** and **Soil & Water Figure 1 in Appendix B**). These findings indicate uncertainty in estimated recharge, and under assumed worst case conditions (no mountain front recharge or infiltration of storm run-off) potentially significant negative impacts to existing wells near the project site may occur.

The applicant's conclusions regarding insignificant impacts resulting from project groundwater use rely substantially on Koehn Sub-basin water levels continuing to increase into the future. Staff confirmed historical water level increases in most parts of the Koehn Sub-basin. However, in some areas, the model-simulated recovery is substantially greater than observed (for example, the actual water levels observed in some wells have been somewhat stable for the past 5-years or more but the model simulates a substantial water level increase) . In other areas, the recovery is supplied primarily by water already in the basin (the re-distribution of existing water in response

to historical agricultural groundwater use). Finally, the simulated water level rise in some areas is contrary to observed, and real world water levels are actually declining. Simulated drawdown from the applicant's model may therefore be optimistic (represent the minimum potential to impact groundwater resources), at least in some areas, whereas the "Zero Recharge" test may be overly conservative (represent the maximum drawdown), at least over the long-term period of 30-years. The actual potential for the project to impact the groundwater resource and existing wells likely falls within a range bounded by these two scenarios (the Base and Zero Recharge simulations).

Because of general uncertainty in hydrogeologic conditions and future groundwater levels, the applicant proposes to mitigate potential negative impacts to wells by forming a Koehn sub-basin groundwater monitoring committee. The purpose for the committee is to implement data collection activities and track actual changes in groundwater levels or quality in wells near the proposed power plant. The committee will include representatives from California City, the community of Cantil, Ranco Seco, Honda, and the project applicant (Beacon Solar LLC). The committee will oversee development of a monitoring well network; establish base line (pre-project conditions); and, routinely collect, archive, and analyze water level and water quality data.

Data collection and routine monitoring is necessary to manage groundwater resources. It will be critical for groundwater monitoring activities to identify and quantify future water level changes and the relationships between groundwater use and recharge in order to quantify project impacts that may occur. To ensure there are no impacts to groundwater resources, staff recommends the applicant be required to comply with Condition of Certification SOIL&WATER – 1 which would require the applicant to form a groundwater management committee, implement a monitoring program to evaluate groundwater basin conditions, and provide recommendations to staff regarding the need for and scope of mitigation necessary for any impacted wells.

Water Quality

In the southwestern portion of the Koehn sub-basin, groundwater is classified as sodium bicarbonate or calcium-sodium bicarbonate and contains TDS concentrations ranging from 350 ppm to 450 ppm (DWR 2003). Monitoring of BSEP site wells by USGS and DWR since 1955 demonstrate that groundwater beneath the site is of high quality with TDS concentrations ranging between 350 ppm and 564 ppm (BS2008a). Near the end of site aquifer testing conducted in 2007, three groundwater samples were collected from onsite wells (BS2008a). Evaluation of laboratory analyses conducted on those samples indicate that site groundwater is fresh and with minimal treatment, suitable for drinking.

Groundwater within the Koehn sub-basin varies in quality in relation to its proximity to Koehn Lake. Koehn Lake is hydraulically connected to groundwater in the basin and is reportedly the only significant natural discharge feature in the Koehn sub-basin. The natural discharge of Koehn Lake is through evaporation, which leaves behind (concentrates) salts previously contained in the groundwater. As Koehn Lake is

approached, TDS concentrations in groundwater increase thereby, decreasing groundwater quality. Groundwater samples collected from wells adjacent to Koehn Lake have contained TDS concentrations exceeding 100,000 ppm (Dockter 1979, DWR 2003).

Saint-Armand (1991) suggested that "farming had so lowered the water table that brackish water from Koehn Dry Lake may migrate westward into the pumping depression near Cantil…" Similarly, Koehler (1977), indicated that because the groundwater gradient is from Koehn Lake toward the pumping depression , which was located near the proposed BSEP site, saline water under Koehn Lake poses a potential threat to the fresh water supply.

Significant pumping west of the lake bed can therefore, potentially change eastward sloping hydraulic gradients, causing them to reverse and induce groundwater flow from east to west. As a result, saline groundwater associated with the lake bed can migrate and co-mingle with the relatively higher quality fresh water. Staff analyzed the project's proposed use of groundwater to determine if it could degrade the quality of regional or local surface water or groundwater supplies.

Staff reviewed water quality data presented by the applicant that was compiled from DWR and USGS records obtained from well-water samples collected during various periods between 1955 and 2007(DB2008t). The data indicate variations in concentrations of TDS in groundwater samples collected from representative wells during this time. However, these data do not indicate a discernible trend that would indicate migration of high TDS groundwater within the Koehn Lake Sub-basin caused by water extraction at the BSEP site during the period of heavy agricultural pumping (1977 to 1984). During this time of heavy agricultural pumping, groundwater was extracted from the site at volumes between 12,000 and 17,000 AFY (SAMDA 2008a). Additionally, surrounding landowners were also pumping heavily causing a significant decline in water levels (SAMDA 2008a). This heavy agricultural pumping was more than 10 times greater than that proposed by the applicant (1,388 AFY). Based on substantial historic pumping levels and corresponding lack of data indicating that relatively high salinity groundwater migrated toward the pumping depression during that period, the withdrawal of 1,388 AFY of groundwater from beneath the site is not expected to induce high salinity groundwater near Koehn Lake to migrate westward, toward the site, and significantly impact local groundwater quality.

Applicant's Groundwater Mitigation Plan

The applicant has proposed a Groundwater Mitigation Plan to address potential impacts to groundwater resources. The program would consist of four components which are discussed below.

1. Partial Zero Liquid Discharge System (ZLD)

   The applicant has redesigned their project (DB 2009r) to include ZLD. They indicate the use of this technology would reduce their water use up to 200 AFY. This reduction in water use has been included in the applicant's current estimated water use of 1,388 AFY. Staff analysis of potential groundwater impacts discussed above includes consideration of this revised water use estimate.

2. Incorporating Low Impact Development (LID)

   The applicant has redesigned their project (DB 2009r) to incorporate LID practices into the facility layout and design. Staff does not believe the applicant's proposed storm water management design is consistent with LID. The goal of LID is to maintain the function and value of the natural drainage system while minimizing the risk of accelerated soil erosion and increased storm water runoff, while enhancing or maintaining groundwater recharge. The applicant did not provide sufficient information to quantify what change in groundwater recharge could be achieved with this design when compared to the no project condition.

3. Tamarisk Removal Program

   The Tamarisk Removal Program is designed to provide benefits to both groundwater and biological resources. The applicant would establish an endowment fund and a program that would include research, stakeholder coordination, mapping, removal, and monitoring. Water savings estimates have been provided but it appears there is insufficient data currently available to identify where there is significant growth of Tamarisk in the Fremont Valley. Since the removal potential is unknown it is not possible to estimate what water savings could be considered in a groundwater impact analysis.

4. Groundwater Monitoring

   The applicant has proposed a groundwater monitoring program in response to staff's analysis in the PSA. Staff has included this program in Appendix I and used it as the basis for development of Condition of Certification **SOIL&WATER – 1**.

In summary, staff believes the analysis of groundwater impacts above has adequately addressed the quantifiable savings described in the appliciant's groundwater mitigation plan. It is possible additional benefits can be achieved through an LID approach to design and a Tamarisk Removal program but insufficient information was provided to evaluate the potential for mitigation of any impacts.

Wastewater

Construction Wastewater

During construction, water would be used for one-time hydrostatic testing of pipelines and pressure vessels. In addition to hydrostatic test water, a small amount of wastewater will be generated during equipment and vehicle washing. The applicant estimates that approximately 360,000 gallons of water will be used for hydrostatic testing. This water will be reused to the extent feasible in accordance with applicable regulations. Water that cannot be reused will be discharged to the evaporation ponds. As currently designed (6 acres of surface area), the evaporation ponds have enough capacity to contain all of the 360,000 gallons of hydrostatic test water. The discharge of any wastewater during construction must comply with Condition of Certification **SOIL & WATER – 4**, and the Requirements of Waste Discharge presented in **Soil and Water Appendices E, F,** and **G**.

Operation Wastewater

Wastewater generated from the project operation would include cooling tower blow down, sanitary wastewater, and storm water. The applicant proposes two separate wastewater collection systems for BSEP operation. The water-balance diagrams provided in the AFC (BS 2008a), show the expected wastewater streams and flow rates for the project under summer (representing peak usage) and annualized conditions.

The first wastewater collection system is the process wastewater system. The process wastewater system is proposed to collect all onsite wastewater generated from operation of the plant. Process water wastes, including cooling tower blowdown and waste streams from the neutralization tank would be conveyed to a partial zero liquid discharge (ZLD) system and disposed to lined, onsite evaporation ponds. The peak summer discharge is designed at a rate of 52 gallons per minute (gpm) and an annual discharge is designed at a rate of 44 gpm.

Three potential water sources with different water chemistries have been identified for use by BSEP. These three sources are 1) site groundwater, 2) recycled wastewater obtained from the city of Rosamond and/or California City and 3) degraded groundwater located in the vicinity of Koehn Lake. Concentration of TDS in the site groundwater and the recycled water are very similar (approximately 500 ppm). TDS in groundwater near Koehn Lake exceeds 1,000 ppm. Employing the partial ZLD, the wastewater discharging to the evaporation ponds will have a TDS concentration of approximately 70,000 ppm if site groundwater or recycled wastewater is the water source, and approximately 111,000 ppm if the degraded groundwater is the water source. Due to the elevated concentration of TDS, this wastewater is considered a Class II designated waste. In order to accommodate this flow, three evaporation ponds will be required, each with a nominal surface area of two acres, for a total surface area of six acres.

The ponds would be designed with an average depth of eight feet, which allows for two feet of freeboard, three feet of wastewater and three feet of accumulated solids. Because the wastewater is considered a Class II designated waste, the ponds must be designed to contain precipitation resulting from a 1,000 year, 24 hour storm (**Soil & Water Appendix F**). For safety and operational purposes, the ponds will be cleaned when three feet of precipitated solids are accumulated in the base of the ponds.

Multiple ponds are planned to allow plant operations to continue in the event that a pond needs to be taken out of service (e.g., needed maintenance or solids removal). Each pond will have enough surface area so that the evaporation rate exceeds the cooling tower blowdown rate at maximum design conditions and at annual average conditions.

As designed, the pond liner system would consist of a 60 mil high density polyethylene (HDPE) primary liner and a minimum 40 mil HDPE secondary liner. Between the liners is a synthetic drainage geonet that is used as part of the leachate collection and removal system (LCRS). There will be a hard surface protective layer on top of the 60 mil HPDE, which will consist of a non-woven geotextile, one-foot thick granular fill/free

draining, material and a one-foot thick hard surface such as roller-compacted concrete. The hard surface provides protection against accidental damage to the HDPE from falling objects, varying climatic conditions and worker activities during cleanout and maintenance.

BSEP estimates that precipitated solids would accumulate to a thickness of three feet in the ponds every 4.5 years if site groundwater or recycled wastewater is the water source, and approximately 3.8 years if the degraded groundwater is the water source. Once the solids accumulate to a thickness of three feet, the evaporative residue would be removed. BSEP estimates that 150,000,000 pounds of residue will be generated in the ponds over a thirty year period if site groundwater or recycled wastewater is the water source, and approximately 300,000,000 pounds of residue will be generated in the ponds over a thirty year period if the degraded groundwater is the water source (DB 2009r).

Evaporation pond monitoring would be required to detect the presence of liquid and/or constituents of concern emanating from the ponds in accordance with the Requirements of Waste Discharge established by the LRWQCB and presented in **SOIL & WATER Appendices E, F** and **H**. As proposed, the leak detection monitoring program for the facility consists of monitoring the LCRS, lysimeters, and monitoring wells for the presence of liquid and/or constituents of concern (BS2008a). The LCRS would be monitored to detect accidental liner failure. BSEP proposes to use several existing onsite water supply wells to detect groundwater impacts from accidental pond discharge. Constituents of concern would include chloride, sodium, sulfate, TDS, biphenyl, diphenyl oxide, potassium, selenium, and phosphate (BS 2008a). Staff believes there would be no significant surface water or groundwater contamination resulting from wastewater discharge if the applicant complies with Conditions of Certification **SOIL&WATER - 3. SOIL & WATER -3** would require the applicant to comply with the Requirements of Waste Discharge presented in **Appendices E, F, G** and **H.**

The second proposed wastewater-collection system is the sanitary system. The sanitary system would collect wastewater from sinks, toilets, and other sanitary facilities for discharge to an onsite septic sewer system and leach field. Design and construction of the on-site waste disposal system would be completed in accordance with Kern County Environmental Health Services Department, Sewage Disposal by Individual Soil Absorption Systems requirements. In order to comply with Kern County on-site sewage disposal requirements, staff recommends that the sanitary wastewater system be constructed in accordance with Condition of Certification **SOIL&WATER – 2.**

Soil Erosion Potential by Water and Wind

Construction

Construction activities can adversely impact soil resources including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water dependant habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters.

The magnitude, extent, and duration of those impacts would depend on several factors, including the proximity of the BSEP site to surface water, the soil types affected, and the method, duration, and time of year of construction activities. Prolonged periods of precipitation, or high intensity and short duration runoff events coupled with earth disturbance activities can result in on-site erosion. In addition, high winds during grading and excavation activities can result in wind borne erosion leading to increased particulate emissions that adversely affect air quality.

The BSEP site would be subject to wind and water erosion during construction. Project construction would be completed over a 26-month period (BS 2008a). The total site grading would be significant, with up to 20 feet of cuts and fills, excavation of a diversion channel to reroute Pine Tree Creek and filling the existing Pine Tree Creek channel, amounting to approximately 8,300,000 cubic yards of soil being moved. The earthwork would consist of primarily cut and fill grading with excavation for foundations and underground systems. The Pine Tree Creek engineered diversion channel would require nearly 3.1 million cubic yards of soil material to be cut.

A draft project grading plan and SWPPP has been prepared by the applicant that includes Best Management Practices (BMPs) for wind and water erosion control during project construction. The implementation of appropriate erosion control measures would help conserve soil resources, maintain water quality, prevent accelerated soil loss, and protect air quality. The erosion and sedimentation control measures include: applying water to the roads in active construction and laydown areas; controlling speed on unpaved surfaces; placing gravel in entrance ways; use of straw bales, silt fences, and earthen berms to control runoff; restoration of native plant communities by natural revegetation, seeding and transplanting, and application of soil bonding and weighting agents. During grading work, soil would also be stabilized by maintaining sufficient water content to make it resistant to weathering and erosion by wind and water. Silt fences would be placed at adequate spacing perpendicular to the drainage path and generally oriented in a northwest to southeast direction to trap sediment before it can migrate.

Given the low frequency of precipitation and storm water runoff BMPs implemented during construction should limit potential soil loss from water erosion caused by on-site precipitation events. As outlined in the preliminary DESCP, BMPs would include temporary erosion control methods such as the use of crushed rock, silt fences and fiber rolls. The potential for soil loss by water erosion was estimated by ENSR (March 2008) for pre-development, construction, and post-development conditions. Under current conditions, the soil loss was estimated to be about one ton per year. As described above and in the DESCP, without implementation of control measures and BMPs, construction activities would increase the potential for soil loss. Estimated soil loss during the construction period is about 150 tons per year (BS2008a). Although the expected infiltration rate at the site is rapid, BMPs would include the following:

- Local soil berms and a retention area would be constructed to contain storm water runoff.
- During site grading, clearing and grubbing would be confined to only those areas needed for facility construction as indicated in the conceptual grading plan.

- Temporary erosion controls including crushed rock, silt fences and fiber rolls would be used as needed to minimize erosion in active grading areas. Soil stockpiles would be covered prior to forecasted storm events and during windy conditions. Fiber rolls or gravel bags would be placed around the perimeter of the stockpiles to further minimize the potential for runoff.
- The applicant indicated that as a BMP, water would be used to control dust and would be applied at a rate so as to minimize runoff. Staff recommends that the applicant utilize CPM- approved dust palliatives and other dust control BMPs including soil binders or weighting agents to minimize water use during construction to the extent possible.

BMPs would be applied and repaired as soon as erosion is evident and as soon as possible. Temporary erosion control measures would be implemented as needed to control erosion. Temporary sediment control materials would be maintained onsite throughout the life of the project to respond as needed to unforeseen rain or emergencies.

In the absence of proper BMPs and due to the soil type, the project earthwork could cause significant fugitive dust and erosion. As shown in **Soil and Water Table 2**, the predominant surface soil condition on the proposed BSEP site is fine to gravelly sand with a water erosion potential of slight to moderate. The surface textures of these gravelly areas have a slight potential for wind erosion and those areas with a finer component have a high potential for wind erosion (NRCS 2008). However, with implementation of BMPs identified by the applicant in the AFC and proposed in Condition of Certification **SOIL&WATER-3**, significant soil erosion and subsequent sedimentation would be avoided. Overall, staff believes the applicant has identified a reasonable plan and sequence for implementing BMPs that would avoid significant adverse erosion and sedimentation impacts resulting from precipitation runoff. Staff concludes that through the proper application of BMPs as proposed by these conditions of certification, the impact to soil resources from water and wind erosion during construction would be reduced to a level that is less than significant.

Staff has also analyzed the potential impacts from construction of the alternative recycled water supply pipelines from Rosamond Community Services District and California City. The applicant did not include these linears in the draft project grading plan and SWPPP. For delivery of this water from Rosamond, construction would require a 40-mile long underground pipeline extending from the community of Rosamond to the BSEP site. The southern 23 mile portion of the Rosamond Alternative water pipeline alignment would be constructed almost entirely within existing road beds and shoulders. The alignment is mostly along improved gravel and dirt roads in rural-residential and undeveloped areas, on the disturbed road shoulder of Sierra Highway, and on the paved road bed of Rosamond Boulevard. The northern 17 mile portion would be constructed in the existing roadbed and shoulder of Neuralia Road. The pipeline alignment crosses two forks of Cache Creek, an ephemeral drainage, and 12 smaller unnamed ephemeral drainages. All features, including Cache Creek, are isolated waters with no direct connection to a perennial stream or other navigable waters or permanent water source such as a lake or spring, and are unlikely to qualify as jurisdictional features subject to regulation under the federal Clean Water Act. Only Cache Creek

would be considered a waters of the state because the other ephemeral drainages are not characterized by a defined bed and bank within the pipeline alignment right-of-way. To reduce construction related erosion and sedimentation impacts to less than significant, the applicant would be required to comply with Condition of Certification **SOIL & WATER-5** for installation of this pipeline.

For delivery of recycled waste water from California City, construction of a 12-mile long underground pipeline extending from California City to the BSEP site would be required. The California City Alternative water pipeline alignment would be constructed almost entirely within existing road beds and shoulders. The alignment is mostly along the disturbed road shoulder of paved Mendiburu and Neuralia Roads. To reduce construction related erosion and sedimentation impacts to less than significant, the applicant would be required to comply with Condition of Certification **SOIL & WATER-5** for installation of this pipeline.

Staff believes that the conceptual Best Management Practices (BMPs) for wind and water erosion control presented in the draft grading plan and SWPPP could also be applied to the pipeline alignments and would be sufficient to address significant adverse erosion and sedimentation impacts resulting from precipitation runoff. To ensure grading and drainage plans are developed that specifically address potential impacts from pipeline construction, staff recommends the applicant be required to comply with Conditions of Certification **SOIL & WATER-3** and **SOIL & WATER-5.** Condition of Certification **SOIL & WATER-3** would require the applicant to develop a SWPPP that would include identifying and implementing BMP's for construction of the pipelines. Condition of Certification **SOIL & WATER-5** would require the applicant to develop and implement a DESCP that would include designs and plans for implementation of soil and water erosion mitigation measures for construction of either pipeline alternative.

Operation

The applicant has proposed permanent erosion control measures to mitigate potential soil erosion and subsequent sedimentation impacts resulting from precipitation runoff during operation of BSEP. During operation, areas not covered by foundations, paving, or the solar array would be treated with soil stabilizers. BSEP has not fully described the durability of these soil stabilizers to withstand adverse weather conditions, and their susceptibility to vehicular traffic. These erosion control measures would be included in the Requirements for Waste Discharge presented in **Soil and Water Appendix F** and required by staff in Condition of Certification **SOIL&WATER – 4**. With implementation of the requirements, staff does not believe there would be significant impacts to soil resources during operation of BSEP.

Staff is concerned that the finish grade soil stabilization treatments may cause a reduction in infiltration and requests that the applicant assess potential impacts related to storm water runoff from treated soils or mitigate for additional surface runoff. Broad application of soil treatments would affect the soils ability to infiltrate rainwater. Less infiltration means more runoff. The applicant referenced the September/October 2003, Journal of Hydrologic Engineering article: "Hydrologic Impacts of Disturbed Lands Treated with Dust Suppressants." The study presents research on changes in hydrologic characteristics of disturbed land surfaces treated with dust suppressants.

The study reports the percent change in runoff from eleven different dust suppressant tests. Tests show disturbed lands treated with dust suppressants can cause minor increases to runoff or increase runoff 300% to 400%.

Staff recommends that the applicant comply with Air Quality Condition of Certification AQ-SC3 to apply dust suppressant compounds as necessary. The applicant would apply the dust suppressants per manufacturer's specifications and rely on data from the manufacturer or studies that examine the change to the runoff characteristics of the disturbed soil. The applicant would be required to describe its findings in the Drainage, Erosion, and Sediment Control Plan (DESCP). Site imperviousness, used for determining runoff as well as sizing onsite retention basins, would account for changes to the runoff characteristics. Staff is requiring that the applicant provide these calculations in the DESCP, a requirement of Condition of Certification **SOIL & WATER-5**. Condition of Certification **SOIL & WATER-5** requires the project owner to obtain Compliance Project Manager (CPM) approval of the site-specific final DESCP that addresses storm water project elements including site runoff, retention, detention (if necessary), and BMPs to protect soil and water resources for the operation phase of the project.

BSEP storm water may encounter soil or chemicals deleterious to aquatic and terrestrial plant and wildlife. Staff reviewed the applicant's conceptual BMPs for managing potentially harmful storm water to check that the measures would protect water quality. Potentially significant water quality impacts could occur during operations if contaminated or hazardous materials used during operations were to contact storm water and drain offsite. BSEP would alter natural storm water drainages and use BMPs to reduce potentially significant impacts related to concentrated drainage and ensuing soil erosion and sediment transport offsite. Recognizing these potential impacts, the applicant has prepared a draft industrial SWPPP required by the general WDR for industrial activity. Condition of Certification **SOIL&WATER – 4** requires the project owner obtain Compliance Project Manager (CPM) approval and implement the final industrial SWPPP and monitoring plan. Condition of Certification **SOIL&WATER – 4** requires that BSEP comply with the conditions of the Requirements for Waste Discharge (**Soil and Water Appendix F**), for discharges of storm water associated with industrial activity.

Temporary and permanent disturbances associated with construction and operation of the proposed project would cause accelerated wind- and water-induced erosion. However, staff has concluded that with the implementation of proposed mitigation measures, the construction and operation SWPPPs, and Condition of Certification **SOIL&WATER-5** that the project would not contribute significantly to cumulative erosion and sedimentation impacts. Staff recommends that BSEP develop a site specific DESCP that addresses all project storm water elements as part of this Condition of Certification to ensure protection of water quality and soil resources during construction and operation of the project. This condition of certification requires the applicant to provide Kern County a copy of the DESCP for their review and comment. The project owner would also be required to obtain CPM approval of the DESCP.

Storm Water

Construction Storm Water

The BSEP site would be located primarily in a former agricultural field with areas having sparse scrub and brush. During site construction, several site conditions would potentially contribute to significant erosion following a significant rainfall event. Some of these construction related site conditions include the large volume of earth graded, the long duration of the construction period, and soil properties that have a high to moderate potential for water erosion. Construction storm water drainage patterns may concentrate runoff in areas that are not properly protected with BMPs causing erosion of soils and sediment discharge offsite and possibly into surface waters. Potentially significant impacts to water quality could occur during construction, excavation, and grading activities if contaminated or hazardous soil or materials used during construction were to contact storm water runoff and drain offsite.

Staff reviewed the BSEP Conceptual Drainage Plan provided in the AFC (BS 2008a) and the Project Design Refinements (DB 2009r) which evaluated storm water runoff for pre-developed conditions onsite and offsite and post-development (operations) conditions at the site. BSEP development would increase site runoff volume because of increased impervious areas or other changes to the site's soil infiltration capacity. Drainage system improvements also reduce the time of concentration of the storm water runoff and may increase peak runoff rates without proper attenuation measures.

Potentially significant impacts to soils resulting from soil erosion would occur in areas not protected with BMPs for construction. Recognizing these potential impacts, the applicant has prepared a draft SWPPP, required by the general WDR, for construction activity. Condition of Certification **SOIL&WATER–3** would require the applicant to comply with the requirements of the WDR for discharges of storm water associated with construction activity. With implementation of the permit requirements and Condition of Certification **SOIL&WATER-3**, staff does not believe there would be significant erosion or sedimentation impacts due to storm water runoff, for on and offsite discharges, during construction.

Construction of the BSEP would add impervious areas to the site, causing an increase in storm water runoff. Drainage and erosion control measures that create a separate storm drainage system for the power plant are proposed. BSEP proposes soil treatments, such as soil stabilizers or sprayed water to resist weathering and wind erosion. BSEP's draft construction SWPPP provides conceptual plans for construction related erosion and drainage control measures (BS 2008a). The draft construction SWPPP includes BMPs for properly storing and containing hazardous materials used, and hazardous waste generated, during the course of construction. Staff concludes that proper application of BMPs in accordance with the conditions of certification would reduce to less than significant levels, the storm water impacts to water quality and soil and water resources. Staff also concludes that with implementation of onsite retention, site improvements would not increase the runoff volume or increase peak flood levels downstream.

Storm Water Management During Operations

Staff reviewed the applicant's hydrologic calculations in the Conceptual Drainage Study (CDS) and the Project Design Refinements (DB 2009r) to evaluate the offsite areas tributary to the BSEP site and the proposed onsite storm water management plan. Storm water from offsite areas historically flow toward and across the site via Pine Tree Creek, small drainage swales, or over land as shallow flooding. As proposed, the BSEP project would alter historic storm water flow paths and change typical runoff patterns from the property. **SOIL and WATER - Appendix C** presents a detailed discussion of staff's review of BSEP's storm water plan and watershed-scale assessment of Pine Tree Creek floodwaters. In this section, staff summarizes the potential erosion and sedimentation hazards resulting from onsite precipitation runoff during project operation, and separately addresses onsite storm water impacts and potential impacts related to the Pine Tree Creek diversion.

Site development would result in the formation of ten individual, gently northward-sloping, planar "cells". The applicant has designed ten onsite drainage ditches at the downslope (northern) edge of each cell to collect rainfall runoff and nuisance water runoff originating from site maintenance activities. The ditches would flow from west to east, carrying runoff from each "cell". The applicant sized the ditches for high intensity short duration rainfall with flow velocities three to four feet per second. Ditch flow depths would not be greater than one foot deep. These shallow ditches would have no design freeboard.

The BSEP Retention Methodology chapter of their Conceptual Retention and Grading Study (DB 2009r) provided the engineering design methods proposed by the applicant to size retention basins and detention basins, if necessary, per Kern County requirements. BSEP's retention basin sizing methods introduced in the Project Design Refinements respond to staff and agency comments seeking to percolate and evaporate storm water and prevent undetained discharges. The applicant would construct a network of retention and drainage features to maintain pre-development peak flows from the site. The onsite retention basins, sized for the Intermediate Storm Design Discharge (ISDD) five-day storm event, addresses Lahontan RWQCB and CDFG comments and Kern County requirements for storm water discharges from industrial use areas. Based on the methods proposed by the applicant, staff believes that storm water runoff from the site as well as potential nuisance flows from plant operation and maintenance would not cause significant impacts to the receiving waters with implementation of the Conditions of Certification **SOIL&WATER-4 and -5**. Mitigation required to reduce potential surface water and groundwater contamination impacts to less than significant from discharges of hazardous substances or plant contact storm water are written in Condition of Certification **SOIL&WATER-4.** Staff believes that BSEP would avoid significant degradation to receiving waters during operations caused by storm water during plant operation by implementing these two Conditions of Certification.

The retention basins proposed by the applicant are terminal storm water facilities that would have a 48-hour drawdown. Staff understands this design satisfies the Kern County requirements to infiltrate and/or evaporate within seven days. Staff expects sediment to build up after sediment-laden inflow dissipates or windblown sand

accumulates in the basins. Maintenance and sediment removal may be difficult for basins located directly within the solar field. Staff concludes that the 12 to 18 inches deep retention basins would require monitoring and close inspection to initiate prompt sediment removal activities. It is not clear to staff that the retention basins are adequately sized. Typical sediment volumes are 20% of the total retention volume. It appears that adequate design would require additional storage volume to accommodate accumulated sediments. Staff recommends that these refinements to the design of the retention basins be incorporated into the final DESCP as part of compliance with Condition of Certification **SOIL&WATER -5**.

Staff believes the terrain, originating from the Chuckwalla Mountains west of BSEP, slopes toward the BSEP site and may have historically drained to the site. An offsite drainage ditch currently diverts the offsite tributary area away from the site to the north. In the PSA, staff requested that the applicant provide an adequate routing assessment of the ditch to assess its capacity and flow path and assure the adjacent property owners are not impacted by BSEP diverting storm water away from the BSEP property. Maintenance of this ditch may be required to ensure peak flood flows are routed away from the solar field. The DESCP, requisite for Condition of Certification **SOIL&WATER -5**, requires that the applicant identify activities and procedures needed to maintain capacity for this offsite ditch to avoid future potential flood related impacts.

In the PSA, staff made requests to the applicant to revise the Conceptual Drainage Study (CDS) to address several concerns about the methods used to meet local storm water management guidelines. The applicant submitted its revised Project Design Refinements (DB 2009r) that overhauled the original Conceptual Drainage Study storm water management plan. Many of staff's concerns were resolved while some issues have not been fully addressed, including the affect of soil stabilizers on the infiltration capacity, impervious area for developed conditions, hydrologic calculations for tributary areas, overflow risks for onsite drainage ditches, and the BSEP contingency plan for potential discharges of hazardous substances in contact with storm water from the industrial site.

Staff finds the current methods proposed by the applicant in the revised Project Design Refinements (DB 2009r), are adequate for developing the onsite, storm water management plan. If implemented as proposed, staff believes the storm water management, including proposed retention basins, would protect the site from erosion and downstream areas from sedimentation and degradation by deleterious materials. However, other issues noted by staff and identified above have not been addressed as part of the design refinements. Condition of Certification **SOIL&WATER-5** requires that the applicant develop a DESCP that addresses these staff comments. Staff believes that if BSEP complies with these conditions, there would not be significant erosion or sedimentation impacts due to onsite storm water runoff.

Based on staff's hydrologic analyses (see **SOIL and WATER - Appendix C**), staff concludes that BSEP's design discharge of 28,000 cfs for Pine Tree Creek is reasonable. This discharge rate establishes the design discharge threshold for the Pine Tree Creek diversion channel basis- of -design. As part of the requirements of Condition of Certification **SOIL&WATER-6**, the project owner would be required to show evidence that, as related to the required CLOMR, Kern County and FEMA have accepted the

calculations and methods used to determine the design discharge. The threshold for significance in this case is the peak design discharge for the 1% annual chance flood (Base Flood). The hydrology study and design discharge must meet FEMA's standards for determining the base flood discharge. As part of the CLOMR approval process, FEMA would review the hydrologic analyses and report on the reasonableness of BSEP's design discharge to meet the 1-percent annual chance flood standard. Condition of Certification **SOIL&WATER-6** also requires BSEP to develop peak flood flow estimates for the 10%, 2%, and 0.2% annual chance flood events using methods acceptable to FEMA.

Since the initial submission of the AFC, the applicant has presented several diversion channel design iterations to staff for review. Staff's most recent review is of the plan provided in the Project Design Refinements (DB 2009r). Staff assessed the potential for this most recent plan to cause impacts related to flooding. Staff's technical review comments are included in **Soil and Water- Appendix C**. Staff provided specific design criteria in the PSA that was meant to guide the applicant into developing the basis- of-design for the diversion channel. In the PSA, staff identified appropriate federal, state and local guidelines and specifications for the applicant that provide design objectives for engineered channels. Staff used these criteria to examine the applicant's flood management plan and to provide comment on the limitations and thresholds of the plan to avoid potential impacts.

CDFG and Lahontan RWQCB provided written comments on the original diversion channel design. Their continued participation in public meetings has resulted in numerous follow-on questions and comments about the design of the diversion channel. The agencies want assurances that the project minimizes environmental impacts, mitigates unavoidable impacts, and restores elements of the natural character of the existing Pine Tree Creek wash. CDFG provided these recommendations to the applicant in response to the BSEP application for a Streambed Alteration Agreement (CDFG, 2009).

Geomorphic Assessment of Pine Tree Creek

Restoring or recreating similar biological functions and values and beneficial uses of Pine Tree Creek, requires an understanding of the geomorphic and hydrological processes found in the natural channel. Staff and the resources agencies identified this link and recommended that the applicant conduct a geomorphic assessment of the diversion channel to identify its potential to meet these criteria. Staff's desktop geomorphic assessment and field reconnaissance focused on sediment erosion, deposition and transport for the natural and proposed engineered channel. Staff used standard geomorphological assessment methods to understand the processes that influence the channel's morphology and sustain its biological characteristics. The geomorphic assessment of Pine Tree Creek is discussed in **Soil and Water - Appendix C**.

In the PSA, staff requested that BSEP use a fluvial geomorphologist with expertise in arid system channel design to conduct a geomorphic study of the Pine Tree Creek drainage. Staff asked that the geomorphic study address the following key issues:

1. Discuss the stability of existing Pine Tree Creek, as it pertains to active alluvial fan morphology, debris flows, erosion, sediment movement and deposition, and channel migration.

2. Selection of an appropriate reference reach (similar watershed characteristics, hydrology, and sediment) to help predict the channel's geomorphic response.

3. Sediment transport analysis that includes the following:

    a. Grain size distributions from Pine Tree Canyon sediment samples and samples taken within the channel on the alluvial fan.

    b. A discussion of Pine Tree Creek watershed as a potential source of sediment, the active erosional and depositional conditions of the existing channel, the sediment transport capacity of the existing channel and proposed diversion channel, and the proposed sediment load and flux anticipated with the proposed channel.

    c. Recommendations for applying bulking factors to the base flood flow.

    d. Provide a discussion of anticipated maintenance requirements and measures that would improve opportunities for successful mitigation.

4. Low flow channel design for the ultimate diversion channel.

BSEP responded with a sediment transport analysis and concise geomorphic assessment that relied heavily on three aerial photographs taken in 1952, 1983, and 2007. Staff's technical comments on the BSEP Preliminary Sediment Transport Study and Geomorphic Assessment are discussed in **Soil and Water - Appendix C**.

Several of the key issues identified in the PSA and listed above, were not addressed in the Project Design Refinements (DB2009r). The anticipated geomorphic response of the diversion channel was ultimately determined in concert with staff's impact assessment. Staff's conclusions provide the impetus to establish the significance criteria to assess potential impacts related to the diversion channel and its ability to sustain the biological and geomorphological characteristics required for successful mitigation. Staff believes that the channel must be slightly aggradational to recreate the geomorphic function of the natural channel. In an engineered flood control channel, this requires a sufficient understanding of sediment delivery to and transport through the proposed channel. Too much sediment deposition would reduce flood capacity or require a significant effort to maintain the system to avoid significant flood impacts caused by insufficient channel conveyance capacity. Maintenance activities would conversely disturb mitigation efforts to restore biological resources.

Staff concludes that a slightly aggradational channel would provide protection against scour and erosion by maintaining a sediment source that can mobilize throughout the engineered channel. Sediment transport analyses using sensitivity tests on likely scenarios or input variables (sediment delivery, in-channel sediment sources, flow duration, discharge, transport methods, etc.) reduces the uncertainty of the computer simulation. Computer modeling provides the basis for identifying thresholds of significance that factor into the final design. The primary goal for developing a reliable sediment transport model is to update and finalize design criteria that characterize the channel's flood management function. Staff believes that with the engineered channel designed to be slightly aggradational, a braided channel would be developed that can erode the deposited sediment, widen within the banks of the engineered channel, lose sediment transport capacity and deposit excess sediment in a positive feedback loop. This process is typical of the alluvial fan geomorphology present in the existing Pine Tree Creek wash. Staff believes that, with sufficient analyses, the final design could result in the bed of the diversion channel supporting similar biological, hydrologic, and geomorphic functions of the existing channel.

In anticipation of a slightly aggradational channel, staff is requiring Condition of Certification **SOIL&WATER-7**. This Condition of Certification directs the applicant to establish a publicly held, and BSEP funded, maintenance district that would identify and monitor key channel indicators, inspect the channel after rainfall-runoff events, conduct periodic inspections, make repairs, and adaptively manage sediment to maintain flood capacity for the design discharge. All calculations supporting the final diversion channel design, including sediment transport modeling results, would be presented in the Engineer's Report as required in Condition of Certification **SOIL&WATER-13** and Condition of Certification **SOIL&WATER-15**. Staff believes the additional Conditions of Certification set forth in **SOIL&WATER-7** and **SOIL&WATER-5** would reduce potential flood impacts and risk, attributable to sediment, to less than significant levels. Staff also concludes that the implementation of these Soil & Water Resources Conditions of Certification, in concert with Conditions of Certification **BIO-7** and **BIO-18**, BSEP would have the least impact possible to native plant communities and wildlife habitat.

Flooding

The existing Pine Tree Creek flood hazard is identified in the effective Digital Flood Insurance Rate Map for Kern County. The special flood hazard area (SFHA) is mapped "Zone A" which is a result of approximate methods used to delineate an area with a high potential for flooding (FEMA 2008). Immediately downstream of the site, Pine Tree Creek joins Jawbone Creek. Jawbone Creek is mapped Zone AE with Base Flood Elevations (BFE) determined. The applicant's proposed plan to divert Pine Tree Creek entails a point of diversion, a new alignment, and a connection back to the Pine Tree Creek near the confluence with Jawbone Creek. The proposed diversion channel would result in a change to the FEMA SFHA.

Changes to the FEMA SFHA would require a Conditional Letter of Map Revision (CLOMR) to address LORS and comply with the Kern County Floodplain Management Ordinance. The existing and proposed conditions analyses would be required as part of

the FEMA CLOMR process to evaluate the project's affect on the SFHA. Because the site is mapped with a Zone A SFHA, BSEP would be required to follow Zone A map revision requirements described in *Managing Floodplain Development in Approximate Zone A Areas, A Guide for Obtaining and Developing Base (100-Year) Flood Elevations* (FEMA, 1995).The primary requirements would be to not increase flood hazards on neighboring properties and match the post-conditions floodplain to the approximate SFHA limits upstream and downstream of the BSEP site.

Historic Floods

Staff conducted research on historic flood events near the BSEP to recognize the potential flood hazards associated with desert hydrology (See **Soil and Water - Appendix C**). Two significant rainfall-runoff events occurred in Pine Tree Canyon during 1961 and 1997. **Soil and Water** - **Figure C1** illustrates these historic rainfall-runoff events occurred above predicted peak discharges for analogous watersheds. In fact, the Red Rock Canyon storm plotted well above the 100-year peak discharge regression analysis yet was identified as only a 50-year event. Staff recognizes that stream gauge estimates measure runoff and sediment in the flow. Sediment can increase clear water flow estimates by as much as 200% (See **Soil and Water - Appendix C**). In desert streams, it is also common for the peak flows to decrease in a downstream direction, especially after leaving the mountains (USGS, 1997a) where flows may flood the plains, infiltrate and attenuate the peak discharge.

One Percent Risk Flow

According to Kern County's Division Four Standards for Drainage, the One Percent Risk Flow is the flow on the alluvial fan based upon the joint probability of the flow distribution at the fan apex and the probability of occurring at the development site. The analyses submitted by the applicant have reasonably shown that the One Percent Risk Flow is equal to the design discharge of 28,000 cfs. Based on staff's geomorphic assessment (**Soil and Water - Appendix C**), it appears that the active channel immediately upstream of the point of diversion at the property line does not have the capacity to contain 28,000 cfs without flowing out of bank (see **Soil & Water Figure C2**). Based on the applicant's hydraulic model results and staff's analysis, the flood inundation area upstream of the site is within the active Pine Tree Creek channel and its floodplain. Staff has concluded that shallow flooding would flow onto the BSEP site along most of the southern property boundary during a one percent risk flood.

Existing Flood Hazards

The effective Digital Flood Insurance Rate Map for Kern County identifies Pine Tree Creek as an existing flood hazard. The special flood hazard area is mapped "Zone A" which is a result of approximate methods used to delineate an area with a high potential for flooding (FEMA 2008). Immediately downstream of the site, Pine Tree Creek joins Jawbone Creek. Jawbone Creek is mapped Zone AE with Base Flood Elevations (BFE) determined. The applicant's proposed plan to divert Pine Tree Creek entails a point of diversion, a realigned engineered channel, and a connection back to Pine Tree Creek near its confluence with Jawbone Creek. The proposed diversion channel would result in a change to the FEMA SFHA.

The proposed diversion channel would completely change the flood flow regime from shallow flooding across the site to concentrated flow that the applicant proposes to return to shallow flooding as the flood exits the property. To address this concern, staff requested numerous engineering studies in the PSA that provide the breadth needed to examine potential flood-related impacts related to the proposed channel diversion. The results of these studies also provide the basis for staff's recommended mitigation. Staff focused on the BSEP hydrologic and hydraulic studies and computer models prepared for this project.

Based on staff's analyses of the One Percent Risk Flow, staff estimates that roughly 4,000 cfs would be "contained" in the natural channel at the planned point of diversion. Discharges exceeding this capacity would sheet flow overland toward the BSEP. Staff approximated the flow path because actual flow paths are uncertain. Staff found that the out of bank discharge would cause shallow flooding across the BSEP property from the south toward the northeast.

The effective Pine Tree Creek SFHA delineated on the Digital Flood Insurance Rate Map (DFIRM), for Kern County does not show a shallow flooding hazard. Requests to FEMA to revise inaccurate SFHA's require an assessment of the existing flood hazards. BSEP studied the existing conditions flood hazards in the Project Design Refinements (DB 2009r) and subsequently revised the analyses to extend upstream and downstream of the site. Staff concludes that the methods used were appropriate.

Using the design discharge of 28,000 cfs, BSEP conducted hydrodynamic modeling simulations to determine the existing flood path. BSEP's delineation of the design discharge confirms staff's recognition of shallow flooding. BSEP extended the existing conditions analyses a significant distance upstream and downstream necessary to test the impacts caused by site improvements. Staff could not be certain that BSEP modified the existing conditions model for the portion of the reach affected by development but this is typical practice. Evaluation of the existing and proposed conditions model results immediately outside of the property boundary provides the basis for assessing potentially significant flood impacts.

Open Channel Hydraulics Study of the Diversion Channel

Staff reviewed the methods and computer models used by the applicant to establish the basis of design for the proposed Pine Tree Creek diversion channel. Development of the basis of design relied on hydrologic and hydraulic analyses for the existing and proposed conditions. Staff commented on the basis of design and associated studies in **Soil and Water - Appendix C**. Staff concluded that the applicant has developed the appropriate analyses to study the diversion channel in the Project Design Refinements (DB 2009r). Staff considers the engineering design drawings submitted for the diversion channel are "conceptual" and have concluded that additional information and final design drawings are required for staff to determine if the project mitigates the effects of the design discharge. Staff concludes that refinements to the computer models are necessary to adapt the conceptual design to final design. Staff's technical review conclusions (**Soil and Water - Appendix C**) have resulted in a series of Conditions of Certifications **SOIL & WATER -10** through **-17** to address these final design deficiencies.

Staff used the results of the hydraulic analyses to assess the adequacy of the proposed channel design and its structural elements. Staff concluded that the resulting design discharge velocity, depth, shear, and Froude Number are high when compared to the anticipated channel stability thresholds of the proposed earthen channel. High velocities and deep concentrated flow tend to increase shear stresses on the channel, which result in a greater potential for failure. Staff reviewed the preliminary diversion channel design and proposed measures to protect the channel from failure. Staff recognizes that many of the specific channel elements (grade control, energy dissipaters, bank protection, etc.) require complete knowledge of the system constraints and hydraulic response. Staff recognizes that the BSEP engineer is ultimately responsible for designing the channel such that the banks and bed of the channel resist the hydraulic forces of the design discharge. Staff recommends that the applicant rely on the results of the hydraulic models to refine the final engineering design criteria for grade control and bank protection. Conditions of Certifications **SOIL & WATER -10** through **-17** specify the analytical requirements needed for BSEP to reach final design for the diversion channel and its structural elements. Staff believes that compliance with these Conditions of Certification would provide sufficient evidence that the project mitigates the effects of the design discharge and would protect BSEP and adjacent properties from significant flood related impacts.

As of the date of this FSA, several important structural design elements have not reached a final selection or a final level of design including levees, grade control structures, soil cement bank protection, and the structural diversion that would account for upstream shallow floods. These engineered channel elements have influence over several areas of concern including flood carrying capacity and mitigation. Staff believes that these final design elements are necessary to assess whether the diversion channel would function properly and avoid flood-related impacts caused by a catastrophic failure of the drainage infrastructure. Staff recommends the applicant be required to comply with Condition of Certification **SOIL&WATER-9** for final design review and approval. Condition of Certification **SOIL&WATER-9** would require the applicant prepare preliminary (30%) design drawings for the channel and include typical channel cross section dimensions, typical details for all structural elements needed to protect the channel from erosion, and a grading plan for proposed conditions that ties into existing topography or solar field grading. The 30% design drawings would be submitted to FEMA showing the proposed drainage infrastructure, the existing or pre-developed floodplain limits and the proposed floodplain limits following channel construction, as required in Condition of Certification **SOIL&WATER-6**. Staff's conditions of certification include these requirements where appropriate so that the project would avoid or mitigate potential flood impacts related to poorly designed channel elements. Staff believes that when the applicant complies with these conditions of certification, there would not be significant flood-related impacts attributable to the diversion channel for peak discharges less than 28,000 cfs.

The applicant reported that the diversion channel water surface profile is contained below the existing grade and would not require levees. Staff could not definitively confirm this statement given the materials provided for review. Staff reviewed the AutoCAD file with preliminary grade contours but the electronic drawing did not include existing site and adjacent offsite topography, needed to determine if a levee is required. The HEC-RAS model cross sections did not extend beyond the top of bank to show the

tie-in with the existing ground elevations. Staff recommends that the height of the banks above the water surface profile provide adequate freeboard. Chapter X of the Kern County's Division Four Standards for Drainage dictates the freeboard and super elevation criteria for constructed channel design. Should the final elevation of the top of bank be higher than the adjacent existing topography or proposed grade then the applicant would design the embankment, or levee, in accordance with the latest revision of the Corps of Engineers Design and Construction of Levees, Engineer Manual, EM1110-2-1913, per Kern County standards. Staff's Condition of Certification **SOIL&WATER-13** requires compliance with Kern County Division Four standards should levees be required to mitigate the potential flood impacts of the design discharge.

BSEP Hydraulic Analysis

To develop a defensible basis of design, the applicant developed several computer models that simulated the existing Pine Tree Creek wash and the diversion channel hydraulics and reported their findings in the Project Design Refinements (DB 2009r). Staff reviewed these computer models and analyses to determine if the diversion channel would discharge the one percent risk flow in a manner, as close as possible, to the existing conditions flow pattern in accordance with Kern County Division Four, Standards for Drainage, Chapter IV. Staff provided a technical discussion in **Soil and Water - Appendix C**. Staff's hydraulic analyses review focused on model applicability/selection, model setup, hydraulic methods and calculations, assumptions, and how the model results apply to the basis of design. Staff's review of the existing conditions model sought to understand the extent of the design flow shallow flooding. Staff's review of the proposed conditions model was to understand if the proposed diversion channel has the capacity for the design discharge.

Staff reviewed two two-dimensional hydraulic models simulating the existing Pine Tree Creek Wash at BSEP: a MIKE-21 model and a FEMA approved FLO-2D hydrodynamic model. BSEP also developed a HEC-RAS model for the existing wash that staff did not review. The MIKE-21 model was a cursory investigation by the applicant. The FLO-2D was a detailed simulation of the design discharge. The hydraulic model allows shallow flooding across a defined topographic boundary. The model results provided a detailed assessment of the existing Pine Tree Creek flood hazards upstream, onsite, and immediately downstream of the property. The model results produce important spatial measurements of depth and velocity and limits of flooding.

Pine Tree Creek, Diversion Channel – Outfall

Flood hazard mapping is the customary format for communicating flood risk. These maps can be approximate or studied using detailed methods that improve the accuracy and identification of the flood hazard. BSEP's engineered channel design requires a significant amount of iterative analyses to assess its potential to cause significant impacts. The pre- and post-conditions engineering analyses results can be compared and are important for determining the significance of a flood impact. Staff compared the pre- and post-conditions flood hazards mapping to determine areas at risk for flooding. Staff also examined the analyses results and flow characteristics at the downstream property boundary for increases in the flow per unit length to assess the danger potential for adults and children to cross safely through the shallow flooding and to

assess downstream changes within the floodway. The safety determination is velocity multiplied by depth, which is essentially the same as the flow per unit length. When the product of velocity and depth increases above four, there is an increased risk to people in the path of the flood. Staff has borrowed this standard method from Maricopa County, AZ (Maricopa 2009a) in an effort to assess potential impacts caused by a change to the SFHA.

Staff concluded that the outflow profile along the northern property line shows a significant reduction in the extent of shallow flooding leaving the site. The revised flood mapping would shorten the width of the design discharge flood by nearly one-mile. The proposed shallow flood path shows a slight increase in the concentration of flows toward the east, as was to be expected. The increased concentration causes slight increases to the flow per unit length that would occur in areas already greater than four. Staff believes these higher rates for the proposed condition do not increase flood risks beyond those found in the existing condition.

To assess downstream changes within the floodway, staff referred to the National Flood Insurance Program (NFIP) criteria 44CFR 65.13c (5) that requires an engineering analyses that includes studying the effect of the project on flood hazards, including velocity and depth of floodwaters. Additionally, CCR, Title 23. Waters Division 1.5, Article 3, Section 221 restrictions use in a floodway since the flood hazard in a designated floodway is usually very great due to greater depth and higher velocity of flood flow. Staff reviewed the BSEP diversion channel to determine if changes to the floodway would result in use restrictions downstream of the site.

Based on the location and alignment of the proposed diversion channel outfall, staff concludes that the proposed flood hazard boundary would not tie into the existing SFHA shown on the effective DFIRM immediately downstream of the site. BSEP's existing conditions flood hazard mapping would provide the basis for changing the effective DFIRM maps. Because Pine Tree Creek ends shortly to the north of BSEP, staff recommended that BSEP extend the hydraulic analysis downstream to Jawbone Creek (CEC 2009n). The applicant's current analyses do not use the effective base flood elevations determined for Jawbone Creek downstream of BSEP. Staff's recommendation would result in a continuous detailed study from the mouth of Pine Tree Creek to a sufficient distance upstream of the site and allow for an adequate assessment of the proposed project. Staff concludes that the applicant has not sufficiently addressed the downstream mapping constraints and is requiring as part of Condition of Certification **SOIL&WATER-6** that BSEP provide sufficient flood hazard mapping that meet FEMA's requirements. Compliance with this Condition of Certification would provide sufficient evidence that BSEP's proposed change to the SFHA has adequately addressed FEMA's map revision requirements in accordance with the Kern County Floodplain Management Ordinance. Staff recognizes that BSEP would submit the revised preliminary mapping to FEMA for review as part of the CLOMR application. Staff recognizes that FEMA requires this mapping as part of their review process. Compliance with Condition of Certification **SOIL&WATER-6** would provide sufficient evidence that BSEP has addressed the potential flood impacts to adjacent and downstream properties.

Diversion Channel – Point of Diversion

Staff interprets, from the applicant's submittals, that the "point of diversion" is the location where the centerline of the proposed engineered channel intercepts the Pine Tree Creek Wash thalweg (low flow channel centerline). The actual extent of the hydraulic diversion, needed to route the design discharge from the natural channel and floodplain to the engineered channel, covers a much broader area along the southernmost property line. Staff defines the "diversion" as the total transition from natural channel (assumed to be the unaffected cross section at the property line) to the location of the engineered channel cross section that conveys the full design discharge. Staff believes this wide-to-narrow hydraulic diversion area, immediately adjacent to the neighboring property to the south, creates a significant design challenge that BSEP has not addressed. While it may be possible to engineer the transition, the applicant has not presented an adequate plan or analyses for staff's engineering and environmental impact review. Staff's conclusions in **Soil and Water - Appendix C** resulted in development of several conditions of certification that relate to the final design deficiencies that must be refined and verified with staff to ensure the project adequately reduces potential impacts to less than significant (See Conditions of Certification **SOIL & WATER -10** through **-17)**. In addition to requests made in the PSA, staff asked about this unique transition during the July 2009 workshop. CDFG expressed concern on this transition in their comments dated February 19, 2009. To date, the applicant has not provided sufficient design details to show that the diversion can divert the design discharge without increasing flood hazards.

The drop into the diversion channel presents a significant hydraulic constriction for the design discharge. The most prominent change across this transition is the large change in bed elevation from the existing channel to the engineered channel bottom. The applicant has shown on their grading plan that the vertical distance between natural and design invert is over 25 feet.

The transition would also require a 90 degree change in flow direction. Staff estimated that the engineered channel as proposed is shown having a 600 foot radius when joined with the natural channel. Kern County requires that the minimum centerline radius for curves in constructed channels be three times the top width of the design water surface. The top width of the design discharge in the engineered channel is approximately 270 feet, which would require an 810 foot radius to meet Kern County design guidelines. Staff recommends that the curvature of the transition be analyzed as part of the overall diversion design. Ultimately, the applicant must show that the selected design radius for the channel transition functions hydraulically without increasing potential flood hazards on adjacent property or to the solar field site. Staff is requiring compliance with Condition of Certification **SOIL&WATER-6** and Conditions of Certification **SOIL&WATER-9** through **-17**, that require the applicant to comply with FEMA NFIP regulations and Kern County design standards. The natural channel floodplain as it crosses the BSEP property boundary is well over 3,000 feet wide. At the point of diversion, the natural channel would likely contain the most concentrated flow but far less than the design discharge. The remainder of the design discharge would spread out across the floodplain as it enters the site boundary. This presents a significant problem for the engineered channel in terms of routing the natural floodplain through the point of diversion. Because site improvements would only take place onsite, BSEP will

need to account for the full extent of the existing channel's floodplain in the final design of the diversion. The applicant has not shown that the diversion channel is capable of capturing the entire design discharge. Staff is concerned that the proposed engineered channel grading does not extend to the west sufficiently to capture the design discharge (left bank) floodplain.

Staff has concluded that the diversion channel poses a potential flood hazard to neighboring properties if it is not properly designed, constructed, and protected against the design discharge flood. An inadequate design could also affect the natural characteristics of the upstream wash especially since the channel upstream from BSEP appears to be actively migrating. The diversion channel point of diversion would fix the bed elevation at the property line and may restrict natural channel morphology upstream of the site. To reduce the risk of impacts to adjacent upstream properties and natural Pine Tree Creek wash, staff is requiring that the applicant respond to these design challenges and present a comprehensive, engineered plan for the diversion channel as part of the requirements of Conditions of Certification **SOIL&WATER-6** and **SOIL&WATER-9.** Staff is requiring these conditions to address CDFG technical comments and to satisfy conditions described in Condition of Certification **BIO-18**. Staff believes that with implementation of these conditions, the risk of flooding during the design discharge flood would be lowered. The reduced risk of flooding mitigates to less than significant the potential flood impacts related to the diversion channel.

SFHA Revisions / CLOMR Requirements

Staff reviewed the existing Pine Tree Creek flood hazard analyses and the proposed conditions analyses that form the basis for determining impacts related to the proposed change to the SFHA. Staff recommends that these analyses become the engineering backup, required as part of a CLOMR application to FEMA. The applicant would coordinate with Kern County prior to making a submittal to FEMA. Kern County would review and comment on the study's conformance with the County's Floodplain Management Ordinance. The applicant would provide staff with a copy of the final CLOMR application and any county comments. Staff is requiring Condition of Certification **SOIL&WATER- 6** to ensure that the proposed revision to the FEMA regulated floodplain meets the minimum floodplain management criteria of Kern County and the NFIP. Staff recognizes that FEMA's pre-development review typically results in conditions in the approved CLOMR. In order to address LORS, staff recommends the applicant be required to comply with the conditions in the CLOMR. Condition of Certification **SOIL&WATER- 6** would ensure the applicant has received an approved FEMA CLOMR for the project prior to site mobilization and is following the guidance from FEMA to avoid potentially significant flood impacts caused by the planned BSEP flood control facilities.

As currently presented, it appears that the Pine Tree Creek existing conditions analyses and "corrected effective" flood hazard mapping would redefine the FEMA effective flood hazard. This change, if accepted by FEMA, would show adjacent properties within the SFHA. This change would initiate a notice from FEMA stating that the effective DFIRM maps could change based on detailed engineering analyses. Because the map update is associated with a proposed project, FEMA would not issue a notice until they have completed their review of the proposed project. The corrected effective maps would

form the basis for determining the change in location of the flood area boundaries caused by the BSEP project. The applicant must demonstrate that the proposed Pine Tree Creek re-alignment would not increase flood hazards to neighboring properties, using the corrected effective maps as the basis for change. Adjacent properties impacted by the proposed project would require notification from the applicant that the proposed BSEP would affect current flood hazards. To ensure the County's standards are met, staff is recommending, as part of Condition of Certification **SOIL&WATER- 6,** that the applicant follow design guidelines described in Kern County Division Four, Standards for Drainage and notify adjacent property owners who are shown to be affected by the proposed change to the corrected effective flood hazard mapping. To avoid significant flood impacts to adjacent properties, the applicant would be required to submit copies of these notices and acknowledgment letters from the property owners as part of the FEMA CLOMR process.

Staff requires that the BSEP's flood management plan and CLOMR request removal of the solar field from the proposed conditions SFHA as defined by the design discharge. Base Flood Elevations (BFEs), determined as part of the final analyses, would be below the adjacent grade of the solar field. Mapped floodways, if required by FEMA or recommended by Kern County, would remain entirely within the channelized reach of the diversion channel. Given the uncertainty of precipitation and the difficulty defining the flood hazard on alluvial fans, portions of the site might be prone to shallow flooding from events greater than the one percent annual chance flood. FEMA may request that the 500-year peak discharge be determined and mapped. Staff recommends that the solar field remain completely free from flooding up to the design discharge. If the proposed solar field is included in the 500-year flood-prone area (Zone X, 500-year flood), all new construction must (i) be designed (or modified) and adequately anchored to prevent floatation, collapse, or lateral movement, (ii) be constructed with materials resistant to flood damage, (iii) be constructed by methods and practices that minimize flood damages, and (iv) be constructed with electrical, heating, ventilation, plumbing, and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding [44 CFR 60.3(a)(3)].

Diversion Channel – Maintenance District

The applicant would be responsible for the diversion channel maintenance. Currently the County of Kern does not have a Flood Control District in place, which could serve as the maintenance entity. The applicant would therefore be required to form a new Maintenance District as part of the project or find an entity that would be willing to conduct maintenance in perpetuity. Staff recommends **SOIL&WATER- 7,** which would require BSEP to develop a public Maintenance District, in perpetuity, to manage the diversion channel maintenance and avoid significant flooding or soil erosion related impacts from diverting Pine Tree Creek wash.

Maintenance District - Channel Maintenance Program

Following creation of the Maintenance District, the applicant would coordinate with the public entity and the Maintenance District supervisor to develop and implement a Channel Maintenance Program that provides long-term guidance to the Maintenance District to implement routine channel maintenance projects and comply with conditions

of certification in a feasible and environmentally-sensitive manner. The Channel Maintenance Program would be a process and policy document prepared by the project owner, reviewed by the CPM and the public entity, and adopted by the Maintenance District as required in Condition of Certification **SOIL&WATER- 8. Soil and Water Appendix J** describes the purpose, objectives and applicability of the requirements for the BSEP Maintenance District's Channel Maintenance Program. Staff is requiring as part of Condition of Certification **SOIL&WATER- 8** that the Channel Maintenance Program provide long-term guidance to the applicant and Maintenance District to implement routine channel maintenance projects and comply with BSEP's related biological (**BIO-18**) and flood protection (**SOIL&WATER-5 and SOIL&WATER-6**) conditions of certification. Condition of Certification **SOIL&WATER- 8** requires verification that the Maintenance District has adopted the Channel Maintenance Program and that the applicant will implement the measures identified in the program. The main goals of the Channel Maintenance Program would be to maintain the diversion channel to meet its original design to provide flood protection, support BSEP mitigation, protect wildlife habitat and movement/migration, and maintain groundwater recharge. Compliance with Condition of Certification **SOIL&WATER- 8** would significantly reduce the long-term risk of flooding and improve the success of the desert wash mitigation. In **Soil and Water Appendix J**, staff provides a summary of related programmatic documentation required for implementation of the Channel Maintenance Program. Additional operation and maintenance plan guidance for proposed flood control measures on areas subject to alluvial fan flooding are specified under 44 CFR 65.10 (c) and (d).

Letter of Map Revision (LOMR)

As soon as practicable, but not later than six months after construction of the diversion channel, the applicant would notify FEMA of the changes by submitting technical or scientific data as part of a Letter of Map Revision (LOMR) request, in accordance with 44 CFR 65.3. A LOMR is required after physical changes to the floodplain have changed the flood hazard information shown on the effective DFIRM. The appropriate portions of the MT-2 application forms package, titled Revisions to National Flood Insurance Program Maps (FEMA Form 81-89 Series), applicable fees, and the required supporting information, must accompany the request. Staff has recommended Condition of Certification **SOIL&WATER-6** to ensure the project owner complies with the conditions established by FEMA in the CLOMR and reports to FEMA that the project has been completed as stated in the CLOMR. Significant variations to the design require prior approval from FEMA. Full compliance with this condition requires CPM notification of the approved FEMA LOMR. The LOMR would provide evidence that the applicant has adequately identified flood hazards associated with the project and has mitigated adverse flood impacts to the solar field and adjacent properties in accordance with the Kern County Floodplain Management Ordinance.

Geotechnical Investigation for Final Design

Staff requested additional information related to onsite soil characteristics in the PSA. BSEP partially responded to staff's requests. Staff requested the studies as part of the development for the basis of design. Staff was concerned that the soils may not support large grade control structures (which could lead to several more, smaller, grade control structures), or that the soil stability would require a more conservative hydraulic

response. Staff requested data regarding the nature, distribution, strength of existing soils, and conclusions and recommendations for grading procedures. Subsequent to the July workshop, staff has relied on the Geotechnical Report (BS2008a) to assess the soil characteristics. Staff examined soil boring logs for subsurface soils at various locations near the engineered channel but none at the exact locations planned for grade control. The report did not discuss the stability of the diversion channel slopes under hydrostatic and hydraulic loading. The applicant acknowledged that these soil characteristics are important for final design and that the applicant's engineers would investigate these conditions during final design.

Based on staff's technical review, staff has concluded that a geotechnical investigation is required of the applicant for final design of the structural elements of the diversion channel to ensure flood-related impacts are mitigated or lowered to less than significant. Staff is requiring Condition of Certification **SOIL & WATER -13** to analyze the stability of onsite soils. Compliance with this Condition of Certification would provide sufficient evidence that the proposed diversion channel grade control structures would not fail under design discharge hydraulic and hydrostatic load conditions.

CUMULATIVE IMPACTS AND MITIGATION

Cumulative impacts represent impacts that are created because of construction and operation of the proposed project in combination with impacts from other past, present, or reasonably foreseeable future projects. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time in the same area.

Construction and operation of the proposed project would result in both temporary and permanent changes at the project site. These changes could incrementally increase local soil erosion and storm water runoff. Potential project related soil erosion and increased sedimentation resulting from storm water runoff could be reduced to a level of insignificance through implementation of the applicant's proposed mitigation measures/BMPs and project DESCP; implementation of the SWPPPs for the Construction and Industrial Activities; and compliance with all applicable erosion and storm water management LORS.

Staff estimates that the initial construction water use could exceed 7,500 AF in the first 5 months of the construction period. Subsequent construction water use could consume as much as approximately 185 million gallons or 567 AF over the last 21 months of the construction period. Combined, the volume of water used for construction of the BSEP could exceed 8,086 AF over a 26-month period.

Project operations are anticipated to consume an annual average of 1,388 AFY of groundwater. Staff estimates that, as proposed, construction and operation of the project would consume approximately 50,000 acre feet of high quality fresh groundwater water, during the 30-year life of the project.

The AFC notes the population and quantity of groundwater consumed in the adjacent California City sub-basin is projected to increase over the next decade. Increased groundwater consumption by existing users or future new users would decrease the storage recovery rate and conceivably cause a net groundwater storage reduction. Long-term groundwater storage declines could negatively impact water users by increasing pumping lifts and potentially negatively impacting the primary potable water supply of the Fremont Valley.

Stetson Engineers Inc. indicated that the California City population will rise to 33,226 by 2025 (CofC 2009a). Concomitantly, California City's demand for water may increase from about 4,500 acre-feet (2007) to as great as 12,655 acre-feet in 2025. The City's water supply is a mix of local groundwater and surface water purchased from the State Water Project. During the period 2000-2007, the average water supply was comprised of 83-percent local groundwater and 17-percent imported surface water (CofC 2009a). Under worse case conditions (no surface water and maximum water demand increase), groundwater extraction by California City could increase from almost 3,100 acre-feet in 2007 to 12,655 acre-feet in 2025 (a more than tripling of groundwater use to almost 9,600 acre-feet per year).

California City extracts groundwater from the California City Sub-basin of the Freemont Valley Groundwater Basin, which is hydraulically connected to the Koehn sub-basin. Observed water levels in the California City area are declining in most wells and indicate current groundwater consumption levels exceed recharge (**Soil & Water Table 6**). An increase in groundwater consumption is therefore expected to exasperate the decline in water levels already observed.

The Koehn Sub-basin is separated from the California City Sub-basin by the Randsburg-Mojave Fault. Groundwater currently flows across the fault from the California City Sub-basin to the Koehn Sub-basin. However, increased groundwater consumption and declining water levels in the California City Sub-basin will change hydraulic gradients between sub-basins, and if drawdown is great enough, the gradients could reverse resulting in a net loss of groundwater from the Koehn Sub-basin. No quantitative information is readily available to assess the relationships between groundwater level decline in the California City Sub-basin and potential groundwater level and storage changes in the Koehn Lake Sub-basin. Staff expects this impact to be insignificant during the operation life of the BSEP based on the following.

The conductivity across the Randsburg-Mojave Fault estimated by the ground-water flow model is 0.00197 feet per day, which is almost six orders of magnitude lower than the representative conductivity of water-bearing deposits in the basin (20 to 40 feet per day). Hence, groundwater in the California City Sub-basin is only partially connected to groundwater in the Koehn Sub-basin.

On average, groundwater levels in the California City Sub-basin (about 2,070 feet above mean sea level) are more than 200 feet greater than water levels in the southern portion of the Koehn Sub-basin (about 1,850 feet above mean sea level) (see **Soil &**

Water Table 6). The observed water level declines in the California City Sub-basin are fairly modest (most are less than 1 foot per year), and under current water use conditions would require 200 years or more to fall from 2,070 to 1,850 feet above mean sea level.

Because of general uncertainty in hydrogeologic conditions and future groundwater levels, the applicant proposes to mitigate potential negative impacts to wells by forming a groundwater monitoring committee. As part of **SOIL&WATER – 1**, staff recommends the scope of this groundwater monitoring program be expanded to include both the Koehn and California City sub-basins. The monitoring effort will require monitoring water levels in California City wells and assessing potential changes in subsurface flow between sub-basins. This effort is necessary to isolate direct impacts on Koehn sub-basin water levels due to BSEP water use and potential cumulative impacts as a result of regional changes in water use and groundwater storage conditions.

Potential cumulative impacts to high quality fresh groundwater resources resulting from use by BSEP for power plant cooling can be avoided by using a degraded water source such as that available in the vicinity of Koehn Lake, recycled wastewater obtained from the City of Rosamond and California City or by employing a different cooling technology such as dry cooling (see **Soil and Water - Appendix D** and **ALTERNATIVES** section of this document). Further analysis of alternative degraded groundwater and recycled wastewater supplies is presented under the Energy Commission and SWRCB water policy in the LORS section below.

COMPLIANCE WITH LORS

Staff has reviewed the LORS and policies presented in **Soil & Water Table 1.** A discussion of selected LORS and policies is presented below.

Code of Federal Regulations Title 44

Staff has determined that the Beacon Solar project would be required to comply with local flood management ordinances (Kern County Floodplain Management Ordinance) and submit an application to FEMA for a Letter of Map Revision (LOMR). Rules regarding data requirements and procedures for obtaining LOMRs are outlined in Title 44, Chapter I, Part 65, Code of Federal Regulations. Staff is requiring Conditions of Certification **SOIL & WATER-6** to ensure Beacon Solar would comply with the local and federal requirements.

Article X Section 2 of the California Constitution, SWRCB Resolution 75-58 and Energy Commission's 2003 Integrated Energy Policy Report

LORS and water policies applicable to this project stem from, among other things, Article X, section 2 of the California Constitution, which declares that *"the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented…"* In order to better define what *"unreasonable use"* means in terms of power plant cooling, the SWRCB issued Resolution 75-58, *"Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling"* (Resolution 75-58). It sets forth, in priority order, a list of preferable water sources for power plant cooling as follows: (1) wastewater

being discharged to the ocean, (2) ocean, (3) brackish water from natural sources or irrigation return flow, (4) inland wastewaters of low TDS, and (5) other inland waters. The resolution also states that fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound. Since adopting Resolution 75-58 in 1976, the SWRCB has more recently confirmed the ongoing applicability of its policy for cooling of modern power plants and clarified a basic principle by stating, *"The policy requires that the lowest quality cooling water reasonably available from both a technical and economic standpoint should be utilized as the source water for any evaporative cooling process utilized at these facilities" (SWRCB 2002a).*

Based, in part, on the State Constitution and SWRCB Policy 75-58, the Energy Commission adopted its own policy for water conservation in the cooling of power plants. The Energy Commission's 2003 IEPR specifies that *"the Energy Commission would approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative cooling technologies are shown to be 'environmentally undesirable' or 'economically unsound'".*

The applicant proposes to use high quality fresh groundwater for power plant construction (primarily dust suppression and grading) and operation (primarily power plant cooling). Use of high quality fresh groundwater for power plant cooling is in direct conflict with Energy Commission and SWRCB policies concerning water use. Staff believes that the use of high quality fresh groundwater for power plant construction and operation is an unreasonable use of this valuable resource and should be prohibited.

Proposed Water Source is Considered Fresh Inland Water

The examination of alternative water supplies and technologies begins with a determination of whether a project will use fresh water for cooling. The IEPR itself does not define what constitutes fresh water. Resolution 75-58, upon which the IEPR water policy is based, defines fresh inland waters as "*those inland waters which are suitable for use as a source of domestic, municipal, or agricultural water supply…*" (State Water Resources Control Board Resolution 75-58, p. 3.) Thus, fresh water is not given a narrow definition but is broadly defined by how it is used, evincing an intent to be as inclusive as possible. The groundwater proposed to be used by BSEP meets the definition of fresh inland water under Resolution 75-58 because it is used for agricultural and domestic use in the area.

Another indication of the suitability of this water as a domestic source is its compliance with the Drinking Water Standards found in Title 22 of the California Code of Regulations. BSEP proposes to use site groundwater that has a TDS of 470 - 550 mg/l (BS 2008a). This TDS level is well within the secondary maximum contaminant level (MCL) for TDS in drinking water of 1000 mg/l and below or near the recommended limit of 500 mg/l (Cal. Code Regs., tit. 22, §§ 64431, 64449). Secondary MCLs are based on aesthetics and intended to protect odor, taste and appearance. Exceeding these levels does not restrict the use of this water for drinking.

Resolution 75-58 is clearly intended to broadly protect beneficial uses of the State's water resources. In this vein, the SWRCB states that "*in considering issuance of a permit or license to appropriate water for power plant cooling, the Board will consider*

the reasonableness of the proposed water use when compared with other present and future needs for the water source and when viewed in the context of alternative water sources that could be used for the purpose" (Resolution 75-58, pgs. 5 & 6). Although no appropriative right is at issue in this case, increasing groundwater demands in this region of the state dictate that the Energy Commission consider the reasonableness of allowing BSEP to use groundwater of a quality suitable for domestic use when a source of lower quality is available.

Availability of an Alternative Water Supply

In accordance with CEQA guidelines, (Article 1, section 15002), staff evaluated whether there were any feasible alternative water supplies and/or cooling technologies that would meet the needs of the project. As discussed above in the Project Water Supply section, staff identified three alternative water supplies that could be used as a project water supply. In addition, staff identified a cooling technology that does not require water. Below, staff has identified and analyzed the technical merits of these alternatives. In addition, the economic feasibility of these alternatives is discussed in **Soil & Water Appendix D** and the **Alternatives** section of this FSA.

Alternative Degraded Groundwater Supply

California Code of Regulations (CCR), Title 23, Division 3, Chapter 15, specifies Primary and Secondary Drinking Water Standards in terms of Maximum Contaminant Levels (MCLs). These MCLs include total dissolved solids (TDS) ranging from a recommended level of 500 mg/L or less to an upper level of 1,000 mg/L. Staff considered groundwater with TDS concentrations greater than or equal to 1,000 mg/L or more degraded relative to potential drinking water supplies. Groundwater TDS concentrations greater than or equal to 1,000 mg/L are therefore preferred as potential water supplies for power plant use because they comply with State Board and Energy Commission water use policies.

Staff reviewed previous studies describing hydrogeologic conditions and groundwater quality in the Koehn sub-basin, confidential boring logs for wells constructed near Koehn Lake (where available), and well location information from Kern County Environmental Health Services Department Resource Management Agency to identify potential alternative water supplies for the BESP. Based on this information, relatively high salinity groundwater appears to occur along the base of the El Paso Mountains, generally within a mile of the trace of the Garlock fault and adjacent to and beneath the Koehn Lake bed.

Well driller logs indicate that subsurface materials (soils) northwest, west and southwest of Koehn Lake are comprised primarily of coarse-grained sand and gravel sequences to depths of at least 600 feet; the coarse-grained deposits can include fine-grained clayey sand and clay interbeds of variable thickness. The predominantly coarse-grained materials generally produce copious amounts of water and are conducive to high well production rates.

Driller logs from 8 wells located west of Koehn Lake (T30S R38E, Sections 17, 18 and 20) indicate reported pumping rates that range from 2,000 to 4,050 gallons per minute (gpm). These pumping rates, if sustainable, are similar to wells located at the BSEP site (1,770 to 2,000 gpm) and therefore assumed sufficient to meet the water needs of the proposed project. However, geochemical data is not available for the water produced by these wells and there is uncertainty in the expected quality of this potential alternative water supply.

Staff conducted a field reconnaissance to locate existing wells in the area of this potential alternative supply. Located wells were photographed and GPS coordinates recorded. As part of the reconnaissance effort, staff also assessed the operational status and possible suitability of the wells for potential power plant supply. Well owners were contacted, permission to access the wells requested and additional information obtained. Accessible wells were sampled in accordance with standard sampling procedures. Due to State budgetary restraints, the Applicant's consultant (AECOM) performed the groundwater sampling program by collecting well-water samples in the target area. The samples were submitted to a State-certified laboratory (Calscience Environmental Laboratories, Inc.), and the Applicant shared this information with CEC staff for independent analysis. A summary of the results of the groundwater sampling effort are presented in **Soil and Water Table 5** below.

Soil and Water Table 5
General Water Chemistry of Groundwater Samples
Degraded Groundwater Sampling Program

Well Number		Arciero #33	Well 52	Well 57	Well 58	Well 59	Well 61	Well 63
Date Sampled		8/5/2009	8/6/2009	8/6/2009	8/6/2009	8/6/2009	8/7/2009	8/7/2009
	Depth to Water feet-bgs2	253.7	NM[9]	NM[9]	NM[9]	NM[9]	NM[9]	NM[9]
Lab Analytical and Field Measured[1] Data	**TDS[3] (mg/L)**	**1420**	522	516	**1210**	895	482	514
	Fluoride	0.20	--	--	0.32	--	--	--
	Chloride	220	--	--	470	--	--	--
	Nitrite	<0.10	--	--	<0.10	--	--	--
	Nitrate	1.2	--	--	<0.10	--	--	--
	Sulfate	530	--	--	150	--	--	--
	Gross Alpha[4]	3.79	--	--	0.00	--	--	--
	pH	7.43	7.51	7.5	--	6.93	7.93	7.3
	Turbidity[5]	35	0	0	--	0	0	0
	ORP[6]	137	-37	-36	--	-48	92	119
	EC[7]	0.22	82.8	84.1	--	0.145	69.4	74.1
	DO[8]	4.3	4.4	1.7	--	3.2	4.4	2.6

Notes:

1. pH, Turbidity, ORP, EC, and DO were measured in the field with a Horiba.
2. bgs = below ground surface
3. TDS = Total Dissolved Solids (milligrams per liter)
4. Gross Alpha = Radionuclides (pico Curies per liter)
5. Turbidity is measured in NTUs
6. ORP = Oxidation-reduction potential (milliVolts)
7. EC = Electric Conductivity (micromhos per centimeter)
8. DO = Dissolved oxygen
9. NM = Not measured. Well had a pump on it that did not allow the water level meter to be dropped down the well.

-- Analysis not run

Bold Values Bold values indicate TDS results exceeding 1,000 mg/L.

Evaluation of the test results indicate that an area of relatively high salinity groundwater (groundwater with TDS concentrations equal to or greater than 1,000 mg/L) occurs approximately 5 miles to the northeast of the BSEP site (Arciero Ranch well #33, which was a former high capacity agriculture well). A water sample from another well (#58 in **Soil and Water Table 5**) also had TDS concentrations greater than 1,000 mg/L. In the past, well 58 provided an agricultural water supply and its large casing diameter (20 inches) suggest it was likely a high producing well. Driller logs for wells constructed in this portion of the Koehn sub-basin report well pumping rates greater than 2,000 gpm, and these wells presumably can meet BSEP water requirements.

Based on staff's review of existing information and on the well sampling program discussed above, staff believes that a viable source of degraded groundwater exists in the BSEP site vicinity that could be developed for project use. Although the specific site

where degraded groundwater is available in sufficient volume has not been identified, staff believes it is likely available and could be further investigated. If this alternative is selected, BSEP would have to provide additional information on project design and alignment of conveyance facilities so potential environmental impacts can be analyzed, and provide a copy of an agreement that would allow BSEP access to pump and use groundwater from this area. Additionally, BSEP would need to assess the groundwater storage and water level changes that could occur as a result of moving the project's pumping center to an alternative site.

Alternative Recycled Wastewater Supply

Rosamond Community Services District (RCSD) and California City have offered to supply BSEP with tertiary treated recycled wastewater that meets California Code or Regulations, Title 22 requirements. In addition to meeting Title 22 requirements, results of analytical testing of recycled wastewater produced at RCSD and California City indicates their recycled wastewater contains 548 ppm and 590 ppm TDS, respectively. The recycled wastewater is chemically similar to site groundwater and would be suitable for use by BSEP with minor changes to BSEP's original design. Further, use of recycled wastewater complies with SWRCB and Energy Commission policies and is encouraged for use by both agencies. Staff considers the use of recycled wastewater to be a preferred alternative to using site groundwater for power plant construction and operation.

Rosamond Community Services District Recycled Wastewater

The Rosamond Community Services District has expressed their willingness to provide 1,456 acre-feet per year of Title 22 tertiary treated waste water to the BSEP for a period of 30 years (Rosamond 2009a-d). Delivery of this water would require construction of a 40 mile long underground pipeline extending from the community of Rosamond to the BSEP site. Staff considers RCSD's recycled wastewater to be a reasonable alternative to the proposed use of fresh groundwater.

If the Energy Commission requires the use of recycled water from RCSD, staff recommends the applicant be required to comply with Condition of Certification **SOIL&WATER - 18**. This condition would require the applicant to enter into a long term purchase agreement for delivery of recycled water to the project and comply with CCR Title 17 and Title 22 requirements for the use of recycled water. Staff also recommends the applicant be required to comply with **SOIL&WATER - 19** which would require the applicant to meter recycled water delivery and report project use in accordance with Title 20 section 1304.

California City Recycled Wastewater

California City has expressed their willingness to provide 1,424 acre-feet per year of Title 22 tertiary treated waste water to the BSEP for a period of 30 years (CofC 2009b &c). Delivery of this water would require construction of a 12-mile underground pipeline extending from California City to the BSEP site. Staff considers California City's recycled wastewater to be a reasonable alternative to the proposed use of fresh groundwater.

If the Energy Commission requires the use of recycled water from California City, staff notes that additional environmental analysis of potential impacts would be required. BSEP would have to provide information on the project design and alignment . If this alternative is selected staff would still recommend that BSEP be required to comply with Condition of Certification **SOIL&WATER -18**. This condition would require the applicant to enter into a long term purchase agreement for delivery of recycled water to the project and comply with CCR Title 17 and Title 22 requirements for the use of recycled water. Staff would also recommend the applicant be required to comply with Condition of Certification **SOIL&WATER - 19** which would require the applicant to meter recycled water delivery and report project use in accordance with Title 20 section 1304.

Dry Cooling

Staff evaluated three Air Cooled Condenser (ACC) dry cooling alternatives presented by the applicant (BS2008a). A summary of the cooling system comparisons is presented in **Soil & Water APPENDIX D, Table D6** and in the **Alternatives** section.

Staff believes that if this dry cooling alternative is selected and the dry cooling equipment is located within the current site footprint, no additional analysis of potential environmental impacts related to soil and water resources would be required. Dry cooling would significantly reduce the volume of process wastewater generated, possibly eliminating the need for a partial ZLD and reducing the volume of wastewater disposed to evaporation ponds. Potential impacts related to stormwater runoff and disposal of other process wastewater would be addressed by the current design proposed by BSEP and mitigation recommended by staff in the Conditions of Certification.

Zero Liquid Discharge Technology

With respect to wastewater, the Energy Commission's 2003 IEPR specifies that "the Energy Commission will require zero liquid discharge technologies (ZLD) unless such technologies are shown to be 'environmentally undesirable' or 'economically unsound.'" As discussed above under process wastewater impacts, the applicant initially proposed to dispose of process wastewater in lined evaporation ponds that would encompass an area of approximately 43 acres.

Based on information provided in the Project Design Refinements (DB2009r), the applicant now proposes to use a partial ZLD system. The partial ZLD system would concentrate brine wastewater to a maximum concentration between 70,000 to 111,000 mg/L TDS depending on which water source is used. The concentrated brine wastewater would then be conveyed to three evaporation ponds (each pond occupying 2 acres), for a combined disposal area of 6 acres. This proposed design would significantly reduce the area needed for brine disposal. Condition of certification **SOIL&WATER - 4** would require BSEP to mitigate any potential impacts related to operation and maintenance of the evaporation ponds. Staff believes the use of the partial ZLD system would be consistent with Energy Commission policy.

CONCLUSIONS

As proposed, the project does not comply with all LORS and existing water policies. A summary of staff conclusions is presented below.

- Ownership of, and the potential for the Beacon Solar Energy Project (BSEP) to use, groundwater underlying the site is disputed and undetermined.
- The proposed use of high quality fresh groundwater for power plant cooling is in conflict with State Water Resources Control Board and Energy Commission policies.
- There is no compelling evidence that using the lowest quality water supply reasonably available (recycled wastewater produced by Rosamond Community Services District and/ or California City) would be environmentally undesirable or economically unsound.
- There is no compelling evidence that alternative cooling technologies (specifically dry cooling) would be environmentally undesirable or economically unsound.
- There is general uncertainty in hydrogeologic conditions and future groundwater levels. Modeling shows that under a conservative set of assumptions there is potential for significant drawdown that could impact nearby wells. Monitoring and mitigation for impacts should be required if the applicant is permitted to use groundwater for power plant cooling.
- The project site is bisected by a mapped FEMA Special Flood Hazard Area (SFHA). The applicant is proposing to construct a diversion channel to reroute the design discharge of 28,000 cubic feet per second around the project site and reduce flood impacts to less than significant levels. The project owner is required to follow the FEMA CLOMR/LOMR application process to remap the SFHA around the solar field.
- The diversion channel may require sediment removal to maintain channel capacity for the design discharge. Sediment removal and other maintenance activities should be the responsibility of BSEP in perpetuity.
- Implementation of Best Management Practices during BSEP construction in accordance with effective Storm Water Pollution Prevention Plans and a Drainage, Sedimentation and Erosion Control Plan would avoid significant adverse effects that could otherwise result in significant transport of sediments or contaminants from the site by wind or water erosion.
- The proposed use of a partial Zero-Liquid-Discharge system to recycle waste water concentrate waste is consistent with state water use and conservation policies.

PUBLIC AND AGENCY COMMENTS ON THE PRELIMINARY STAFF ASSESSMENT

California Regional Water Quality Control Board, Lahontan Region (LRWQCB) Comments:

> The drainages affected by the Project are waters of the State, as defined by California Water Code section 13050, and are subject to State requirements in accordance with Water Code section 13260. Therefore, the requirements for

construction and industrial storm water management will be issued in the form of proposed Waste Discharge Requirements that will be incorporated in the Energy Commission's certification process.

STAFF RESPONSE:

See Condition of Certification **SOIL & WATER -3** and **Appendices E, F, G** and **H** for Waste Discharge and Storm Water Requirements

LRWQCB Comment:

The discussion of construction wastewater streams on page 4.9-23 appears to be incomplete. The only wastewater stream discussed is a one time hydrostatic testing of pipelines and pressure vessels. Please evaluate construction activities to determine if all waste streams have been identified, e.g., vehicle washdown.

STAFF RESPONSE:

See discussion of Construction Wastewater above.

Comments from Intervener California Unions for Reliable Energy (CURE):

The applicant's proposal to use potable water for power plant cooling poses a significant impact to water resources under CEQA and is inconsistent with applicable laws, ordinances, regulations, and standards ("LORS").2 In addition, the Project's proposed use of onsite groundwater poses a significant impact to the water levels and storage volumes of the potable water supply, and could significantly impact nearby potable water wells.3 Thus, the Project's proposed use of wet cooling results in numerous significant impacts under CEQA.

STAFF RESPONSE:

See Assessment of Impacts and Discussion of Mitigation and Compliance with LORS within this section and the Alternatives section of the FSA.

CURE Comment:

The proposed use of potable water for power plant cooling also conflicts with State Water Resources Control Board and Energy Commission policies. The applicant's proposal is inconsistent with SWRCB Policy 75-58 as LORS in the area of soil and water resources. This policy prohibits the use of potable water for power plant cooling unless other sources or other methods of cooling are environmentally undesirable or economically unsound. Compliance with SWRCB Policy 75-58 is wholly consistent with the Commission's practices in past siting proceedings and decisions in which the Commission has identified and relied upon Policy 75-58 as LORS.4

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[2] PSA, pp. 4.2-37, 4.9-49.

[3] PSA, p. 4.9-50.

[4] See, e.g., Commission Siting Decision for the Delta Energy Center (98-AFC-3), Appx. A: LORS, at p. 30; Commission Decision for the Pittsburg District Energy Facility (98-AFC-1), Appx. A: LORS, at p. 44; Commission Decision for the Luz Engineering Corporation SEGS (87-AFC-1), Condition 8.

The applicant's proposed use of potable water for power plant cooling is also inconsistent with Energy Commission policy. The Commission has an established policy regarding the use of fresh water for power plant cooling. The Energy Commission's 2003 Integrated Energy Policy Report states that the Commission will approve the use of fresh water for power plant cooling "only where alternative water supply sources and alternative cooling technologies are shown to be 'environmentally undesirable' or 'economically unsound.'"[5] The Commission defines "economically undesirable" as "having a significant adverse environmental impact," and "economically unsound" as "economically or otherwise infeasible."[6]

The impacts posed by the Project's proposed use of potable water for power plant cooling must be mitigated. Mitigation measures must be designed to minimize, reduce, or avoid an identified environmental impact or to rectify or compensate for that impact.[7] We propose that the CEC adopt dry cooling as mitigation for these impacts. Dry cooling completely eliminates the need for evaporation ponds, avoiding significant impacts to migratory birds and desert tortoise from the ponds. In addition, dry cooling avoids the Project's impact to groundwater and local wells. Finally, dry cooling avoids the Project's conflicts with LORS.

STAFF RESPONSE:

Staff has proposed a number of alternatives to onsite groundwater use. See Assessment of Impacts and Discussion of Mitigation and **LORS Compliance** sections above. Also see the **Alternatives** section of the FSA.

CURE Comment:

The PSA includes increased costs for larger cooling pond acreage than proposed by the applicant. It is not clear whether either the PSA or the applicant have included costs associated with mitigating the harm and risks to avian life from the cooling ponds, and mitigating the surface disturbance caused by building the cooling ponds.

In addition, neither the PSA nor the AFC appear to have fully considered possibilities for reoptimizing other aspects of power block design to take into account differences between wet and dry cooling. Since the plant design has presumably already been optimized for the proposed wet cooling system, any such changes should have the effect of reducing the net cost of dry cooling.

STAFF RESPONSE:

Staff believes dry cooling is feasible. See the **LORS Compliance** section above and the **Alternatives** section of the FSA.

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[5] 2003 Integrated Energy Policy Report, California Energy Commission, December 2003, Docket No. 02-IEP-1, Pub. No. 100-03-019.

[6] *Id*.

[7] CEQA Guidelines, § 15370.

CURE Comment:

CURE made a number of comments which generally pointed out that at the time of the Preliminary Staff Assessment some information about the design and function of the re-routed wash were not yet developed.

STAFF RESPONSE:

The Soil and Water Resources section contains a more complete analysis of the re-routed wash (diversion channel) as the applicant has submitted additional information since the publication of the Preliminary Staff Assessment. See Operations Storm Water section above and the detailed discussion of the re-routed wash in **Appendix C**. Conditions of Certification **SOIL & WATER -9** through **-17** are proposed by staff to address current deficiencies in the final design of the re-routed wash.

CURE Comment:

The groundwater monitoring system, as proposed, is inadequate and would unlikely detect releases of hazardous waste to groundwater. Groundwater monitoring wells must be placed at the point of compliance, defined as the "vertical surface located at the hydraulically downgradient limit of the Unit that extends through the uppermost aquifer underlying the Unit."[8] The point of compliance is further defined as follows:

If the facility contains contiguous Units and monitoring along a shared boundary would impair the integrity of a containment or structural feature of any of the Units, the Point of Compliance may be located at the hydraulically downgradient limit of an area described by an imaginary line along the outer boundary of the contiguous Units. This provision only applies to contiguous Units that have operated or have received all permits necessary for construction and operation before 7-1-91.[9]

The locations of the proposed detection groundwater monitoring wells in the ROWD do not conform to the cited regulatory requirements. According to water level contours provided in the ROWD, only one detection monitoring well (MW-1) is located at what would be downgradient of the land treatment unit.[10] Water level contours are plotted in Figure 1-11 at a scale of 1 inch = approximately 2000 feet. However, this scale is inadequate for determining groundwater flow direction in the vicinity of the land treatment unit. A figure at a scale appropriate for determining flow direction (DTSC specifies 1 inch = 200 feet[11]) and adequacy of detection well placement should be included in the PSA.

[8] 27 Cal. Code Regs. § 20405(a).

[9] 27 Cal. Code Regs. § 20405(b).

[10] ROWD, Appendix I, Figure 1-11.

[11] http://www.dtsc.ca.gov/SiteCleanup/upload/SMP_Report-Hydrogeologic_Char_Data.pdf

Two additional detection monitoring wells (MW-2 and 3) are identified in Figure 4-1 at the northern and eastern margin of a boundary that would encompass the evaporation ponds. No upgradient detection monitoring well is identified in Figure 4-1. The ROWD states that the point of compliance after operations at the site commence will be defined by the extraction wells (Well 63 and Well 49).[12] From Figure 1-11, Well 63 was measured to be approximately 1000 feet northeast (and downgradient according to "predicted drawdown contours") from the northeastern-most evaporation pond and nearly 3000 feet downgradient from the Land Treatment Unit.

Point of compliance monitoring wells, as defined in the CCR, must be located at the margin of the regulated units, not at the distances specified in the ROWD which, in some cases, are more than a half-mile downgradient of the regulated unit. The PSA completely ignores this issue and potentially significant impacts from hazards on the Project site. The PSA should be revised and recirculated accordingly.

STAFF RESPONSE:

The Requirements for Waste Disposal presented in the attached Appendices provide appropriate groundwater monitoring requirements. See Soil and Water Resources - **APPENDIX H, MONITORING AND REPORTING PROGRAM for GROUNDWATER (THREE SURFACE IMPOUNDMENTS AND A LAND TREATMENT UNIT**).

CURE Comment:

In the ROWD, Detection Monitoring Program, diphenyl oxide and biphenyl oxide are listed as annual monitoring parameters and are to be monitored with a reporting limit goal of 500 ug/L each.[13] However, in a review of cleanup programs for biphenyl and diphenyl oxide, we found cleanup goals for groundwater at a site in Washington as follows:

- Biphenyl: 230 ug/L; and
- Diphenyl oxide: 410 ug/L.[14]

[12] ROWD, Appendix I, p. 3-4.

[13] ROWD, Appendix G, Table 4-4.

[14] http://www.ecy.wa.gov/programs/tcp/sites/emerald_kal/Kalama%20Consent%20Decree%20-%20Exhibit%20B%20Part%202.pdf

COC	Groundwater Cleanup Level (µg/L)	K_{oc} (mg/g)	K_d (mg/g)	Henry's Law Constant (dimensionless)	Unsaturated Zone Soil Concentration (mg/kg)
Benzene	1.2	62	0.062	0.228	0.00676
Toluene	2,000	140	0.14	0.272	14.5
Benzoic Acid	24,590	0.6	0.0006	6.31E-05	99
Biphenyl	230	1,072	1.072	0.016	5.9
Bis(2-ethylhexyl) phthalate	1.8	111,123	111.123	4.18E-06	4.01
Diphenyl Oxide	410	1,655	1.655	0.0089	15.2
Phenol	2,560	28	0.028	1.63E-05	11.7
UCF	0.001		mg/µg		
DF (unsaturated)	20				
Theta w (unsaturated)	0.3				
Theta air (unsaturated)	0.13				
soil bulk density	1.5		kg/L		
fraction of organic carbon	0.001				

Given that the cleanup goals are lower than the monitoring reporting limits, the PSA should evaluate the reporting limits to ensure protection of beneficial uses.

STAFF RESPONSE:

The Requirements for Waste Disposal presented in the attached Appendices provide the appropriate groundwater monitoring requirements. See **Soil and Water - APPENDIX H, MONITORING AND REPORTING PROGRAM for GROUNDWATER (THREE SURFACE IMPOUNDMENTS AND A LAND TREATMENT UNIT**). These Requirements were developed in consultation with the Lahontan Regional Water Quality Control Board (LRWQCB). Regarding determination of reporting limits, staff and LRWQCB concluded that Biphenyl Oxide is a solid at normal environmental temperatures (melting point 158 degrees F), it has a very low solubility in water (0.0004 g/100 ml), and due to the great depth to groundwater at the site, the site's arid climate, the design of the Title 27 waste containment units, the applicant's spill response plan, etc., the migration of biphenyl oxide and diphenyl oxide to groundwater is unlikely. The detection limit of biphenyl and diphenyl was set at 500 ug/L because that is the test method detection limit and it is also the concentration that is applied at the other solar facilities using heat transfer fluid within the Lahontan Region.

CURE Comment:

Selenium concentrations have been estimated by the applicant to be discharged to the evaporation ponds from the following individual source terms at the following concentrations:

- Mean well water concentration: 0.39 ppb (0.00039 ppm);
- Cooling tower blowdown: 0.6 ppb (0.0006 ppm); and

- Ion exchange regeneration: 4.5 ppb (0.0045 ppm).[15]

Selenium, in the food chain, is a compound that undergoes bioconcentration, bioaccumulation, and biomagnification as trophic levels increase. In aquatic organisms, including waterfowl, adverse effects include loss of equilibrium, neurological disorders, liver damage, reproductive failure, reduced growth, reduced movement rate, chromosomal aberrations, reduced hemoglobin, increased white blood cell count, and necrosis of the ovaries.
Discharge of selenium is subject to the California Toxics Rule which establishes a water quality criterion for selenium of 5 ppb. Selenium concentrations in wastewater have been limited by California regulatory agencies to concentrations as low as 4 ppb, as demonstrated by the following examples:

- The California Regional Water Quality Control Board ("RWQCB"), Central Valley Region, required the City of Davis to limit selenium discharge in effluent to a weekly average of 5 ppb.[16]
- The RWQCB, Colorado River Basin Region, required the City of El Centro to limit selenium discharge in effluent to a monthly average of 4 ppb.[17]
- The City of Davis 2001 National Pollutant Discharge Elimination System ("NPDES") permit limits selenium discharge in effluent to a four-day average of 5 ppb and to a one-hour maximum of 20 ppb.[18]

The RWQCB would, via a NPDES permit, make specific requirements regarding selenium. The PSA proposes a condition for certification that "the project owner shall comply with the requirements of the general NPDES permit for discharges of storm water associated with industrial activity."[19] However, the PSA fails to discuss the likely requirement of such a permit and how these discharge requirements would be met in wastewater discharged to the ponds upon evaporation as selenium concentrations increase. Thus, the PSA must be revised accordingly.

STAFF RESPONSE:

See **Soil and Water Appendix E, F, G and H** for Waste Discharge Requirements for selenium and other materials.

CURE Comment:

The applicant has estimated the selenium concentration in surface water to be discharged into the evaporation ponds at 0.0028 ppm (mg/L) (2.8 ppb)[20] and 0.0027

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[15] Beacon's Response to Staff's Data Request No. 125.

[16] R5-2008-0601 City of Davis http://www.swrcb.ca.gov/rwqcb5/board_decisions/adopted_orders/yolo/r5-2008-0601_enf.pdf

[17] R7-2006-0075 City of El Centro http://www.swrcb.ca.gov/rwqcb7/board_decisions/adopted_orders/orders/2006/06_0075.pdf

[18] City of Davis DPDES http://cityofdavis.org/pw/water/pdfs/WWExecSumm_Website.pdf

[19] PSA Condition of Certification Soil & Water-4, pp. 4.9-52-53.

[20] July 16, 2008 Response to Staff's Data Requests, p. BR-7. http://www.energy.ca.gov/sitingcases/beacon/documents/applicant/2008-07-16_DATA_RESPONSES_1-70_TN-47078.PDF

ppm (2.7 ppb).[21] The applicant has also estimated selenium concentrations to be discharged to the evaporation ponds from the following individual source terms at the following concentrations:

- Mean well water concentration: 0.39 ppb (0.00039 ppm)
- Cooling tower blowdown: 0.6 ppb (0.0006 ppm)
- Ion exchange regeneration: 4.5 ppb (0.0045 ppm)[22]

However, the applicant does not provide any explanations of how these numbers were derived. Thus, the PSA should address whether the assumptions are valid and whether potentially significant impacts related to selenium concentrations have been adequately analyzed and mitigated.

STAFF RESPONSE:

See **Soil and Water Appendix E, F, G and H** for Waste Discharge Requirements for selenium and other materials.

Kern County Planning Department Comments:

The proposed project has incorporated into its design a flood control channel which will re-route the flows from Pine Tree Creek around the solar energy plant site. Pine Tree Creek has been mapped by the Federal Emergency Management Agency (FEMA) as a Special Flood Hazard Area (SFHA), Zone A. In order to construct the proposed flood control facility the applicant will be required to obtain a Conditional Letter of Map Revision (CLOMR) from FEMA prior to construction.

As part of the CLOMR application the applicant must identify a public entity which will be responsible for channel maintenance. Currently the County of Kern does not have a Flood Control District in place which could serve as the maintenance entity. The applicant would therefore be required to either form a District as part of the project or find an entity outside.

STAFF RESPONSE:

See Condition of Certification **SOIL & WATER - 6** which requires the applicant to obtain approval from FEMA to change the SFHA and Condition of Certification **SOIL & WATER - 7** which requires the applicant to set up or fund a public maintenance entity.

California Department of Fish and Game (DFG) Comments:

The Soil and Water Resources section of the PSA discusses the option of using lower quality water, such as brackish water near Koehn Lake, as opposed to potable water, and states that there is no compelling evidence that using this water would be environmentally undesirable. However, if this lower quality water

[21] http://www.energy.ca.gov/sitingcases/beacon/documents/applicant/data_response_set_02/8.%20Water%20Resources%20Data%20Response%20Set%202.pdf

[22] Beacon's Response to Staff's Data Request No. 125.

is used in a wet cooling scenario, where evaporation ponds are necessary, because of higher salinity, and/or higher levels of different trace elements of concern (Se), potential impacts to migratory birds posed by evaporation ponds could be more significant than those considered in the PSA, depending on how the water is treated prior to use and disposal into the evaporation ponds. However, if lower quality water is used in a dry cooling or zero liquid discharge scenario where evaporation pond will not be necessary, or if the water is treated such that constituents of concern are removed prior to discharge into the evaporation ponds, we encourage the use of lower quality water.

STAFF RESPONSE:

Staff has proposed a number of feasible alternatives to onsite groundwater use. See the **LORS Compliance** section above and **Alternatives** section of this FSA.

DFG COMMENT:

A January 26, 2009 letter to the Energy Commission, the California Department of Fish and Game provided comments on the applicant's AFC and provisions for the Streambed Alteration Agreement (SAA) (CDFG, 2009). Related to Soil and Water Resources, the California DFG requested several specific revisions to the site design, including:

1. A hydrologic analyses report that evaluates the potential impacts to the existing FEMA designated 100-year floodplain and potential impacts to areas upstream and downstream of the property;

2. Revised storm water management plan to require all site storm water runoff to be directed into retention ponds and avoid discharge to Waters of the State.

3. A requirement that the applicant reconsider placement of rock lining of the channel's low flow.

STAFF RESPONSE:

Staff concurs with California DFG's request and has asked the applicant to meet Conditions of Certification **SOIL & WATER-5, -6, & -7, -8, and BIO-18** that would examine the current channel design and recommend the most appropriate design elements for the channel that respond to the SAA provisions. Staff also concur with the CDFG comments above and have required BSEP to prepare a DESCP and CLOMR that address impacts related to the SFHA, include retention basins, and remove rock placed in the channel bed with the exception of the toe rock intended to protect the channel banks from lateral migration of the streambed.

Staff have also reviewed the CDFG provisions included in the January 26th letter. These provisions require the Project Owner to:

1. Provide a set of near final engineering plans and drawings, and notify the CDFG of the construction start date.

2. Determine limitations to the annual construction schedule in an effort to protect nesting birds.

3. Direct all site storm water runoff away from Waters of the State by utilizing retention ponds.

4. Avoid use of materials hazardous to aquatic life, wildlife, and desert habitat for project related activities that have the potential for contaminating the soil and/or entering the Waters of the State. Hazardous materials may include but are not limited to: chemicals used to clean solar panels, cooling system wastewater, herbicides and pesticides, raw cement, concrete washings, asphalt, paint, coating materials, and oil or petroleum based products. Hazardous material placed in areas where they may enter Waters of the State will be removed immediately.

5. Prepare a hydrologic (and hydraulic) analyses of the re-routed stream to determine if the proposed structures and other constructed features will be properly engineered, installed and maintained to assure resistance to washout, and to erosion of the stream bed, stream banks and/or fill (upstream and downstream), and that they will not cause long-term changes in water flows that adversely modify the existing streambed bank contours (upstream and downstream) or increase sediment deposition.

6. Thoroughly analyze the existing FEMA designated 100-year floodplain to identify impacts (upstream and downstream) of the site.

7. Ensure the diversion channel design would be constructed and maintained to avoid barriers to wildlife movement, or cause an avoidance reaction. (Barriers may include channel features such as in-stream grade control or structural elements of bank protection).

8. Develop an engineered plan and submit to the CDFG for review for the construction laydown area which would describe protective structures, procedures for moving equipment, fuels and materials, and plan for conveyance of runoff during a rainfall event.

9. Construct a diversion channel before altering the historic Pine Tree Creek flow path.

The project owner would also be required to notify CDFG when activities covered by the provisions of the Streambed Alteration Agreement have been completed. Staff have integrated these CDFG comments and provisions into our analyses and conclusions for the BSEP site's ability to reduce impacts to less than significant levels.

PROPOSED CONDITIONS OF CERTIFICATION

SOIL&WATER-1: If the Energy Commission approves the use of site groundwater for power plant construction and/or operation, the project owner shall be

limited to using no more than 1,388 AFY. The project owner shall also develop and implement a groundwater impact monitoring and mitigation program. The monitoring and mitigation program shall be consistent with the intent of **Soil and Water APPENDIX I**, attached to this FSA. The primary objective for the monitoring is to establish pre-construction and project related water level trends that can be quantitatively compared against observed and simulated trends near the project pumping wells, at the property boundary, and near potentially impacted existing wells. Specifically, the project owner shall do all of the following:

A. Prior to construction,

1. Create the Fremont Valley Groundwater Monitoring Committee, in accordance with provisions set forth in **Soil and Water Appendix I**, to provide for land owner protection and include stakeholder participation in evaluation of project impacts. The monitoring committee's function will be to implement and oversee the groundwater monitoring program and to confer with the CPM to verify that there are no unacceptable impacts, as discussed in the Groundwater Impacts section of this FSA, to groundwater levels or to water quality in water supply wells adjacent to the BSEP.
2. Identify and secure access to the wells predicted by the "Zero Recharge" simulation run (see Groundwater Impacts section of this FSA), to allow monitoring of groundwater levels and quality of those wells. Any new wells within the potentially impacted area not previously identified shall also be included in the monitoring network. Abandoned wells, or wells no longer in use, that are accessible and provide reliable water level data shall also be included as part of the monitoring network.
3. In addition to the Zero Recharge wells discussed above, identify and include all available wells between the BSEP site and California City, in both the Koehn and California City sub-basins, into the monitoring network. Inclusion of these wells into the monitoring network is necessary to assess potential changes in hydraulic gradients and subsurface flow between sub-basins.
4. At least 30-days prior to project construction, accessible abandoned or unused wells within the monitoring network shall be instrumented with recorders to track groundwater levels during project construction. The water level recorders shall continuously collect and store the data every four hours and shall be serviced at least quarterly.
5. Obtain all historic water level and water quality data for each water supply well where access to monitor groundwater conditions has been obtained. Additionally, obtain well construction information (completion depth, well screen depth interval, and pump intake depth), historic well performance data, including pumping and non-pumping water levels, and pump specifications for each of those wells.

6. Update the groundwater data presented in the AFC with all new information obtained from the wells where access to monitor groundwater conditions has been obtained.

7. Prepare time series graphs for water level and total dissolved solids (TDS) concentrations data for each well where information is available.

8. Perform statistical trend analysis using Mann-Kendall Trend Test and Sen's Slope Estimator for water levels and the TDS data to statistically analyze the data. Determine the significance of an apparent trend and estimate the magnitude of that trend.

9. Collect groundwater levels from the off-site and on-site wells and collect and analyze groundwater samples for TDS concentrations to provide baseline groundwater levels and TDS concentrations for both on-site and off-site wells. Groundwater samples shall be analyzed for TDS by a California Certified Analytical Laboratory in accordance with Standard Methods 2540C.

10. Map TDS data and groundwater levels within the Koehn Sub-basin from the groundwater data collected prior to construction. Update trend plots and statistical analyses, as data is available.

B. During Construction:

1. Collect water levels and TDS concentrations within the monitoring network on a quarterly basis throughout the construction period, and at the end of the construction period. The continuous monitoring discussed in item A.4, above shall continue a minimum of 30-days after completion of project construction. Perform statistical trend analysis using Mann-Kendall Trend Test and Sen's Slope Estimator for water levels and the TDS data to statistically analyze the data. Determine the significance of an apparent trend and estimate the magnitude of that trend.

C. During Operation:

1. On a quarterly basis for the first five years of operation, collect water level measurements and TDS data from the wells identified in the groundwater monitoring program to evaluate operational influence from the project. Quarterly operational parameters (i.e., pumping rate) of the water supply wells shall be monitored. Additionally, quarterly groundwater-use in the Koehn sub-basin shall be estimated and the values submitted to the Fremont Valley Basin Groundwater Monitoring Committee for evaluation and consultation with the CPM.

2. On an annual basis, perform statistical trend analyses using Mann-Kendall Trend Test and Sen's Slope Estimator for water levels and the TDS data to statistically analyze the data. The significance of an apparent trend shall be determined and the magnitude of that trend estimated. Based on the results of the statistical trend analyses, the project owner shall determine if the project pumping has induced a drawdown in the water supply at a level of ten feet or more below the baseline trend.

3. If water levels have been lowered below pre-site operational trends, and monitoring data provided by the project owner show these water level changes are different from background trends and are caused by project pumping, then the project owner shall provide mitigation to the well owner(s).Mitigation shall be provided if the CPM's inspection of the well monitoring data confirms changes to water levels and water level trends relative to measured pre-project water levels, and the well yield has been lowered by project pumping. The type and extent of mitigation shall be determined by the amount of water level decline and site specific well construction and water use characteristics. The mitigation of impacts will be determined as follows:

   a. If project pumping has lowered water levels and increased pumping lifts, increased energy costs shall be calculated in accordance with item **SOIL & WATER-1I** above. Payment or reimbursement for the increased costs shall be provided at the option of the affected well owner.

   b. If groundwater monitoring data indicate project pumping has lowered water levels below the top of the well screen, and the well yield is shown to have decreased by 10-percent or more of the initial yield, compensation shall be provided for the diagnosis and maintenance to treat and remove encrustation from the well screen. Reimbursement shall be provided at an amount equal to the customary local cost of performing the necessary diagnosis and maintenance for well screen encrustation. Should well yield reductions be reoccurring, the project owner shall provide payment or reimbursement for either periodic maintenance throughout the life of the project or, if treatment is anticipated to be required more frequently than every 3-5 years, replacement of the well.

   c. If project pumping has lowered water levels to significantly impact well yield or cause casing collapse, payment or reimbursement of an amount equal to the cost of deepening or replacing the well shall be provided to accommodate these effects. Payment or reimbursement shall be at an amount equal to the customary local cost of deepening the existing well or constructing a new well. The demand for water, which determines the required well yield, shall be determined on a per well basis using well owner interviews and field verification of property conditions and water requirements compiled as part of the pre-project well reconnaissance. Well yield shall be considered significantly impacted if it is incapable of meeting 150-percent of the well owner's maximum daily demand, dry-season demand, or annual demand – assuming the pre-project well yield documented by the initial well reconnaissance met or exceeded these yield levels. For already low-yielding wells identified prior to project construction, a reduction due solely to project pumping of 10-percent or more below the pre-project yield shall be considered a significant impact. The contribution of project pumping to observed decreases in observed well yield shall be determined using the groundwater monitoring data collected.

   d. Electrical cost reimbursement – If the pumping water level falls below a depth of 10 feet from an average of the baseline measurements, the well owner shall be compensated by the project owner for the additional electrical costs commensurate with the additional lift required to pump. The water level in the

well will be assessed relative to the pumping rate established during the pre-site development period.

e. Where it is determined by the CPM that the project owner shall reimburse a private well owner for increased energy costs, the project owner shall calculate the compensation owed to the owner of any impacted well as described below.

Increased cost for energy	= change in lift/total system head x total energy consumption x costs/unit of energy
Where:	
change in lift (ft)	= calculated change in water level in the well resulting from project
total system head (ft)	= elevation head + discharge pressure head
elevation head (ft)	= difference in elevation between wellhead discharge pressure gauge and water level in well during pumping.

discharge pressure head (ft) = pressure at wellhead discharge gauge (psi) X 2.31

f. The project owner shall notify all owners of the impacted wells within one month of the CPM approval of the compensation analysis for increased energy costs.

g. Compensation shall be provided on either a one-time lump-sum basis, or on an annual basis, as described below:

Annual Compensation: Compensation provided on an annual basis shall be calculated prospectively for each year by estimating energy costs that will be incurred to provide the additional lift required as a result of the project. With the permission of the impacted well owner, the project owner shall provide energy meters for each well or well field affected by the project. The impacted well owner to receive compensation must provide documentation of energy consumption in the form of meter readings or other verification of fuel consumption. For each year after the first year of operation, the project owner shall include an adjustment for any deviations between projected and actual energy costs for the previous calendar year.

One-Time Lump-Sum Compensation: Compensation provided on a one-time lump-sum basis shall be based on a well-interference analysis, assuming the maximum project-pumping rate of 20.8 AFY. Compensation associated with increased pumping lift for the life of the project shall be estimated as a lump sum payment using the following criterion:

- The current cost of energy to the affected party considering time of use or tiers of energy cost applicable to the party's billing of electricity from the utility providing electric service, or a reasonable equivalent if the party independently generates their electricity;
- An annual inflation factor for energy cost of 3 percent; and

- A net present value determination assuming a term of 30 years and a discount rate of 9 percent.

h. Pump lowering – In the event that groundwater is lowered to an extent where pumps are exposed but well screens remain submerged the pumps shall be lowered to maintain production in the well. All costs associated with lowering pumps shall be borne by the project owner.

i. Deepening of wells – If the groundwater is lowered enough that well screens are exposed, pump lowering is not an option. In this case, the wells shall be deepened or new wells constructed. All costs associated with deepening existing wells or constructing new wells shall be borne by the project owner.

4. After the first five-year operational and monitoring period, the CPM, after consultation with the Fremont Valley Basin Groundwater Monitoring Committee, shall evaluate the data and determine if the monitoring program water level measurements and TDS sampling frequencies should be revised or eliminated. Revision or elimination of any monitoring program elements shall be based on the consistency of the data collected. The determination of whether the monitoring program should be revised or eliminated shall be made by the CPM after consultation with the Fremont Valley Basin Groundwater Monitoring Committee.

5. At the end of every subsequent five-year monitoring period, the collected data shall be evaluated by the CPM after consultation with the Fremont Valley Basin Groundwater Monitoring Committee and the CPM shall determine if the sampling frequency and TDS sampling should be revised or eliminated.

6. Comply with Condition of Certification **SOIL & WATER -19**, which requires metering of water used for power plant construction and operation.

7. During the life of the project, the project owner shall provide to the CPM and Fremont Valley Basin Groundwater Monitoring Committee, all monitoring reports, complaints, studies and other relevant data within 10 days of being received by the project owner.

Verification: The project owner shall do all of the following:

1. At least 60 days prior to start of construction, the project owner shall submit to the CPM a list identifying the members of the Fremont Valley Basin Groundwater Monitoring Committee and each member's written agreement to participate in accordance with the Committee's stated purpose and function and assist the project owner in implementing the groundwater monitoring program.

2. At least 30 days prior to project construction, the project owner shall submit to the CPM, a comprehensive report presenting all the data and information required in items **SOIL & WATER – 1.A.2** through **-1.A.9**.

The project owner shall submit to the CPM all calculations and assumptions made in development of the report data and interpretations, along with any agreement or dissenting opinions voiced by Committee members or local well owners on the data, calculations and assumptions used in development of the report.

3. During project construction, the project owner shall submit to the CPM quarterly reports presenting all the data and information required in items **SOIL & WATER – 1.B.1** through **-1.B.2**.

   The project owner shall submit to the CPM all calculations and assumptions made in development of the report data and interpretations, along with any agreement or dissenting opinions voiced by Committee members or local well owners on the data, calculations, and assumptions used in development of the report.

4. No later than 60 days prior to project operation, the project owner shall provide to the CPM for review and approval, documentation showing that any mitigation to private well owners during project construction was satisfied, based on the requirements of the property owner as determined by the CPM.

5. During project operation, the project owner shall submit to the CPM, applicable quarterly and annual reports presenting all the data and information required in items **SOIL & WATER – 1.C.1** through **-1.C.7**.

   The project owner shall submit to the CPM all calculations and assumptions made in development of report data and interpretations, along with any agreement or dissenting opinions voiced by Committee members or local well owners on the data, calculations, and assumptions used in development of any reports.

6. The project owner shall provide mitigation as described in **SOIL & WATER- 1.C.3**, if the CPM's inspection of the monitoring information confirms changes to water levels and water level trends relative to measured pre-project water levels, and well yield has been lowered by project pumping. The type and extent of mitigation shall be determined by the amount of water level decline and site specific well construction and water use characteristics. The mitigation of impacts will be determined as set forth in **SOIL & WATER-1.C.3**.

7. If mitigation includes monetary compensation, the project owner shall provide documentation to the CPM that compensation payments have been made by March 31 of each year of project operation or, if lump-sum payment is selected, payment is made by March 31 following the first year of operation only. Within 30 days after compensation is paid, the project owner shall submit to the CPM a compliance report describing compensation for increased energy costs necessary to comply with the provisions of this condition.

After the first five year operational and monitoring period, the project owner shall submit a 5 year monitoring report to the Fremont Valley Basin Groundwater Monitoring Committee and to the CPM that submits all monitoring data collected and provides a summary of the findings. After consultation with the Fremont Valley Basin Groundwater Monitoring Committee, the CPM will determine if the water level measurements and TDS sampling frequencies should be revised or eliminated.

SOIL&WATER-2: The project owner will comply with the requirements of the Kern County Environmental Health Services Department, regarding sanitary waste disposal facilities such as septic systems and leach fields.

Verification: The project owner will submit all necessary information and the appropriate fee to the county of Kern to ensure that the project has complied with the county's sanitary waste disposal facilities requirements. A written assessment prepared by Kern County of the project's compliance with these requirements must be submitted to the CPM for review and approval 30-days prior to the start of power plant operation.

SOIL&WATER-3: The project owner shall comply with the Waste Discharge Requirements for discharge of storm water associated with construction activity that are presented in **Soil and Water Appendices E, F, G** and **H** and submit the appropriate compliance fee to the LRWQCB. The project owner shall develop, obtain compliance project manager (CPM) approval of, and implement a Storm Water Pollution Prevention Plan (SWPPP) for the construction of the BSEP site, laydown area, and all linear facilities.

Verification: At least 60 days prior to site mobilization, the project owner shall submit to the CPM and LRWQCB, a copy of the construction SWPPP for review and CPM approval prior to site mobilization. The project owner shall also submit to the CPM evidence of payment to LRWQCB of the appropriate compliance fee. The project owner shall retain a copy of the SWPPP on site. The project owner shall submit to the CPM copies of all correspondence between the project owner and the LRWQCB regarding the Waste Discharge Requirements for the discharge of storm water associated with construction activity within 10 days of its receipt or submittal.

SOIL&WATER-4: The project owner shall comply with the requirements of the Waste Discharge Requirements in **Soil and Water Appendices E, F, G and H**, for discharges of process water and storm water associated with industrial activity. The project owner shall develop, obtain CPM approval of, and implement an industrial SWPPP for the operation of the project.

Verification: At least 60 days prior to commercial operation, the project owner shall submit to the CPM a copy of the industrial SWPPP for operation of the project for review and approval prior to commercial operation. The project owner shall retain a copy on site. The project owner shall submit copies to the CPM of all correspondence between the project owner and the LRWQCB regarding the Requirements of Waste Discharge of process water and storm water associated with industrial activity within 10 days of its receipt or submittal. Copies of correspondence shall include the Notice of Intent sent by the project owner to the SWRCB.

SOIL&WATER-5: Prior to site mobilization, the project owner shall obtain CPM approval for a site specific DESCP that ensures protection of water quality and soil resources of the project site and all linear facilities for both the construction and operation phases of the project. This plan shall address appropriate methods and actions, both temporary and permanent, for the protection of water quality and soil resources, demonstrate no increase in off-site flooding potential, and identify all

storm water monitoring and maintenance activities. The project owner shall complete all necessary engineering plans, reports, and documents necessary for Kern County to conduct a review of the proposed project and provide its written evaluation as to whether the proposed grading, drainage improvements, diversion channel design, and flood management activities comply with all county requirements. The project owner shall ensure compliance with all county standards and requirements for grading, erosion control, and flooding for the life of the project. The plan shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1,** and with requirements described in Condition of Certification **BIO-18**. The DESCP shall contain the following elements:

- ***Vicinity Map*** – A map shall be provided indicating the location of all project elements with depictions of all significant geographic features to include watercourses, washes, irrigation and drainage canals, major utilities, and sensitive areas, such as Waters of the State.
- ***Site Delineation*** – The site and all project elements shall be delineated showing boundary lines of all construction areas and the location of all existing and proposed structures, underground utilities, roads, and drainage facilities. Adjacent property owners shall be identified on the plan maps. All maps shall be presented at a legible scale
- ***Drainage*** – The DESCP shall include the following elements suitable for submittal to FEMA as part of compliance with Condition of Certification **SOIL&WATER-6**:

  a. Topography – Topography for offsite areas are required to define the existing upstream tributary areas to the site and downstream to provide enough definition to map the existing Pine Tree Creek flood hazard. Spot elevations shall be required where relatively flat conditions exist.

  b. Proposed Grade – Proposed grade contours shall be shown at a scale appropriate for delineation of onsite sub-basins, drainage ditches, pond contours, diversion channel, and tie-ins to the existing topography.

  c. Hydrology - Existing and proposed hydrologic calculations for on-site areas and offsite areas that drain to the site; include maps showing the drainage area boundaries and sizes in acres, topography and typical overland flow directions, and show all existing, interim, and proposed drainage infrastructure and their intended direction of flow.

  d. Hydraulics - Provide hydraulic calculations to support the selection and sizing of the onsite drainage network, retention facilities and best management practices (BMPs). Design

calculations and the results of the hydraulic backwater model for the Pine Tree Creek diversion channel shall be included.

e. Channel Stabilization Plan – The Project Owner shall present methods to mitigate for adverse hydraulic conditions (high velocities, high shear stress, Froude Numbers greater than 0.8) in the proposed diversion channel. Channel plan and profile maps showing water surface elevations, channel slope, bank protection, channel stabilization elements. Channel bank elevations shall also be identified.

Watercourses and Critical Areas – The DESCP shall show the location of all nearby watercourses including washes, irrigation and drainage canals, and drainage ditches, and shall indicate the proximity of those features to the construction site. Maps shall identify high hazard flood prone areas:

a. FEMA Regulated Special Flood Hazard Areas (Effective floodplain from DFIRM) shall be shown on site as well as upstream and downstream within 2,000 feet from the BSEP property boundary;

b. Existing Conditions 100-year Floodplain – Shall be continuous with the effective floodplain; and

c. Proposed (Revised) Conditions 100-year Floodplain – Shall be continuous with the effective floodplain.

- ***Clearing and Grading*** – The plan shall provide a delineation of all areas to be cleared of vegetation and areas to be preserved. The plan shall provide elevations, slopes, locations, and extent of all proposed grading as shown by contours, cross sections, cut/fill depths or other means. The locations of any disposal areas, fills, or other special features shall also be shown. Proposed contours shall tie into existing topography. The DESCP shall include a statement of the quantities of material excavated at the site, whether such excavations or fill is temporary or permanent, and the amount of such material to be imported or exported or a statement explaining that there would be no clearing and/or grading conducted for each element of the project. Areas of no disturbance shall be properly identified and delineated on the plan maps.
- ***Project Schedule*** – The DESCP shall identify on the topographic site map the location of the site-specific BMPs to be employed during each phase of construction (initial grading, project element and diversion channel excavation, and construction, and final grading/stabilization). The project schedule shall identify the construction sequence for the Pine Tree Creek diversion channel. Separate BMP implementation schedules shall be provided for each project element for each phase of construction.

- ***Best Management Practices*** – The DESCP shall show the location, timing, and maintenance schedule of all erosion- and sediment-control BMPs to be used prior to initial grading, during project element excavation and construction, during final grading/stabilization, and after construction. BMPs shall include measures designed to control dust and stabilize construction access roads and entrances. The maintenance schedule shall include post-construction maintenance of treatment-control BMPs, including application of soil stabilizers, applied to disturbed areas following construction.
- ***Erosion Control Drawings*** – The erosion-control drawings and narrative shall be designed, stamped and sealed by a professional engineer (PE) or a Certified Professional in Erosion and Sediment Control (CPESC).
- ***Agency Comments*** – The DESCP shall include copies of recommendations, conditions, and provisions from Kern County, CDFG, and LRWQCB.
- ***Monitoring Plan*** – Monitoring activities shall include routine measurement of the volume of accumulated sediment in the onsite drainage ditches, storm water retention basins, and the diversion channel.

  Additional monitoring requirements shall be presented in a Desert Wash Mitigation and Monitoring Plan as discussed in Condition of Certification BIO-18.
- ***Maintenance Plan –*** The maintenance plan shall identify activities and procedures needed to maintain capacity within all onsite drainage ditches, and the drainage ditch that currently diverts flow along the western property boundary. Channel maintenance may include BMP repairs, bank stabilization, debris removal, grade control, and revegetation. The maintenance plan shall support the objectives of the revegetation plan and mitigation effort. Maintenance activities must also include removal of accumulated sediment from all retention basins when an average depth of 0.5 feet of sediment has accumulated in the retention basin. The maintenance plan shall be developed in accordance with the activities and procedures identified for the Pine Tree Creek diversion channel as part of compliance with Condition of Certification **SOIL&WATER-7** and **SOIIL&WATER-8**.

Verification: The project owner shall do all of the following:

1. No later than 90 days prior to start of site mobilization, the project owner shall submit a copy of the DESCP to Kern County and the LRWQCB for review and comment. A copy shall be submitted to the CPM no later than 60 days prior to the start of site mobilization for review and approval. The CPM shall consider comments received from both Kern County and LRWQCB.

2. During construction, the project owner shall provide an analysis in the monthly compliance report on the effectiveness of the drainage-, erosion- and sediment-control measures and the results of monitoring and maintenance activities.

3. Once operational, the project owner shall provide in the annual compliance report information on the results of storm water BMP monitoring and maintenance activities.

4. Provide the CPM with two (2) copies of all monitoring or other reports required for compliance with Kern County, CDFG, and LRWQCB.

5. Provide Kern County, LRWQCB and the CPM with quarterly maintenance activity reports for all onsite drainage ditches and the drainage ditch that currently diverts flow along the western property boundary. These reports shall also provide an account of any significant runoff event and will describe channel performance.

SOIL&WATER-6: In accordance with Kern County's Floodplain Management Ordinance and 44 CFR 65.12, the project owner shall prepare all necessary engineering plans and documents to support a Conditional Letter of Map Revision (CLOMR) application submittal to FEMA. The project shall not commence construction in the SFHA until Kern County receives from FEMA an approved CLOMR. Following construction, the Project Owner shall prepare all necessary documents required for a final Letter of Map Revision (LOMR). The project owner shall use FEMA's Guidelines and Specifications for Mapping Partners for guidance. The project owner shall:

a. Prepare hydrologic analyses to estimate the 10-, 2-, 1-, and 0.2-percent annual chance flood events for the Pine Tree Creek watershed. The analyses shall be conducted using numerical models approved by FEMA;

b. Prepare preliminary (30%) design drawings for the channel, include typical channel cross section dimensions, typical details for all structural elements needed to protect the channel from erosion, and a grading plan for proposed conditions that ties into existing topography;

c. Conduct hydraulic analyses for existing and proposed conditions. Plot the water surface and energy grade line profile for the constructed channel. Tie the proposed conditions water surface elevation profile into the water surface profile from the existing hydraulic model upstream and downstream of the site;

d. Prepare flood hazard mapping for the existing and proposed conditions. Floodplain mapping shall tie-into the upstream and downstream special flood hazard mapping shown on the effective DFIRM;

e. Provide notification to all adjacent property owners, impacted by the proposed change to the SFHA;

f. Complete the necessary FEMA MT-2 application forms package and pay all applicable CLOMR review fees. The submittal shall be certified by a California-licensed professional engineer; and

g. Address all FEMA review comments as needed to receive an approved CLOMR.

Prior to mobilization, the Project Owner shall receive confirmation from Kern County that FEMA has issued a CLOMR for the BSEP. The Project Owner shall address all "conditions" in the CLOMR during project construction. No later than six months after the end of construction, the project owner, through a request from Kern County, must notify FEMA of the changes in accordance with 44 CFR 65.3. The Project Owner shall submit the following technical or scientific data as part of a Letter of Map Revision (LOMR) request:

h. Conduct an As-Built survey of the completed construction;

i. Update the Proposed Conditions Model to reflect the As-Built Revised Conditions and delineate the resulting flood hazards;

j. Complete the necessary FEMA MT-2 application forms package and pay all applicable LOMR review fees. The submittal shall be certified by a California-licensed professional engineer;

k. Address all FEMA review comments as needed to receive approval of the LOMR; and

l. Notify the CPM of the approved LOMR.

Verification: The project owner shall do all of the following:

1. Submit a copy of the draft application for a CLOMR, to include all backup calculations and the preliminary design drawings, to the CPM 60 days prior to sending the request to FEMA.

2. No later than thirty (30) days after receiving notification from FEMA that all required CLOMR or LOMR documents have been received by FEMA, the Project Owner shall notify the CPM that the project is currently being reviewed by FEMA. During the review process, the project owner shall submit all correspondence between FEMA and project owner's engineer representative responsible for addressing FEMA's comments.

3. Prior to construction activity within the effective SFHA the Project Owner shall provide a copy of the CLOMR to the CPM for verification.

4. Following construction of the channel improvements, the Project Owner shall complete an As-built survey of the improvements, update the hydraulic model, and

prepare a final submittal, to include forms and fees, for a FEMA LOMR request. The Project Owner shall submit a copy of the completed LOMR submittal to the CPM and Kern County for review.

5. No later than thirty (30) days after receiving notification from FEMA that the LOMR has been issued to Kern County the project owner shall submit a copy of the LOMR to the CPM for verification.

SOIL&WATER-7: The project owner shall coordinate with a public entity to establish a BSEP Maintenance District. The project owner shall be responsible for maintaining the integrity, engineering design, and design discharge capacity of the rerouted Pine Tree Creek channel. The maintenance district shall be formed with consideration of all appropriate Waste Discharge requirements presented in **Soil and Water Appendices E** through **H**. The project owner shall also ensure that the BSEP Maintenance District manages utility crossings of the rerouted Pine Tree Creek channel. The Project Owner shall develop the Maintenance District according to the stream alteration agreement as described in the Biological Resources section and in accordance with Condition of Certification **BIO-18**. Funding for the maintenance district shall be provided by the project owner in perpetuity. The project owner shall ensure the following duties are performed:

1. In coordination with the public entity, develop and supervise the implementation of a Channel Maintenance Program in accordance with conditions of certification;

2. Consult with the Maintenance District Manager on the preparation of the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP);

3. Be available to coordinate with the Designated Biologist on mitigation, monitoring, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as special-status species or their habitat, as they relate to maintenance district responsibilities;

4. Notify the CPM of any non-compliance with conditions of certification related to the maintenance district;

5. Respond directly to inquiries of the CPM regarding the maintenance district or the Channel Maintenance Program;

6. Maintain written records of the tasks specified above and those included in the Channel Maintenance Program. Summaries of these records shall be provided to the CPM, as required, per the conditions of certification;

7. Train the Maintenance District personnel as appropriate, and ensure their familiarity with the Channel Maintenance Program;

8. Manage utility crossings at the Diversion Channel;

9. Develop the Maintenance District's CIP Plan and manage the available funds;

10. Be available to coordinate with the public entity during emergency repairs conducted by the Maintenance District;

11. Report to the CPM and the public entity annually the Maintenance District's available funds and annual costs each year since the District was created.

Verification: Prior to receiving a FEMA approved CLOMR, required as a part of Condition of Certification **SOIL & WATER -6**, the Project Owner shall receive written consent from a public entity allowing BSEP to create a special maintenance district. The project owner shall provide a copy of the final Maintenance Agreement to the CPM for approval and shall include a detailed discussion of the funding mechanism for the Channel Maintenance Program and Capital Improvement Projects. The maintenance agreement shall report the name and contact information of the Maintenance District supervisor.

SOIL&WATER-8: Following creation of the Maintenance District, the project owner shall coordinate with the public entity and the Maintenance District supervisor to develop and implement a Channel Maintenance Program that provides long-term guidance to the Maintenance District to implement routine channel maintenance projects and comply with conditions of certification in a feasible and environmentally-sensitive manner. The Channel Maintenance Program will be a process and policy document prepared by the project owner, reviewed by the CPM and the public entity, and adopted by the Maintenance District.

The project owner is responsible for implementing a Channel Maintenance Program as presented in **Soil and Water APPENDIX J**, attached to this FSA. The Channel Maintenance Program shall be developed in consultation with the Maintenance District and the public entity and shall include the following:

1. **Purpose and Objectives** – establishes the main goals of the Program, of indefinite length, to maintain the diversion channel to meet its original design to provide flood protection, support BSEP mitigation, protect wildlife habitat and movement/ migration, and maintain groundwater recharge.

2. **Application and Use** - The channel maintenance work area is defined as the BSEP engineered channel, typically extending to the top of bank, include access roads, and any adjacent property that BSEP or the District owns or holds an easement for access and maintenance. The Program would include Pine Tree Creek maintenance as needed to protect the BSEP facilities.

3. **Channel Maintenance Activities**

   a. **Sediment Removal** - sediment is removed when it: (1) reduces the diversion channel effective flood capacity, to less than the design discharge, (2) prevents appurtenant hydraulic structures from functioning as intended, and (3) becomes a permanent, non-erodible barrier to instream flows.

   b. **Vegetation Management** - manage vegetation in and adjacent to the diversion channel to maintain the biological functions and values proposed in the mitigation. Vegetation management shall include control of invasive or nonnative vegetation as prescribed in Condition of Certification **BIO-18**.

   c. **Bank Protection and Grade Control Repairs** - Bank protection and grade control structure repairs involve any action by the District to repair eroding banks, incising toes, scoured channel beds, as well as preventative erosion protection. The District would implement instream repairs when the problem (1) causes or could cause significant damage to BSEP, adjacent property, or the structural elements of the diversion channel, (2) is a public safety concern, (3) negatively affects groundwater recharge, or (4) negatively affects the mitigation vegetation, habitat, or species of concern.

   d. Routine Channel Maintenance - trash removal and associated debris to maintain channel design capacity; repair and installation of fences, gates and signs; grading and other repairs to restore the original contour of access roads and levees (if applicable); and removal of flow obstructions at BSEP storm drain outfalls.

   e. Channel Maintenance Program – Exclusions including: emergency repair and CIP.

4. **Related Programmatic Documentation** – CPM will review and approve the Channel Maintenance Program programmatic documentation. Maintenance activities shall comply with the stream alteration agreement provisions and requirements for channel maintenance activities consistent with California's endangered species protection regulations and with NFIP regulations.

5. **Channel Maintenance Process Overview**

   a. Program Development and Documentation – This documentation provides the permitting requirements for channel maintenance work in accordance with the conditions of certification for individual routine maintenance of the engineered channel without having to perform separate CEQA review or obtain permits.

b. **Maintenance Guidelines** - based on two concepts: (1) the maintenance standard and (2) the acceptable maintenance condition, and applies to sediment removal, vegetation management, trash and debris collection, blockage removal, fence repairs, and access road maintenance.

c. **Implementation** – Sets Maintenance Guidelines for vegetation and sediment management. BSEP's vegetation management activities are established in Condition of Certification **BIO-18**. Maintenance Guidelines for sediment removal provide information on the allowable depth of sediment for the engineered channel that would continue to provide design discharge protection. The final determination on allowable sediment accumulation will be studied by the applicant as part of compliance with Condition of Certification **SOIL&WATER-7**.

d. **Reporting** – CPM requires the following reports to be submitted each year as part of the ACR:

   i. Channel Maintenance Work Plan - Describes the planned "major" maintenance activities and extent of work to be accomplished; and

   ii. Channel Maintenance Program Annual Report - Specifies which maintenance activities were completed during the year including type of work, location, and measure of the activity (e.g. cubic yards of sediment removed).

   iii. A report describing "Lessons Learned" to evaluate the effectiveness of both resource protection and maintenance methods used throughout the year.

6. **Resource Protection Policies** - establishes policies to ensure that resources would be protected to the fullest extent feasible during routine channel maintenance activities. Policies would be developed to guide decision-making for channel maintenance activities. BMPs shall be developed to implement these policies.

Verification: Following creation of the Maintenance District and at least 60 days prior to the start of any project-related site disturbance activities, the project owner shall coordinate with public entity and the Maintenance District supervisor to develop the Channel Maintenance Program. The project owner shall submit two copies of the programmatic documentation, describing the proposed Channel Maintenance Program, to the CPM (for review and approval). The Project Owner shall provide written notification from the Maintenance District that they plan to adopt and implement the measures identified in the approved Channel Maintenance Program. The project owner shall:

1. In coordination with the public entity and the Maintenance District staff, develop and supervise the implementation of a Channel Maintenance Program in accordance with conditions of certification;

2. Ensure the BSEP Construction and Operation Managers receive training on the Channel Maintenance Program and coordinate with the Maintenance District staff;

3. Coordinate with the Maintenance District staff to develop Maintenance Guidelines;

4. Coordinate with the Maintenance District staff to develop annual and project specific Channel Maintenance Work Plans; and

5. As part of the BSEP Annual Compliance Report to the CPM, submit a Channel Maintenance Program Annual Report specifying which maintenance activities were completed during the year including type of work, location, and measure of the activity (e.g. cubic yards of sediment removed).

SOIL&WATER-9: The project owner shall submit two (2) copies of the 30-percent, 60-percent and 90-percent design drawings for the diversion channel to the CPM for review and comment. The project owner shall prepare a set of design specifications to supplement the 90-percent design drawings. Plans, specifications, computations and other data shall be prepared by persons properly authorized by the State of California. If the 60-percent plans or 90-percent plans and specifications do not comply with the appropriate Conditions of Certification, the necessary changes or revisions to the plans shall be made by the project owner. If the CPM finds that the work described in the plans and specifications conform to the Conditions of Certifications in the Energy Commission Decision and other pertinent LORS, then the project owner shall submit two (2) copies of the 100-percent set for CPM approval. All design drawings must be submitted on bound or stapled 24" x 36" size paper.

Verification: The project owner shall prepare preliminary (30-percent) diversion channel design drawings for CPM review and comment. The preliminary design drawings shall be submitted as required in the verification for Condition of Certification **SOIL&WATER-6**. The project owner shall submit two (2) copies of the 60-percent and 90-percent (with specifications) design drawings to the CPM for review and comment. No later than 30 days after publication of the Energy Commission Decision, the 60-percent set of design drawings shall be submitted to the CPM for review and comment in consultation with CDFG and Kern County. The project owner shall submit the 90-percent design drawings to the CPM after the person who originally drew the plan or their duly authorized agent addresses the CPM's 60-percent submittal comments and required changes directed by FEMA during the CLOMR review. The 100-percent design drawings and specifications (construction documents), shall be signed and sealed by a Registered Professional Engineer in the State of California, are to be submitted as the final, approved set of construction documents prior to site mobilization.

SOIL&WATER-10: The project owner shall comply with the Kern County Division Four Standards for Drainage to estimate an appropriate imperviousness value to apply to onsite storm water runoff and retention basin analyses. Retention basin sizing shall take into account the effects of dust suppressants on infiltration. The applicant shall assess all offsite

drainage areas tributary to the site in the hydrologic study. Runoff from tributaries mapped as a water of the state shall not be piped.

Verification: The project owner shall do the following:

1. Estimate an appropriate imperviousness for the BSEP developed conditions site. Submit a description of the methods used to calculate imperviousness to the CPM for approval at least 60 days prior to submitting the DESCP.

2. Prepare a hydrologic study to estimate the peak flood flows to the BSEP site for two offsite watersheds that drain toward the BSEP: A) the 8.0 square-mile drainage area east of the Barren Ridge watershed and B) the 1.5 square-mile area draining the Chuckwalla Mountains. Submit the hydrologic analysis results to the CPM as part of the DESCP, required as part of Condition of Certification **SOIL&WATER-5**.

3. Provide the open channel design across the solar field for undetained runoff originating from the offsite tributary west of BSEP. Provide the CPM with evidence that a maintenance easement is established for the channel.

SOIL&WATER-11: The Kern County Division Four Standards for Drainage and 44CFR Part 65 require that projects on alluvial fans study the potential for debris flow and sediment movement using engineering methods acceptable to FEMA. The project owner shall analyze the potential for sediment to influence the Pine Tree Creek design discharge. The final analyses shall be reported in the hydrology section of the DESCP, required as part of Condition of Certification **SOIL&WATER-5**.

Verification: The project owner shall submit all calculations necessary for determining a bulking factor to the CPM for review and approval 30-days prior to submittal of the CLOMR application required in Condition of Certification **SOIL&WATER-6**. After FEMA has issued a CLOMR, the final hydrologic analyses with bulking factor applied, if required by the CPM, shall be applied to the diversion channel design discharge.

SOIL&WATER-12: The project owner shall comply with the Kern County Standards for Drainage, Chapter IV and provide engineering analyses and design details for the transition where the diversion channel intercepts the natural channel. The project owner shall provide engineering analyses showing that the shallow flooding along uncertain paths from the south will not cause diversion channel bank failure from lateral overtopping. The project owner shall submit a proposed- conditions grading plan as evidence to show the diversion channel will capture shallow flooding along the left bank (looking downstream) of the natural wash.

Verification: The project owner shall complete the engineering analyses, design, and grading for the transition from the natural channel to the proposed diversion channel to intercept the design discharge along the southern property boundary. The engineered design for this transition shall be provided to the CPM for review and approval at the same time the 30 percent design drawings are submitted to the CPM as required in Condition of Certification **SOIL&WATER-6**. The project owner shall also provide final design details for the transition in the 60 percent and 90 percent design

drawings to the CPM for approval as required in Condition of Certification **SOIL&WATER-9**.

SOIL&WATER-13: The project owner shall complete the hydraulic analyses and final basis of design for the diversion channel, upstream- and downstream-transitions, bank protection, levees (if applicable), and grade control structures using hydraulic criteria for flood velocity, depth, Froude Number, and shear stress appropriate for the anticipated channel stability thresholds. These thresholds are based on the Kern County Division Four Standards for Drainage, Chapter X, where applicable. The value of the Froude Number between grade control structures shall be less than 0.8. Channel design elements not in compliance with Kern County Division Four standards will require a written variance from the County. All grade control structure stilling basins shall be designed with weep drains to prevent perched groundwater conditions and promote groundwater recharge. The project owner shall also be responsible for a geotechnical investigation to test the soils as necessary for final design of the grade control structures and bank stabilization measures. The results of the hydraulic analyses and the geotechnical investigations shall be presented in an Engineer's Report that accompanies each iterative stage of final design (30-percent, 60-percent and 90-percent as required in Condition of Certification **SOIL&WATER-9)**.

Verification: At each iterative stage of final design (30-percent, 60-percent and 90) the project owner shall submit an Engineer's Report that includes the hydraulic analyses and geotechnical investigation results for the diversion channel to the CPM for review and approval. All design variances approved by Kern County shall be provided to the CPM.

SOIL&WATER-14: The project owner shall design the diversion channel to avoid soil cement lining on the bed of the channel between grade control structures to address resource agency comments. The project owner shall install bank toe protection along the entire length of the diversion channel to protect the banks from under-cutting, channel migration, and local erosion.

Verification: The project owner shall provide channel design drawings to the CPM for review and approval. The channel design drawings shall show the cross section detail for the bank toe protection measures, the longitudinal extent of the bank treatment with linear dimensions, and the area of the exposed diversion channel bed between each grade control structure. The design drawings shall be submitted with each verification requirement in Condition of Certification **SOIL&WATER-9.**

SOIL&WATER-15: The project owner shall complete a proposed-conditions sediment transport analyses to determine the final channel slope for the diversion channel that provides a slightly aggredational system that is predicted to result in a braided low flow channel.

Verification: The project owner shall provide to the CPM for review and approval a proposed-conditions sediment transport analyses that predicts an aggredational system for the final diversion channel design. The sediment transport analyses shall be submitted to the CPM at the same time as the engineer's report, required in Condition of Certification **SOIL&WATER-13.**

SOIL&WATER-16: The project owner, in accordance with Kern County Division Four Standards for Drainage, Chapter IV, shall provide engineering analyses or evidence showing that the diversion channel structural design elements will provide protection from hazards associated with the possible relocation of the Pine Tree Creek wash upstream of BSEP project boundaries.

Verification: The project owner shall provide engineering analyses or evidence to the CPM showing that the BSEP flood control facilities will provide protection from hazards associated with the relocation of Pine Tree Creek upstream from the site.

SOIL&WATER-17: The project owner shall stockpile topsoil excavated from the Pine Tree Creek wash separately. The topsoil material shall be used to backfill the energy dissipaters or stilling basins planned as part of each grade control structure. This requirement is in consistent with Condition of Certification **BIO-18**.

Verification: Following construction of the grade control structures and after FEMA approves the CLOMR, the project owner shall use the stockpiled topsoil from the existing Pine Tree Creek wash excavation to backfill the grade control structure stilling basins up to the height of the sill.

SOIL&WATER-18: The project owner shall provide the CPM two copies of the executed Recycled Water Purchase Agreement (agreement) with the recycled waste water purveyor for the long-term supply (30 – 35 years) of disinfected tertiary recycled water to the BSEP. The agreement shall specify a delivery rate to meet BSEP's maximum operation requirements and all terms and costs for the delivery and use of recycled water at the BSEP. The BSEP shall not connect to the new recycled water pipeline without the final agreement in place and submitted to the CPM. The project owner shall comply with the requirements of Title 22 and Title 17 of the California Code of Regulations and section 13523 of the California Water Code.

Verification: No later than 60 days prior to the connection to the recycled water pipeline, the project owner shall submit two copies of the executed agreement for the supply and on-site use of disinfected tertiary recycled water at the BSEP. The agreement shall specify that the recycled waste water purveyor can deliver recycled water at a maximum rate up to 900-gpm and will provide the BSEP a minimum of 1,424-AFY.

The project owner shall submit to the CPM a signed agreement between the applicant and the recycled waste water purveyor for the long-term supply of disinfected tertiary

recycled water from the recycled wastewater purveyors treatment plant to the BSEP for industrial and landscape irrigation purposes.

The project owner shall submit to the CPM a copy of the Producer/User Water Recycling Requirements, the recycled wastewater criteria, the Engineering Report, and the Cross Connection Inspection and Approval report prior to the connection to the disinfected tertiary recycled wastewater pipeline.

SOIL&WATER-19: Prior to the use of groundwater or recycled wastewater for operation of the BSEP, the project owner shall install and maintain metering devices as part of the water supply and distribution system to monitor and record in gallons per day the volume of water supplied to the BSEP. The metering devices shall be operational for the life of the project. An annual summary of daily water use by the BSEP, differentiating between potable, recycled wastewater or groundwater, shall be submitted to the CPM in the annual compliance report.

Verification: At least 60 days prior to use of any water source for BSEP operation, the project owner shall submit to the CPM evidence that metering devices have been installed and are operational on the water pipelines serving the project. The project owner shall provide a report on the servicing, testing, and calibration of the metering devices in the annual compliance report.

The project owner shall submit a water use summary report to the CPM in the annual compliance report for the life of the project. The annual summary report shall be based on volume of water used and shall distinguish recorded daily use of potable and recycled water. Included in the annual summary of water use, the project owner shall submit copies of meter records from the potable water and recycled water supplies documenting the volume of water supplied over the previous year. The report shall include calculated monthly range, monthly average, and annual use by the project in both gallons per day and acre-feet. After the first year and for subsequent years, this information shall also include the yearly range and yearly average potable and recycled water used by the project.

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SOIL AND WATER RESOURCES - APPENDIX A

ACRONYMS USED IN THE SOIL AND WATER RESOURCES SECTION

AF	acre-feet
AFY	acre-feet per year
BFE	Base Flood Elevation
BMP	Best Management Practices
BSEP	Beacon Solar Energy Plant
CalTrans	California Department of Transportation
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CPM	Compliance Project Manager
CLOMR	Conditional Letter of Map Revision
CSDD	Capitol Storm Design Discharge
CVWD	Coachella Valley Water District
CWA	Clean Water Act
CWC	California Water Code
DESCP	Drainage, Erosion, and Sediment Control Plan
DFIRM	Digital Flood Insurance Rate Map
DTSC	Department of Toxic Substances Control
DWA	Desert Water Agency
DWR	Department of Water Resources
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FIRMS	Flood Insurance Rate Maps
FSA	Final Staff Assessment
gpd	Gallons per day
gpm	gallons per minute
IEPR	Integrated Energy Policy Report
KCWA	Kern County Water Agency
LORS	laws, ordinances, regulations, and standards
mg/l	milligrams per liter
MW	megawatt
MWD	Metropolitan Water District of Southern California
NFIP	National Flood Insurance Program
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Services
NWS	National Weather Service
NOAA	National Oceanic and Atmospheric Administration
Porter-Cologne	Porter-Cologne Water Quality Control Act
PSA	Preliminary Staff Assessment
RCRA	Resource Conservation and Recovery Act

RWQCB	Regional Water Quality Control Board
SFHA	Special Flood Hazard Area
SPRR	Southern Pacific Railroad
SSG	Solar Steam Generator
STG	Steam Turbine Generator
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WQMP	Water Quality Management Plan
WSP	Water Supply Plan
WWTP	wastewater treatment plant
ZLD	zero liquid discharge

Soil And Water Resources - Appendix B

OVERVIEW OF MODELING APPROACH AND KOEHN LAKE SUB-BASIN MODEL REVIEW

The proposed Beacon Solar site is located in the Koehn sub-basin, which is part of the larger Fremont Valley Groundwater Basin located in the Mojave Desert and northeast of Antelope Valley, southeastern California. Environmental Simulations, Inc. (BS 2008a) developed a two-dimensional groundwater-flow model of the Koehn sub-basin to evaluate potential pumping impacts as part of the proposed Beacon Solar Energy Project (herein referred to as the "Koehn sub-basin model" or "the model"). Based on staff comments, they completed sensitivity testing with the model in October of 2008, and then refined the conceptual model and model calibration in May 2009 (many of the sensitivity tests were updated using the refined model). The updated model was employed to simulate groundwater level changes in response to pumping from extraction wells for plant construction (5-month simulation) and plant operation (30-year simulation). This appendix assesses model construction, assumptions, parameters, calibration, sensitivities, and simulated results from the May 2009 modeling effort (ESI 2009).[23]

BACKGROUND ON GROUNDWATER-FLOW MODELING

The process of numerical groundwater-flow modeling involves first developing a conceptual model of the physical system and then applying a mathematical model to represent it quantitatively. A conceptual model is a clear, qualitative description of the natural system and its operation including water sources (recharge), flow directions, and sinks (discharge). The conceptual model of the Koehn sub-basin is based largely on the work of Koehler 1977, and was summarized by ENSR in the Application for Certification (BS 2008a).

A mathematical model utilizes equations to simulate the physical processes described by the conceptual model. The potential complexity of processes and variety of boundary conditions require numerical procedures to determine an approximate solution to the mathematical groundwater-flow equations. The Koehn sub-basin model utilizes the numerical mathematical model MODFLOW 2000 (Harbaugh2000), which is an updated version of the U.S. Geological Survey's groundwater-flow model MODFLOW.

[23] The terms "verification" and "validation" are often used interchangeably in hydrologic modeling. Some consider a "valid" groundwater-flow model as meaning it has been adequately demonstrated that the model simulates the cause and effect relationships within a specific groundwater basin. For example, the model adequately simulates the magnitude and distribution of water level changes in response to a change in recharge and pumpage. This type of validation is typically accomplished by conducting a post audit after the modeling study is completed. A post audit assesses whether conditions predicted by the model is confirmed by new field data that has been collected. This type of validation is beyond the scope of our evaluation; rather, we instead consider a "valid" model as a model constructed with an accepted computer code, reasonable parameter values supported by field data, and appropriately defined and implemented boundary conditions. An application is "valid" when all simulations meet typical measures of numerical accuracy (i.e., acceptable mass balance errors and groundwater-level closure criterion) and considers the potential sensitivity of model results to uncertainty in the input parameters.

MODFLOW was originally published and distributed in the 1980's, and is widely accepted and used and verified to produce numerically stable solutions (AndersonWoessner1992).

In applying models to real world groundwater-flow systems, errors can potentially arise from the following sources:

- Conceptual deficiencies (i.e., erroneous basin geometry, incorrect boundary conditions, neglecting important processes, including inappropriate processes, and so forth),
- Numerical deficiencies from errors associated with the equation solvers. These errors introduce problems with computational accuracy and precision, and
- Inadequacies in parameterization (water transmitting and storage properties) and poorly defined stresses (inflows and outflows like recharge and pumping).

The most common errors in model construction are attributed to conceptual deficiencies, inadequate parameterization and poorly defined stresses. The focus of this assessment is: (1) the modeling approach employed to simulate pumping impacts; (2) the assumptions, parameter values, and boundary conditions incorporated into model construction; and, (3) the simulation results and their inherent sensitivity to uncertainty in model input.

CONCEPTUAL MODEL

The Koehn sub-basin is bounded by low permeability rocks and faults, which act as partial barriers to water movement and limit the exchange of groundwater between adjoining sub-basins of the Fremont Valley Groundwater Basin. In the south, the Koehn sub-basin is bounded by the Rand Mountains and Randsburg-Mojave Fault; to the east by the confluence of the El Paso and Rand Mountains; to the north by the El Paso Mountains and Sierra Nevada; and, to the west by the Oak Creek sub-basin. The Koehn sub-basin is further divided by the Cantil Valley Fault and the Garlock Fault. The Cantil Valley Fault is the most hydrologically significant because it acts as a partial barrier to ground-water movement and effectively splits the Koehn sub-basin into two halves that are only partially connected (Koehler 1977).

In the Koehn sub-basin, percolation of runoff from the mountains and possibly subsurface inflow from the Antelope Valley are the primary sources of groundwater recharge (See **SOIL & WATER FIGURE 3**). Under pre- and early area-development conditions, groundwater flow was from the sub-basin boundaries inward toward Koehn Lake, which is the lowest point within the sub-basin and is the primary natural discharge feature. Since the 1950's, evapotranspiration of groundwater extracted by wells increased and this consumptive use reportedly peaked at almost 60,000 acre-feet per year in the mid- 1970's (Koehler 1977). These groundwater extractions resulted in substantial groundwater storage reductions in the sub-basin. During the 1980's, groundwater extractions largely ceased and groundwater levels and storage volumes have since somewhat continuously increased (SAMDA 1997; BS 2008a). The water level increase is localized recovery from substantial past pumping drawdown, where the

recovery is lateral inflow from other parts of the sub-basin, and continued water additions from mountain front recharge and infiltration of storm water runoff (recharge).

MODEL CONSTRUCTION

ASSUMPTIONS

We reviewed ENSR's modeling assumptions and found that most are generally consistent with published descriptions of the conceptual model for the Koehn sub-basin and the objectives specified for the numerical groundwater-flow model. The assumptions used in the model included:

- Groundwater in the Koehn Lake sub-basin is unconfined;
- For modeling purposes, vertical groundwater flow in the saturated zone is ignored and the Koehn Lake sub-basin was represented as a two-dimensional system where flow is exclusively in the horizontal (x-y) plane;
- Faults act as partial barriers to groundwater flow, and are represented in the model as thin, vertical, low-permeability geologic features located at the boundary between two adjacent finite-difference cells;
- Groundwater recharge is primarily from mountain-front recharge and infiltration of storm-runoff into stream beds; and,
- Aquifer compaction and land subsidence is neglected because water levels in the sub-basin have been increasing, and Earth Satellite Corporation (SAMDA1997), concluded the likelihood of subsidence due to groundwater extraction at the proposed project site was small owing to a relative lack of significant clay layers beneath the water table and unconfined groundwater conditions.
- The model simulations are assumed to converge when the residuals in hydraulic head and volumetric fluxes meet a water level closure criterion of 0.001 foot and mass balance error criterion of less than 0.1 percent.

Staff's review of relevant published modeling studies and data provided by the project applicant indicate uncertainty in simulated conditions and therefore some modeling assumptions may be incorrect. The relevant assumptions include two simulated boundary conditions (Antelope Valley inflow and discharge to Koehn Lake, recharge processes, aquifer parameters (hydraulic conductivity and storage coefficients), and water density effects.

- Groundwater inflow across the southern boundary is assumed to decrease from 1,000 acre-feet per year in 1958 to 200 acre-feet per year in 2007 and beyond. Although the magnitude of flux into the Fremont Valley is generally consistent with previous modeling studies completed by the USGS, staff concluded the likelihood of this water reaching the southern model boundary and contributing inflow to the Koehn Sub-basin is questionable. This is discussed in greater detail below under "*Boundary Conditions-Constant Flux*";

- The model employs drain cells to simulate groundwater discharge from Koehn Lake. The simulated discharge ceases by 1976, which staff concluded may disagree with hydrogeologic conditions. This is discussed in greater detail below under "*Boundary Conditions-Fixed Head*";
- The magnitude, distribution, and timing of recharge may be influenced by agricultural return flows and unsaturated zone thickness. This process is not considered by the project applicant's model, although one of the sensitivity tests conducted on the model considers delayed recharge from return flows. The potential consequences of this potential conceptual difference is discussed in greater detail below under "*Recharge and Pumping*";
- The model assumes that water removed from storage is discharged instantaneously with decline in head, and the storage coefficients do not vary with time. However, staff's review of pumping test results and modeling analyses reported by the project applicant suggest a time-delay in the dewatering response to water level declines, and therefore storage coefficients may not be constant but instead vary with time. This deficiency is discussed in greater detail below under "*Storage Coefficient*"; and,
- The groundwater-flow model (MODFLOW) simulates vertical and horizontal groundwater movement of constant-density groundwater in saturated sediments. However, density differences can influence hydraulic conditions and flow near and beneath Koehn Lake.

PARAMETERS

The two aquifer properties specified in the model are hydraulic conductivity and storage coefficient (specific yield). Hydraulic conductivity is a measure of the rate of flow through a strip of aquifer of unit height and width under a unit hydraulic gradient. The storage coefficient is the volume of water an aquifer releases or takes into storage per unit surface area per unit change in groundwater level.

Hydraulic Conductivity

Hydraulic conductivity is a measure of the aquifer's ability to transmit water. There is almost always uncertainty in the magnitude and distribution of hydraulic conductivity owing to the inherent uncertainty of natural heterogeneous systems.

The initial modeled hydraulic conductivity distribution was based largely on Koehler (Koehler1977), with refinements based on model calibration to short-term aquifer tests and various water level records in wells during the period 1958 to 2007 (BS 2008a). Koehler approximated transmissivity from specific capacity[24] data, from which hydraulic conductivity was calculated using an assumed saturated aquifer thickness. The conductivity values inferred from Koehler's transmissivity estimates range from 11.5 to almost 31 feet per day (ft/day) (DB 2008t).

In the Koehn sub-basin model, the calibrated conductivity values range from 0.11 to 68.8 ft/day. Except for the lowest conductivity values (0.11 to 0.52 ft/day), the remaining

[24] Specific capacity is the yield of water from a well, typically in gallons per minute, divided by the associated water level drawdown, in feet. Specific capacity is influenced by the pumping rate, duration of pumping, well construction, well age, and other factors.

calibrated values (20.0 to 68.8 ft/day) are within about 50-percent of the values inferred from Koehler's transmissivity estimates (11.5 to 31 ft/day), and are generally similar to unconfined aquifer zone conductivity values reported by Leighton (2003), for the nearby Antelope Valley Groundwater Basin (2 to 30 ft/day). However, the spatial distribution of calibrated conductivity values in the Koehn sub-basin model are reversed from Koehler's estimate; the calibrated hydraulic conductivity values north of the Cantil Fault (20 ft/day) are approximately one-half the calibrated conductivity values south of the Fault (43.3 ft/day).

ENSR (DB 2008t) acknowledge model conductivity values south of the Cantil Fault are greater than estimated from Koehler's (1977) transmissivity results. They reasoned that uncertainty in aquifer thickness and specific capacity data could explain the differences. ENSR (DB2008t) concluded that model results may be more reliable than Koehler's results because they represent values averaged over a greater basin area than specific capacity data from individual wells. However, staff's experience with groundwater flow models indicates that calibrated conductivity values are often coupled to specified stresses, and therefore uncertainty in the magnitude and distribution of simulated pumping and recharge influence modeled hydraulic conductivity. The AFC (BS 2008a) reports that modeled pumping and recharge are only approximate values. Therefore, because of the coupling between conductivity and specified stresses, staff concluded the reliability of the calibrated hydraulic conductivity is also only approximate.

The two largest conductivity zones represent the area north and south of the Cantil Valley Fault (conductivity zones 1 and 2, respectively, as reported by ENSR, BS2008a). The modeled hydraulic conductivity distribution is uniform and continuous throughout these zones, except for the area beneath Koehn Lake. The modeled conductivity north and south of the lakebed is 20.0 and 43.5 ft/d, respectively, whereas the modeled conductivity beneath the lakebed is 15.3 ft/d (a reduction of 24- to 65-percent, respectively). The hydraulic conductivity reduction beneath the lakebed is generally consistent with the sub-basin's geologic description provided in the AFC (BS2008a) indicating that sediment texture fines towards the lake and that five deep borings in the lake bed found predominantly clay sediments to a depth of 515 ft below ground surface. Specifically, five deep borings in the lakebed reported by the USGS (Dockter1979) encountered 100- to 92-percent clay (average percent clay of 97-percent), whereas confidential well reports provided to staff for wells located one to two miles west and south of the lakebed encountered less clay (average percent clay of 19-percent). These reported observations confirm that that hydraulic conductivity is not uniform but decreases with the increased fining of sediment texture beneath the lakebed. Based on average clay content (97-percent), the expected conductivity beneath the lake bed could be even lower than 15.3 ft/d. A greater conductivity contrast between predominantly coarse and fine grained deposits may influence temporal trends in the magnitude and rate of simulated water level changes and groundwater discharge to the lake (groundwater discharge to Koehn Lake is discussed in detail below under "*Boundary Conditions*").

The lowest calibrated model-conductivity values are located beneath the northern portion of the proposed project site (0.11 ft/d), and beneath the eastern end of the modeled valley (0.40 to 0.52 ft/d). Model calibration to short term pumping test data was used to determine site specific conductivity values, and the low values beneath the

proposed project site seem to correspond to areas mapped by Earth Satellite Corporation (SAMDA 2008) as having significant surficial clay deposits and more frequent and thicker clay lenses with depth. In the eastern end of the valley, no specific capacity or aquifer test data is provided to confirm the lower calibrated conductivity values that were reportedly necessary to simulate high water levels in the area (BS 2008a). A map showing model-calibration target locations (DB 2009o, Figure 2) shows three wells utilized as match points to calibrate the low conductivity values modeled in the eastern end of the valley.

Due to uncertainty in hydraulic conductivity, the model simulations reported by ENSR consider a range in hydraulic conductivity. Uncertainty was considered by conducting parallel simulations that uniformly multiplied hydraulic conductivity values by factors of 0.5 and 2.0 (DB 2009o).

Storage Coefficient

The storage coefficient relates the volume of water released per unit area of aquifer to a unit decline in head. In an unconfined aquifer, the storage coefficient is represented by the specific yield. Koehler estimated a specific yield for the Koehn sub-basin of 0.11 based on well-driller logs, which is the value employed in the model.

Similar to hydraulic conductivity, there is uncertainty in the magnitude and distribution of specified yield. The model assumes that the water removed from storage is discharged instantaneously with a decline in water level, and the specific yield is constant and does not vary with time. Pumping test data analyses conducted with the model and reported by ENSR (BS 2008a) indicate short-term storage coefficients of about 10^{-3} for most of the model area and 10^{-4} for the central part of the project site. These storage coefficient values were determined from short-term tests (several days) and are substantially lower than the specific yield employed in the model (0.11). The applicant concluded the small storage coefficients indicated semi-confined to confined aquifer conditions, which is inconsistent with the conceptual model (the sub-basin is considered an unconfined aquifer system). Alternatively, the small storage coefficients from multi-day pumping tests may indicate groundwater releases slowly from storage as water levels decline. The delay in yield would indicate storage changes are not instantaneous, but instead are a time-dependent process, and significant time may be required to drain the water from storage between sediment grains at amounts that are consistent with the specific yield.

If the pumping test results indeed reflect delayed yield, the assumption that storage releases instantaneously is probably reasonable for long-term simulations (i.e., simulations that consider water level changes over a 30-year period). However, the simulated water level response to shorter pumping periods (i.e., simulations that consider water level changes over a period of several days or weeks) can be under-estimated using the specific yield. ESI (DB 2009o) reported a sensitivity test conducted using the lower storage coefficients to maximize local impacts from the 5-month construction period; the lower storage coefficient resulted in an additional 5 feet of simulated water level decline at the end of the construction period.

Due to uncertainty in the storage coefficient, the model simulations reported by ESI consider a range in specific yield. The uncertainty was considered by conducting parallel simulations that multiply specific yield values by factors of 0.5 and 2.0 (DB 2009o).

Faults

The Horizontal Flow Barrier Package simulates the hydrologic effects of internal faulting within the Koehn sub-basin. It represents faults as thin, vertical, low-permeability geologic features located at the boundary between two adjacent finite-difference cells. The parameter representing the fault is its hydraulic characteristic, in units of per day (day^{-1}); the hydraulic characteristic is the barrier hydraulic conductivity (ft/day) divided by its width (ft).

In the Koehn sub-basin model, four faults are simulated (the Garlock, Cantil Valley, Randsburg-Mojave, and Muroc Faults). With the exception of the Garlock Fault, the calibrated hydraulic characteristics range from about $4x10^{-5}$ to $2x10^{-3}$ day^{-1}, which is generally similar to the range in unconfined zone fault hydraulic characteristics reported by Leighton for their model of the Antelope Valley ($1.0x10^{-5}$ to $4.0x10^{-3}$ day^{-1}). The calibrated hydraulic characteristic for the Garlock Fault is considerably higher than the other three faults (1.0 day^{-1}).

Due to uncertainty in fault hydraulic characteristics, ESI (DB 2009o) reported model simulations that tested model sensitivity to faults by reporting a simulation that removed the Cantil Valley Fault.

BOUNDARY CONDITIONS

The model utilizes three types of boundary conditions: free-surface, constant-flux, and fixed-head (general-head and drain).

Free-Surface

The free-surface boundary condition simulates the water table, which intercepts recharge and subsequently rises and falls in response to simulated recharge and pumping. The model does not explicitly simulate the contribution of irrigation return flows to the magnitude and distribution of recharge, and does not consider potential delays in the timing of irrigation return flows owing to the thick unsaturated zone. These issues are discussed below beneath the heading "*Recharge and Pumping*".

Constant-Flux

Groundwater flow across the southern boundary is specified as 1,000 acre-feet per year in 1958 and decreases linearly to 200 acre-feet per year in 2007. In the future, the specified inflow is assumed constant at 200 acre-feet per year. ENSR (BS2008a) cites Durbin (1978) as the source for a specified inflow of 1,000 AF/yr. Leighton reported that the gradient from the Antelope Basin to the Fremont Basin has not been constant over time, and therefore subsurface inflow to the Koehn sub-basin is not constant over time. Leighton reported that subsurface inflow to the Fremont Basin was about 5,400 AF/yr in 1958, and declined to 200 AF/yr by 1995. If this trend continued after 1995, the inflow probably declined to a value significantly less than 200 AF/yr by 2007.

Durbin1978 represented subsurface flow from Antelope Valley into the Fremont Basin through a gap in the bedrock located southeast of California City (a gap in the bedrock located at the northwest corner of the north Muroc groundwater sub-basin). However, staff's review of Koehn sub-basin model boundaries indicate the model introduces this inflow at a location northwest of California City. **Soil & Water- Figure 1** shows water levels in the California City Sub-basin of the Freemont Valley and the North Muroc Sub-basin of the Antelope Valley are declining (note the observed water level trends in wells 32S/37E-11N1, -12M1, and -26N1). Hence, staff concluded that subsurface flow entering the model southeast of California City, if any, is probably captured, at least partially, by extraction wells in the California City Sub-basin prior to reaching the model boundary located northwest of California City. No information was provided by the project applicant to assess the sensitivity of model results to the magnitude of specified inflow from the North Muroc Sub-basin.

Fixed-Head

Two types of fixed-head boundaries are employed in the model: a general-head boundary along the eastern edge of the model simulates subsurface inflow across the Muroc Fault, and a drain boundary that simulates groundwater discharge to Koehn Lake.

General Head Boundary

The general-head boundary assumes the exchange of water across the Muroc Fault is proportional to the difference between a specified external water level west of the Fault (presumably located within the Chaffee sub-basin) and the model-calculated water levels in the adjacent portion of the California City sub-basin. The external water level is specified at 2,430 feet above mean sea level. The proportionality constant (the general head boundary conductance) represents the effective hydraulic conductivity across the fault and between the two sub-basins, and the distance to the specified external water level. Because the specified external water levels are maintained constant, they assume water levels within the Chaffee sub-basin are stable and simulated flow across the Muroc Fault is solely dependent on model-calculated water levels in the California City and Koehn sub-basins. Based on the model output listing file (ESI2009), simulated flow across the Muroc Fault increases from 704 AF/yr in 1959, to 709 AF/yr in 2007.

Drain Boundary

Groundwater discharge from Koehn Lake is the primary discharge mechanism under pre- and early-development conditions. Groundwater discharge across the lake bed is simulated using drain boundaries, which assume leakage to the drain is proportional to the difference between model-calculated groundwater levels and the specified drain elevation. The drain elevation is considered equal to lake bed elevation, and averages 1,893 feet (ranges from 1,888 to 1,900). The proportionality constant, or drain conductance, is determined by the properties of the interface between the lake bed and deeper groundwater system. The model uses an assumed value of 1 foot per day for the drain conductance (the information source or calibration effort undertaken to estimate this value is not reported).

As justification for employing drain cells, ESI (DB 2009o) cites a USGS modeling study of the Death Valley flow system that also employed drain cells to simulate groundwater

discharge to playa lakes. The USGS approach is significantly different from the Koehn Sub-basin model because it specified drain elevations substantially less than land surface elevation. In the USGS model, the drain elevation is set almost 33 feet below the lowest land-surface elevation, which was assumed a reasonable depth below which evapotranspiration would not occur (the extinction depth) and to represent springs located in land-surface depressions (Faunt2004).

Staff notes there is variability in approaches employed to represent groundwater discharge from bare soil and playa lakes. The USGS Mohave Desert Model (Stamos 2001) employed drains to simulate dry lake evaporation. Similar to the Koehn Sub-basin model, the Mohave Desert Model set drain elevations equal to the average elevation of the lakebed surface and calibrated conductance values ranged from 0.001 to 1.0 ft^2/day. The USGS Antelope Valley Model (Leighton 2003) employed MODFLOW's Evapotranspiration Package to simulate both bare-soil evaporation and transpiration by phreatophytes. The annual maximum evapotranspiration rate was specified when the water table was at land surface and decreased linearly to zero when the water table reached a depth of 10 feet below land surface (the extinction depth).

In the "verification" run (DB 2009o), simulated drain flow (groundwater discharge to Koehn Lake) ceases after 1975 No tests are reported that assess the sensitivity of simulated discharge to drain elevation, conductance and proposed project pumping. Several pieces of evidence indicate groundwater may have continued to discharge to Koehn Lake bed under present day (2008) conditions, which would be contrary to the "verification" run.

- Potentiometric maps prepared by Earth Satellite Corporation for 1985 and 1997 (SAMDA1997, Figures F.2 and F.3, respectively) continued to show groundwater gradients toward Koehn Lake Groundwater gradients toward Koehn Lake could be indicative of groundwater discharge from the lakebed. Alternatively, the project applicant believes most of the water migrating toward Koehn Lake is replenishing storage depleted by historical pumping, and no significant discharge is occurring from the lakebed. In the future, as water levels in the Koehn Sub-basin continue to recover, groundwater will again discharge from the lakebed.
- There is no groundwater level data for beneath the lakebed, and groundwater storage increases beneath Koehn Lake is inconsistent with observed water levels near the lakebed (**Soil & Water – Figure 1**). In March 2008, the water level in 30S/38E-24F01 corresponded to an elevation of 1,893 feet, which is equal to the average lakebed elevation. The water levels in this well have been declining since 1985 at an annual rate of -0.4 ft/year. In March 2008, the water level in 30S/38E-3K02 corresponded to an elevation of 1,880 feet, which is 8 feet lower than the minimum average lakebed elevation (1880 feet). The water levels in this well have been slowly rising since 1985 at an annual rate of only 0.03 ft/year. Lastly, on July 8 2009 staff visited the lakebed south of 30S/38E-3K02 and noted areas of standing water beneath the salt crust. The standing water could be the surface expression of a shallow water table, or it could be the remains of ponded surface water from past runoff events. Without additional data, conclusions regarding the source of standing water are speculative.

- A drain elevation equal to the lakebed surface may ignore potential groundwater discharge to the atmosphere from a shallow water table. Detailed evapotranspiration studies in Death Valley indicate average annual groundwater discharge from dry, salt encrusted and bare-soil playa lakebeds at 0.13 to 0.15 foot per year, respectively (DeMeo2003). The water table underlying these areas ranged from 5 to 10 feet of land surface. If these Death Valley estimates are applied to the Koehn Lake bed, which has an area of about 7,300 acres, the annual evaporation rate from the dry salt encrusted and bare-soil lakebed could be 950 to 1,095 acre-feet per year. These evaporation rates represent about 6-percent of the simulated, average annual water inflow to the Koehn Sub-basin and more than 20-percent of the average simulated pumpage during 1998-2007 (about 4,900acre-feet per year).
- Substantial variations in water salinity and density near and beneath Koehn Lake contribute to uncertainty in groundwater-flow and potential discharge from the lake. Historical water quality data for samples collected below and adjacent to the lakebed indicate groundwater can be high in dissolved solids concentrations. Dockter1979 reported water samples collected 300 to 400 feet beneath the lakebed having TDS concentrations ranging from 1,430 to 110,000 mg/L. Koehler 1977 cited samples from a well located on the northwest side of the lake having TDS concentrations ranging from 68,800 to 101,000 mg/L (30S/38E-3B1). ENSR-2008 documented several additional wells near the lake having substantial TDS concentrations; 30S/38E-5R3 (59,500 mg/L in 1976), 30S/38E-24F1 (13,100 mg/L in 1953), and 30S/38E-32D1/D3 (5,700 mg/Lin 1953). On July 9 2009, staff measured the electrical conductivity of a grab sample from 30S/38E-K02 at 113,000 μS/cm, indicating TDS concentrations of approximately 79,000 mg/L. For comparison, seawater is about 35,000 mg/L (Hem-1985). Without correcting for the salt-density effects, comparisons between groundwater elevations, hydraulic gradients, and flow directions can be erroneous.

RECHARGE AND PUMPING

Simulated 1958-2007 average, annual recharge from mountain-front recharge and infiltration of storm-runoff into streambeds is almost 15,600 AF/yr. This recharge rate was estimated from previous studies (Koehler, 1977; Bloyd, 1967; Welch 2007) and an analysis of historical precipitation and run-off potential (BS2008a). ENSR concluded mountain-front recharge and infiltration of storm-runoff into stream beds could range from 3,000 to 22,000 AF/yr. In addition to mountain-front recharge and storm-runoff infiltration, simulated subsurface inflows across the Muroc Fault and Antelope Valley is 700 and 600 acre-feet per year, respectively. Total simulated average inflow to the Koehn Sub-basin is therefore almost 26,900 acre-feet per year.

During the period 1958 to 2007, simulated annual pumping rates range from 3,357 to 66,115 AF/yr. During the period 1960 to 1976, historical annual pumping rates are based on the Koehler annual consumptive use estimates. After 1976, annual pumping rates included estimated domestic, industrial, and agricultural water uses (agricultural pumping was estimated from irrigated land areas identified by field surveys and aerial photographs). Neither the assumptions and calculations employed to derive the pumping values nor their uncertainty is reported and estimated.

The model relies substantially on Koehler-reported annual consumptive use estimates for simulated pumping rates. Koehler defined consumptive use as being equivalent to evapotranspiration, which is not the same as the applied water or pumpage. Water application rates are usually greater than consumptive use rates because some of the applied water is lost to deep percolation past the plant roots, evaporates from bare surfaces, and so forth. Leighton estimated that 30-percent of the applied irrigation water in the Antelope Valley is not available to the plant and becomes deep percolation to the groundwater system.

The principal crop grown in the Fremont Valley was alfalfa, and Koehler employed a "consumptive use" rate of 6.2 feet per year (ft/yr). Koehler's consumptive use rate is higher than plant water use rates reported for alfalfa grown in similar areas. Leighton cited studies that estimated the consumptive use rate for alfalfa in desert areas at 4.8 ft/yr, and a corresponding water application rate for alfalfa of 6.6 ft/yr.

If the Koehler "consumptive use" estimates in fact represent plant water use, then the volume of water extracted and applied (total pumpage) was substantially greater than 6.2 ft/yr. Conversely, if the Koehler "consumptive use" estimates actually represent the water applied (total pumpage), then a substantial proportion of the 6.2 ft/yr of applied water (approximately 30-percent) probably percolated past the crop roots and was returned to groundwater storage (agricultural return flow). In either case, based on this information staff concluded that potentially important processes (agricultural return flows) and the relationships between total pumpage and groundwater recharge may not be considered by the model.

Staff recognizes it could be argued that the Koehn sub-basin is a one-layer model, and the appropriate input to evaluate is the difference between total pumpage and return flows (net pumpage), which is essentially the water consumed by the plants. However, the analysis of Leighton indicates there is a time lag between when water is applied and when it reaches the water table. Specifically, they employed a 10-year delay for agricultural return flows to percolate through the thick unsaturated zone and reach the water table. Including this time delay will alter the time-series of net pumpage in the model. ESI (ESI2009) conducted a sensitivity test in which "agricultural return flows were added with a 10-year lag". The locations where the return flow is introduced into the model are not identified. After including agricultural return flows, the simulated hydrographs show significant changes in the timing of drawdown and recovery as well as the magnitude of the water levels at the end of the "verification" model run (simulated water levels at some locations were 30 to 50 feet higher in 2007 than the corresponding model run without including the return flows).

CALIBRATION

The purpose of calibration is to establish that the model reproduces observed real-world groundwater levels and flows. During model calibration, model parameters like hydraulic conductivity and storage coefficient are systematically adjusted in an attempt to improve the match between simulated and observed groundwater levels and flows. The result is an improved description of the magnitude and distribution of hydraulic conductivity and storage coefficient in the groundwater system.

All calibrated models are influenced by uncertainty because we cannot define the distribution of parameters like hydraulic conductivity and storage coefficient exactly. There is also uncertainty in the definition of boundary conditions, and uncertainty in the magnitude, distribution and timing of stresses like recharge and pumpage. For these reasons, a sensitivity analysis is performed to assess and quantify the effect of uncertainty on model calibration and predicted water levels simulated by the model. The model simulations reported by ESI (DB 2009o) included calibration sensitivity tests conducted on hydraulic conductivity (multiplied by factors between 0.5 and 2.0), storage coefficient (specific yield multiplied by factors between 0.1 and 10.0), recharge (multiplied by a factor between 0.5 and 10.0), and fault conductance (the conductances of four faults multiplied by factors ranging from 0.1 and 10.0). Additionally, sensitivity tests were included for conductivity, specific yield, faults (removal of Cantil Valley Fault), and agricultural return flows to test their influence on simulated water level changes owing to proposed project pumping.

RESULTS

CALIBRATION

The revised model data input files for the historical calibration run were received from ESI in June 2009, and we ran the model in DOS using executable files obtained from the U.S. Geological Survey's Water Resource Divisions website (MODFLOW Version 1.15.00, 8/6/2004). The model as provided converged in all time-steps

The revised calibrated historical model, referred to as the "verification" run by ESI (DB 2009o) indicates that since 1996 groundwater storage has been increasing at an average annual rate of almost 10,830 AF/yr. Accordingly, simulated groundwater levels have also steadily increased in most wells through the end of the simulation in 2007.

Staff compared the simulated and observed water level recoveries plotted in **Soil & Water- Figure 1** and summarized the results below in **Soil & Water- Table B1**. While ESI (DB 2009o) assessed model calibration and the "verification" using a statistical comparison of the difference between simulated and observed water levels, their assessment did not consider a comparison between observed and simulated water level trends. At nine of the 16 locations in **Soil & Water- Figure 1**, the directions of the simulated and observed water level trends agree. Specifically, the model simulated increasing water levels at eight locations where observed water levels are also increasing (however, the simulated recovery rate at most of the locations was greater than observed). Similarly, the model simulated decreasing water levels at one location where observed water levels are also decreasing. At the remaining seven well locations, the simulated and observed trends were opposite in direction. In other words, the model simulated increasing water levels where observed water levels are decreasing, or the model simulated decreasing water levels where observed water levels are increasing. The specific discrepancies are summarized as follows.

- Two wells are located north of the Garlock Fault (30/37E-4D2 and -13C1), and simulated water levels increased 1.0 to 1.2 ft/yr whereas observed water levels decreased 0.1 ft/yr.

- Two wells are located south of the Randsburg-Mojave Fault (31S/37E-33H1 and -35N1), and simulated water levels decreased 0.6 to 0.7 ft/yr whereas observed water levels increased 0.2 ft/yr.
- One well is located east of Koehn Lake (29S/39E-33K1), and simulated water levels decreased 1.4 ft/yr but observed water levels increased 5.8 ft/yr.
- One well is located west of Koehn Lake and approximately mid-way between the lakebed and proposed project site (30S/38E-30Q1). Simulated water levels increased 3.7 ft/yr but observed water levels decreased 0.5 ft/yr. It is noteworthy that this well is located near two other wells (30S/38E-30P1 and -31C1) where simulated and observed water level trends agree and are both upwards. However, the simulated recovery rate at these two locations is approximately 2 to 4 times greater than observed.
- One well is located near the north shoreline of Koehn Lake (30S/38E-3K2), and simulated water levels at this location decreased 0.8 ft/yr but observed water levels were approximately flat (the calculated trend is 0.03 ft/yr).

Staff noted the water level data reported by ESI (DB 2009o) for some wells are incomplete and appear to be missing observations reported by the USGS after approximately 1999. The missing data reveal water level trends that are quite different from the trends simulated by the model. For example, observed water levels in wells 30S/37E-27H2 and -38G1 both show flat trends after 1999 relative to the upward trends simulated by the model for the same locations. Similarly, observed water levels in 29S/39E-33K1 continued to rise after 1999 whereas simulated water levels show a steady decline beginning around 1975.

Soil & Water Table B1
Observed and Simulated Water Level Trends, Koehn Sub-basin Model

Well Number	Recovery Trend (ft/year)				
	Years	Observed *alpha = 0.05*	Simulated	Simulated/ Observed	Simulated *(without mountain front and infiltration recharge)*
KOEHN SUB-BASIN OF FREEMONT VALLEY					
29S39E33K001M	1996-2006	5.8	-1.4	Opposite	-2.9
30S37E13C001M	1986-2006	(-0.1)	1.2	Opposite	-0.7
30S37E27H002M	1985-2006	2.4	4.9	2.0	3.6
30S37E34H002M	1986-2005	(2.0)	2.7	1.4	0.9
30S37E36G001M	1985-2006	0.6	4.8	8.0	3.5
30S37E36N001M	1993-2006	3.3	5.3	1.6	4.5
30S38E03K002M	1985-2006	0.03	-0.8	Opposite	-2.1
30S38E04D002M	1996-2006	(-0.1)	1.0	Opposite	-0.7
30S38E24F001M	1985-2006	-0.4	-1.0	2.5	-2.2
30S38E30P001M	1985-2006	0.8	3.7	4.6	2.4
30S38E30Q001M	1985-2006	-0.5	3.7	Opposite	2.4
30S38E31C001M	1995-2006	2.6	4.6	1.8	3.7
31S37E04J001M*	1986-2004	5.4	1.4	0.3	-0.6
31S37E04Q001M*	1985-2006	5.6	1.4	0.3	-0.5
CALIFORNIA CITY SUB-BASIN OF FREEMONT VALLEY					
31S37E33H001M	1985-2006	0.2	-0.6	Opposite	-1.1
31S37E35N001M	1985-2006	0.2	-0.7	Opposite	-1.1

Parentheses indicate calculated trend is statistically insignificant at the 95-percent confidence interval

The simulated recovery rate is sensitive to the net difference between recharge and pumpage (net recharge). Net recharge can decrease because of a decrease in mountain-front recharge and/or storm-runoff infiltration, an increase in groundwater consumption by pumpage, and/or increased discharge from Koehn Lake. Reducing net recharge decreases the simulated rate of water level rise. Staff tested “verification” run sensitivity to net recharge by eliminating mountain-front recharge and storm-runoff infiltration. Without mountain-front recharge and runoff infiltration, the model continued to simulate rising water levels at seven well locations. On the average, the resulting decrease in groundwater inflow reduced the simulated recovery rates from 4.2 to 3.0 ft/yr – an average decrease of 1.2 ft/yr (almost 30 percent). The continued inflow causing the water levels to rise is therefore from groundwater storage. Hence, on the average 70-percent of the simulated recovery in some model areas is from the re-distribution of groundwater in storage.

PREDICTIONS

The data input files for the verification and prediction runs were received from ESI in June 2009, and staff ran the model in DOS using executable files obtained from the U.S. Geological Survey’s Water Resource Divisions website (MODFLOW Version 1.15.00, 8/6/2004). The models as provided converged in all time steps.

ESI (DB 2009o) reported model simulation results for groundwater pumping and use owing to project construction and project operations. Project construction is expected to take place over a period of about 26 months, but the most intensive pumping will occur during the first 5 months as the site is prepared and graded. Actual project operations are planned to begin about 21-months after grading and site preparation, during which time a small amount of pumping will continue (about 9 AF per month or less). At the end of the 26-months, project operations are expected to use at most 1,600 AFY of groundwater. For the purposes of their impact assessment, ESI (DB 2009o) initiated the 5-month construction period in 2011 and followed it with 30-years of constant pumping to represent project operations.

Five-Month Construction Pumping

Water usage during site preparation and grading was simulated by the model. The simulated pumping schedule consisted of 338 AF the first month (month 1), 2,025 AF during the next three months at an average rate of 675 AF per month (months 2-4), and 338 AF during the final month (month 5). The total pumpage during the 5-month site preparation and grading period was 2,701 AF, and the pumping rate was assumed equally distributed between seven existing site wells.

Thirty-Year Project Pumping

For project operations, 1,600 AF/yr of pumping was simulated for a continuous 30-year period (DB 2009o). The pumping was assumed to come from one well during the entire 30-year period (either well 48 or 63).

Simulated Impacts

ESI (DB 2009o) summarized the uncertainty in projected maximum water level changes due to pumping owing to uncertainty in model input. Their summary is reproduced below in **Soil & Water Table B2**. For all but the “Zero Recharge” analysis, the impact represents the difference between simulated future water levels without the project and future water levels after 30 years of project pumping. Because the model simulates rising water levels into the future, the impacts in **Soil & Water Table B2** represent the decrease in water level rise relative to future conditions without project pumping. In contrast, for the “Zero Recharge” analysis the impact represents the difference between predicted 2010 water levels and water levels after 30 years of project pumping assuming no mountain front recharge or infiltration of storm run-off. Calculated impacts greater than zero indicate future water levels are lower than predicted in 2010, whereas negative impacts (values less than zero) indicate future water levels are greater than predicted in 2010. Increasing water levels without recharge is the result of the redistribution of groundwater already in storage.

Soil & Water Table B2
Maximum Thresholds and Simulated Impacts from Project Pumping.

Well	Distance to Pumping Well (miles)	Simulated Drawdown and Impacts (feet)[a]					
		Zero Recharge[b]	Base		Maximum from Sensitivity Tests		
			Drawdown[a]	Impact[c]	Drawdown[a]	Impact[c]	Test Name
Pumping Well 63	0.0	33.4	-40	24.5	-30	34.6	K x 0.5
31S37E08C001M	0.6	30.0	-43	21.4	-36	28.5	K x 0.5
31S37E05M01	0.9	31.6	-44	20.5	-37	27.1	K x 0.5
Pumping Well 48	1.0	28.3	-44	21.2	-38	27.7	K x 0.5
31S37E10A01	1.9	-11.0	-48	2.9	-42	8.4	No Cantil Fault
30S37E34H02	2.7	24.1	-43	11.4	-40	14	K x 0.5
31S37E14L01	3.0	-11.7	-47	2.6	-42	7.7	No Cantil Fault
30S37E27H002M	3.4	24.3	-41	9.3	-39	11.2	K x 0.5
31S37E30F001M	3.6	-2.0	-23	2.0	-18	6.6	No Cantil Fault
Well 24	4.1	-7.9	-46	2.0	-43	5.1	No Cantil Fault
31S38E06E001M	4.2	-9.4	-45	1.9	-42	4.7	No Cantil Fault
30S37E36G001M	4.3	15.1	-44	7.3	-43	8.6	K x 0.5
31S37E33H001M	4.5	9.5	-2	0.6	0	2.1	No Cantil Fault
31S37E35N001M	5.3	9.8	-1	0.5	1	1.9	No Cantil Fault
30S37E24J001M	5.4	11.8	-35	5.4	-34	6.5	Sy x 0.5
30S38E32D03	5.6	-10.9	-40	1.3	-38	2.9	No Cantil Fault
30S38E19K01	5.9	9.1	-33	4.5	-32	5.4	Sy x 0.5
30S38E03K002M	10.2	6.3	-25	1.7	-24	2.2	Sy x 0.5
30S38E24F001M	10.2	-6.3	-19	0.3	-18	1.2	K x 2
29S39E32E001M	13.6	13.5	-22	1.3	-22	2	Sy x 0.5
30S39E08A001M	13.7	4.5	-7	0.4	-6	1.2	K x 2
29S39N29N01	13.9	14.8	-22	1.3	-22	2	Sy x 0.5
29S39E33K001M	14.9	8.5	-7	0.4	-6	1.3	K x 2
29S39E28H001M	15.8	18.1	-20	1.1	-19	1.9	K x 2, Sy x 0.5

a) Drawdown calculated as the simulated 2007 water level minus the 2040 water level with project pumping. Negative values indicate that simulated water levels in 2040 are greater than in 2007.

b) ESI (2009) reported simulated impacts in their Table 4 assuming Zero Recharge (no mountain front recharge or rainfall runoff infiltration), and defined the impact as the predicted water level in 2010 minus the predicted water level in 2040 with project pumping. The impact for this model run is equivalent to drawdown.

c) Reported by ESI (2009) in their Table 4, and defined as the simulated 2040 water level without project pumping minus the simulated 2040 water level with project pumping.

CONCLUSIONS

The Koehn Sub-basin model employs a verified computer code (MODFLOW) that is widely used and an appropriate application for this evaluation. The specified aquifer parameters and most boundary conditions appear generally consistent with the published conceptual groundwater system (WR2003; Koehler1977; and others). However, staff identified potential problems with two boundaries specified in the model (Antelope Valley inflow and discharge to Koehn Lake). Model testing conducted by ESI (May 2009) indicate including agricultural return flows can have a significant effect on simulated water levels, but this process was not considered during model calibration.

The key findings and outstanding issues identified by our assessment are summarized below.

1. The model utilizes a specified constant inflow of 1,000 acre-feet per year (AF/yr) in 1958 and decreases linearly to 200 AF/yr by 2007. In the future, the specified inflow is assumed to be constant at 200 acre-feet per year. Previous Antelope Valley modeling studies suggest the inflow is probably significantly less than 200 AF/yr in 2007. In the real world, this inflow enters the Fremont Valley southeast of California City; however, the model introduces the flow at a location northwest of California City. Existing extraction wells in the California City Sub-basin probably capture some, if not all of this inflow prior to reaching the location it is introduced into the Koehn Sub-basin. As a result, there may be little to no contribution of subsurface inflow from Antelope Valley to the Koehn Sub-basin.

2. The model employs drain cells to simulate groundwater discharge from Koehn Lake. In the "verification" run (DB 2009o), the simulated discharge ceases by 1976. A number of factors contribute to the uncertainty of groundwater flow and discharge near and beneath Koehn Lake. For example, water level data and groundwater elevation contour maps seem to indicate groundwater discharge to the lakebed continued beyond 1976. Detailed evapotranspiration studies in other desert basins determined that annual groundwater discharge from dry, salt encrusted and bare-soil playa lakebeds could be significant even when water levels are 5 to 10 feet below land surface. If significant volumes of groundwater continued to discharge from Koehn Lake after 1975, then an important component could be missing from the simulated volumetric water budget.

3. The magnitude, distribution, and timing of historical agricultural return flows are not explicitly considered during model calibration and "verification" runs. Including "agricultural return flows added with a 10-year lag" influenced the timing of simulated drawdown and recovery as well as the magnitude of water levels at the end of the "verification" run (simulated water levels at some locations were 30 to 50 feet higher in 2007).

4. The reported short-term pumping impacts during project grading activities need to be qualified as minimum impacts owing to possible delayed yield effects. Pumping test analyses indicated aquifer storage coefficients vary with time yet the model assumes groundwater releases from storage instantaneously. The assumption is probably reasonable for long-term simulations (i.e., simulations that consider water level changes over the 30-year project period); however, the simulated water level response to shorter pumping periods (i.e., simulations that consider changes over a period of several days, weeks or possibly months) may under-estimate the short-term water level decline. ESI (DB 2009o) reported a sensitivity test using the lower storage coefficients to maximize local impacts from the 5-month construction period; the lower storage coefficient increased the simulated water level decline by about 5 feet.

5. Staff compared the simulated and observed water level recoveries at 16 locations. At nine locations, the directions of the simulated and observed water level trends agree, but simulated recovery rates were typically greater than observed. At the remaining seven locations, the simulated and observed water level trends were

opposite in direction. In other words, the model simulated increasing water levels where observed water levels are decreasing, or the model simulated decreasing water levels where observed water levels are increasing. Lastly, the reported water level data sets for some wells considered by the applicant are incomplete, and in some wells, the missing observations reveal significant differences between actual and simulated water level trends after about the year 2000.

6. Simulated water level trends are sensitive to the balance between water inflows and outflows (net recharge). The applicant conducted a test that eliminated mountain-front recharge and runoff infiltration and showed simulated water levels continue to rise at some locations. Rising water levels in the absence of significant water inflow indicate existing groundwater in storage contributes substantially (almost 70-percent on average) to the simulated water level recovery in some model areas.

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SOIL AND WATER RESOURCES – APPENDIX C

PROPOSED PINE TREE CREEK DIVERSION CHANNEL HYDROLOGIC AND HYDRAULIC ANALYSIS

OVERVIEW/PURPOSE

The proposed Beacon Solar Energy Project (BSEP) site is located near the mouth of the Pine Tree Creek watershed in the South Lahontan Hydrologic Region of the Mojave Desert (DWR2003). Pine Tree Creek, which is mapped by FEMA as a Special Flood Hazard Area (SFHA), crosses the BSEP site. Grading and construction for the BSEP would eliminate 10,900 linear feet (approximately 15 acres) of Pine Tree Creek, 2,150 linear feet (approximately 1 acre) of an unnamed wash on the west side of the project boundary and approximately 400 to 650 acres of Pine Tree Creek flood plain. BSEP has proposed an onsite realignment of Pine Tree Creek around the solar plant. The diversion channel would route the design discharge along the inside perimeter of the BSEP property.

Staff's review and analyses focused on the applicant's analyses of the existing site and the proposed diversion channel presented in following key areas:

- Special Flood Hazard Areas
- Hydrology
- Geomorphic Assessment
- Channel Hydraulics
- Sediment Transport
- Bank Protection
- Grade Control

This appendix provides staff's technical evaluation of the computer models developed by the applicant to study Pine Tree Creek, an ephemeral desert wash, and prepare the preliminary design documents for the diversion channel. Staff's review was to determine: 1) the reasonableness of the applicant's hydrologic analyses; 2) whether the diversion channel would replicate the existing wash's channel morphology and geomorphic function; 3) if the diversion channel design would contain the design discharge; and 4) whether the flood control measures effectively eliminate alluvial fan flood hazards to avoid significant flood impacts. These metrics establish the thresholds of significance for determining increased flood hazards that would result from the proposed flood control facilities.

TECHNICAL REVIEW EVOLUTION AND REFERENCES

Carlton Engineering, Inc. prepared a Conceptual Drainage Study (CDS) (Carlton 2008) to assess drainage patterns associated with the project. The CDS included detailed analyses for the existing and proposed drainage flows through and around the proposed

project and provided the initial basis for the conceptual design. The CDS was submitted to the California Energy Commission as part of the AFC (BS 2008a) and was revised as part of a supplemental drainage study in response to staff's Data Requests.

Staff met with the applicant and their consultants on January 20, 2009 to discuss specific requirements related to the National Flood Insurance Program (NFIP) Regulations, Chapter 44 of the Code of Federal Regulations (44 CFR). Staff also presented the applicant with the local requirements contained in the Kern County Division Four Standards for Drainage and the Kern County Hydrology Manual. The meeting addressed several basis of design related issues identified during staff's review of the AFC. These issues included existing flood hazard analyses, proposed site improvements, hydrologic analysis, hydraulic analysis, proposed flood hazard mapping, and FEMA's Conditional Letter of Map Revision / Letter of Map Revision (CLOMR/LOMR) application process. The applicant agreed to re-evaluate their design and resubmit detailed engineering analyses for the diversion channel.

California Department of Fish and Game (CDFG) commented on the BSEP AFC in a January 26, 2009 letter to the Energy Commission with provisions typically included in a Streambed Alteration Agreement. CDFG also provided comments on the engineering design of the channel in a February 10, 2009, Interoffice Technical Memorandum, prepared by Kris Vyverberg, CDFG Senior Engineering Geologist. CDFG's written comments echoed Energy Commission staff's concerns with the engineered channel design.

Staff published the Preliminary Staff Assessment (PSA) on April 1, 2009. The PSA concluded that the design of the engineered channel was inadequate for flood control and for reproducing the hydrologic and hydromorphic functions of the wash. Staff presented the applicant with numerous requests for data needed to determine whether the BSEP diversion channel would replicate the existing wash's channel morphology and geomorphic function, contain the design discharge to reduce the risk of flooding, and replace the natural and beneficial functions of the existing desert wash, especially wildlife habitat/movement corridor. Staff requested the following engineering studies: Revised Conceptual Drainage Study, Geomorphic Study, Revised Diversion Channel Design, and a Soils Engineering Report.

On April 14, 2009, a public meeting was held to discuss issues related to the project identified in the PSA. At the time of the meeting, the applicant had not fully completed the studies required for developing their basis of design for the diversion channel. In a letter from the California Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board) dated April 17, 2009, the Lahontan Water Board's staff concurred with CEC staff concerns regarding storm water management as described in the PSA. Lahontan Water Board staff understood that the diversion channel design was being revised and, therefore, did not provide detailed comments on the applicant's plan in their letter.

On May 1, 2009, the applicant submitted its comments on the PSA. These comments did not address Staff's assessment of the proposed diversion channel plan. The applicant requested a meeting with Energy Commission staff which was held on May 13, 2009 to present their basis of design and to present new maps of the revised

diversion channel design. The primary changes to the design were an increase in the design flow to 28,000 cfs, grade control structures for the channel, and slightly revised channel dimensions. Staff asked detailed technical questions and provided comments for the applicant to address prior to the applicant formally submitting the updated design.

The applicant provided the Energy Commission with an update to the conceptual design on June 23, 2009 (DB2009r). Staff requested numerous electronic data files used to test the design criteria. On June 29, 2009, staff was provided access to the applicant's computer models. Several of the models had missing input files and could not be adequately reviewed without making considerable assumptions on the model setup and procedures. Two days later, on July 1, 2009, the CEC held a public workshop in California City, CA. At the workshop, staff provided additional comments on the basis of design and proposed diversion channel design. Staff also requested additional hydrology and hydraulic modeling data that the applicant was revising subsequent to the July public workshop. On July 20, 2009, the applicant reported that their application for the CLOMR would be completed and sent to the County of Kern for review and comment before submitting to FEMA for approval. As of the date of this FSA, the hydrology updates and the CLOMR application have not been provided to staff.

SPECIAL FLOOD HAZARD AREAS

The Flood Insurance Study (FIS) for Kern County, California and Incorporated Areas (FIS Number 06029CV001A), became effective on September 26, 2008. The county-wide FIS investigates the existence and severity of flood hazards in, or revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Kern County, California and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Most of the hydrologic and hydraulic analyses for the original FIS study are from the 1980s. The County's FIS includes flood hazard data in the region of BSEP. Staff used the data to evaluate the applicant's floodplain management plan. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations, 44 CFR, 60.3. (FEMA 2008).

The effective Digital Flood Insurance Rate Maps (DFIRM) were developed using a straight conversion from paper maps or Flood Insurance Rate Maps (FIRMs). The method used to convert the Special Flood Hazard Area (SFHA) to the digital format did not include new analyses. The "straight conversion" did not correct for topographic irregularities in the mapping. The result of the effective DFIRM mapping is that there continues to be inconsistencies with the actual flood hazard and the mapped flood hazard. For instance, when comparing the Pine Tree Creek SFHA to the existing channel, staff notes that the mapped floodplain does not always contain the low flow channel. These inaccuracies reflect the limitations of applying the effective floodplain mapping to the BSEP project.

In addition to data retrieved from published FEMA documents, staff collected data from various sources including the National Weather Service; National Oceanic and Atmospheric Administration (NOAA), U.S. Army Corps of Engineers (USACE); U.S.

Geological Survey (USGS); National Resources Conservation Services (NRCS), California Department of Water Resources (DWR), California Department of Fish and Game (CDFG), California Department of Transportation (CalTrans); Kern County Water Agency (KCWA), Kern County Planning Department, Public Works Department, and several other sources.

Kern County Water Agency and Kern County Planning Department participate in the Cooperative Stream Gauging Program. The stream gauge at Pine Tree Creek (USGS 10264750) is located13 miles northeast of Mojave, CA. The gauge is located on the downstream side of the Los Angeles aqueduct siphon pier near the right bank. The drainage area at this gauge is approximately 33.5 square-miles. USGS established the gauge in 1958. Data is available from 1958 through 1976. Another gauge on Cottonwood Creek (USGS 10264770) recorded annually during the period 1967 to 1972. A third nearby gauge is located on Cache Creek, which also has less than 10 years of data.

RIVERINE FLOOD HAZARDS

Kern County, due to its large extent and varied geography, has several hundred potential flood sources and approximately one-half million acres of FEMA identified SFHA's. The types of floodplains within the County are very diverse and include riverine floodplains (fast moving channelized flow), distributary flow floodplains (very broad, slow moving, shallow flow), and alluvial fan floodplains (heavily sediment laden, broad, shifting, and rapid moving flow) (FEMA, 2008).

Pine Tree Creek is the principal drainage feature with a high potential for flooding at the proposed BSEP site. Pine Tree Creek originates from the Pine Tree Canyon, which has a drainage area of 33.5 square-miles near the mouth of the canyon. After leaving the canyon, Pine Tree Creek forms and flows across an alluvial fan and crosses beneath State Route-14 (SR-14) and the Southern Pacific Railroad (SPRR) tracks before it becomes more of a distributary flow floodplain on the alluvial flat or piedmont where the Beacon site is proposed. The distal terminus of the Pine Tree Creek alluvial fan is near its confluence with Jawbone Creek.

Pine Tree Creek conveys offsite runoff across the property from the south to the northeast. The Federal Emergency Management Agency's effective DFIRM for Kern County (FEMA, 2008) indicates that portions of the BSEP site are within the FEMA designated SFHA 'Zone A' floodplain area. The FEMA SFHA Zone A is the flood insurance rate zone used for 1-percent-annual-chance (base flood) floodplains that are determined for the Flood Insurance Study (FIS) by approximate methods of analysis. Because detailed hydraulic analyses are not performed for such areas, no Base Flood Elevations (BFEs) or depths are shown in this zone. Mandatory flood insurance purchase requirements apply.

FEMA SFHAs in the Pine Tree Creek watershed are mapped for several miles upstream from its confluence with Jawbone Creek. Upstream of the BSEP property, the SFHAs follow two primary sub-watershed drainage paths: Pine Tree Canyon and the

Barren Ridge flats. It is clear from comparing recent aerial photos to the DFIRM mapping (especially along the flats) that the SFHAs do not always coincide with the location of the channels.

The requirements of the CLOMR process require delineation of the revised 1-percent-annual-chance floodplain in accordance with 44 CFR 65.12. Staff recommends the applicant use FEMA's Guidelines and Specifications for Flood Mapping Partners for guidance in determining the technical requirements for submitting an application for a CLOMR / LOMR. Staff has requested a copy of the CLOMR application as part of Condition of Certification **SOIL&WATER-6**, which is being prepared concurrently with this FSA.

HYDROLOGY

The applicant's CDS provided a preliminary evaluation of pre- and post-development site hydrology for the site and its tributary areas. The results of the CDS were used to provide preliminary design flow rate criteria for the proposed diversion channel and onsite drainage features. The applicant used USDA Natural Resource Conservation Service Technical Release 55 for estimating runoff from the site and from small offsite areas draining the site. In the PSA, staff commented on the analysis results and recommended a new analysis for further staff evaluation. Subsequently the applicant used the US Army Corps of Engineers rainfall-runoff computer model HEC-HMS to re-study the hydrology at the site.

This section provides Staff's technical comments on the hydrologic analyses conducted for BSEP, describes regional watersheds near the project, and presents a summary of historic flood events for context. Staff reviewed the hydrologic analyses, a basis-of-design component, in the development of the Soil & Water impacts analysis section of the FSA.

The goal of staff's review of the applicant's hydrologic evaluation is to provide an assessment of the "reasonableness" of the applicant's proposed base flood discharge estimates and, if necessary, to suggest alternative methods that may provide more reasonable flood discharges. The reasonableness of a flood discharge depends on the study requirements and hydrologic conditions in the region of interest (FEMA 2008).

REGIONAL WATERSHEDS

California Department of Water Resources identified 10 hydrologic regions in California that were delineated based on their similar geographic, climatic, and hydrologic characteristics. The BSEP site is within the South Lahontan Hydrologic Region. The South Lahontan Hydrologic Region has been further subdivided into 78 basins and sub-basins. This analysis primarily evaluates the Pine Tree Creek Watershed located within the Fremont Valley Groundwater Basin. Pine Tree Creek originates at Barren Ridge and Pine Tree Canyon in the Tehachapi Mountains, southwest of the BSEP site.

Pine Tree Canyon drains along an alluvial channel that flows through an existing six cell 8'x8' Reinforced Concrete Box (RCB) culvert at SR-14. Staff estimates this culvert can convey flows of nearly 4,000 cubic feet per second (cfs). The SR-14 culvert outfall forms an artificial hydrographical apex for flows within the culvert's capacity. Flows greater than the capacity of the culvert would simply overtop SR-14. No attenuation of flow is expected in any overtopping event. According to Caltrans, the six cell culvert has not been overtopped since its construction. Downstream of SPRR, Pine Tree Canyon flows join with runoff from the Barren Ridge area and drain toward the BSEP site. The total drainage area is approximately 83.2 square-miles.

Based on staff's review of a regional topographic map, a large portion of the Chuckwalla Mountains appears to be tributary to the BSEP site. Staff could not determine the historic offsite drainage patterns from this offsite watershed area. State Route-14 and the SPRR separate the Chuckwalla Mountains sub-watersheds from the BSEP site. Staff has identified several large culvert crossings along SR-14 and SPRR that currently direct runoff from the foothills toward the site. Staff identified this basin and its possible alignment toward the BSEP site in our PSA Appendix C conclusions. The applicant maintains that a ditch located immediately outside of the BSEP's western property boundary that would divert runoff from this area to the north. Drainage from this basin is not accounted for in the current BSEP onsite drainage plan.

A small sub-watershed, having a drainage area of approximately 1.5 square miles, drains to State waters that cross the site from the west. Staff calculated the peak flowrate for this sub-watershed using regional regression equations. The 100-year peak discharge entering the BSEP site could range between 700 cfs and 1,440 cfs depending on which regression equation is used. Staff estimates that a ditch with similar design characteristics (roughness, side slopes, longitudinal slope, etc) to ditches planned at the site would require a bottom width of at least 20 feet and require 3.0 feet of depth plus another foot for freeboard. The applicant has proposed to route the drainage from this small sub-watershed through the site in a culvert or ditch but has not provided specific details about the size of conveyance required to convey the offsite runoff. Peak runoff calculations for this sub-watershed were not included in the Project Design Refinements, hydrologic calculations (DB 2009r). Staff is concerned that an insufficiently sized conveyance could affect areas adjacent to the BSEP site including the transportation corridors: SR-14 and SPRR.

BSEP ONSITE HYDROLOGY

The applicant's CDS presented the results of an onsite drainage analyses required by Kern County to quantify the pre- and post-developed conditions runoff and appropriately size attenuation basins. The BSEP Retention Methodology chapter of their Conceptual Retention and Grading Study (DB2009r) established the plan for attenuation of post-developed runoff. The applicant would design retention basin (ponds) with enough capacity to store onsite runoff from the developed solar plant and match pre-developed runoff from the site. Staff has not received the final design calculations but the applicant has adequately described their proposed methods in the BSEP Project Design Refinements (DB 2009r).

Final design considerations for the onsite peak runoff, conveyance facilities, and retention basin size and location are primarily a function of the proposed site imperviousness and ability to percolate rainwater. The CDS identified Desert Shrub as the hydrologic cover type for the site, which is a predominantly pervious surface. CDS classified most of the soils across the site as Hydrologic Soil Group A, which has a very rapid permeability (6-20 inches per hour). A small portion of the site contains Hydrologic Soil Group D, which has moderately slow percolation rates from 0.2 to 0.6 inches per hour. Due to the increase in impervious area from site development, the post-development curve numbers or runoff coefficients (related to imperviousness in hydrologic calculations) need to increase above the existing condition values in the final analysis.

As proposed, BSEP would alter historic storm water flow paths and change runoff patterns from the property. To reduce the peak developed-conditions discharge from the site to the estimated pre-developed conditions, the applicant proposes several shallow retention basins to collect runoff generated from the developed solar array. The ponds would be linked via shallow, gradually sloped swales. The applicant used an approximate imperviousness estimate of 17.34% to calculate the preliminary retention volume for the entire site. Using the Kern County Division Four drainage standards, the applicant estimated the total retained volume at 58.5 acre-feet. The applicant compared this estimate to the requirements in the California Storm Water Quality Association (CASQA) California BMP Handbook and found the Kern County method would provide sufficient storage to meet the CASQA's requirements.

At the time of this FSA, the applicant has not determined the impervious relationship between pre- and post-developed conditions. The applicant met with Kern County to discuss their methods for estimating BSEP imperviousness but could not determine a final value since the BSEP finished surface is not yet certain. Staff agrees with the applicant that the impervious area is somewhat subjective for this type of development. Staff's Condition of Certification **SOIL&WATER-10** requires that the applicant demonstrate how imperviousness for the site was calculated. The applicant shall report site imperviousness in the DESCP in accordance with Condition of Certification **SOIL&WATER-5** and apply the CPM-approved imperviousness to size retention basins as part of the final onsite drainage study.

Staff is concerned that application of dust suppressants on disturbed land would affect the infiltration and percolation of rainwater. A reduction in the percolation rate could dramatically increase the amount of anticipated runoff from the developed site. The applicant has not provided an acceptable recommendation for increasing the runoff coefficient for these treated lands but has agreed to increase the capacity of the site's retention facilities to account for higher values. Condition of certification **SOIL&WATER-10** requires that the storm water retention facilities account for increased rainfall-runoff resulting from the application of dust suppressants.

BSEP will convey offsite sub-watersheds that drain toward the site historically across the solar field. These flows would not mix with onsite storm water. Staff agrees with this approach and has established Condition of Certification **SOIL&WATER-10** that requires conveyance on the surface (not piped) and that the applicant provide an adequately sized easement for maintenance.

PINE TREE CREEK HYDROLOGY

In their initial estimate of the peak design flow for the Pine Tree Creek diversion channel, the applicant plotted drainage area versus peak flow estimates from the 1995 FEMA Flood Insurance Study (FEMA, 1995). The applicant interpolated from the curve to estimate the design discharge for the 83.2 square-mile watershed between 14,000 to 20,000 cfs for Pine Tree Creek (BS 2008a). Staff concluded in the PSA that 20,000 cfs is a reasonable estimate compared to peak flood estimates in analogous watersheds and regional regression statistics. Staff recommended that the applicant conduct additional analyses following Kern County's method and select a model from the list of FEMA's "Numerical Models Meeting the Minimum Requirements for the NFIP". Staff also recommended that the applicant assess the potential for sediment to increase, or bulk, the peak design flow rate.

On May 13, 2009, the applicant reported their new design flow at 28,000 cfs. Sediment bulking did not influence the results. Staff requested the HEC-HMS computer model in an effort to conduct a detailed review of this important basis-of-design value. The main file was provided but several files associated with the model were not. Staff was unable to review the input parameters used in the model. Relying on the information provided in the Project Design Refinements, hydrologic calculations (DB 2009r), staff concluded that the 28,000 cfs was reasonable, and may be considered conservative when compared to prior studies in the South Lahontan Hydrologic Region of the Mojave Desert. At the July public workshop, staff recommended that the applicant determine the sediment bulking factor using methods acceptable to FEMA before submitting the CLOMR application.

Staff requested a copy of the final technical analyses used as the basis for the CLOMR application. At this time staff has not received this information.

REGIONAL HISTORIC FLOODS / FLASH FLOODS

Staff's research on historic flood events near the BSEP site acknowledge the potential for flood hazards associated with desert hydrology. Nearby areas in Kern County have suffered from numerous damaging floods. The following accounts describe several large events that were reported or recorded since 1961. (Source: NOAA, The Interior Central California Climate Calendar, http://www.wrh.noaa.gov/hnx/ WXCALENDER.pdf and FEMA 2008). These flood events are important to include in this analysis because they provide a realistic understanding of the damaging potential for flash flooding in the region and where the applicant is proposing the BSEP.

> August 23, 1961 - Flooding resulting from a thunderstorm covered roads with water and mud, trapping passengers in at least 20 cars in the Mojave area. Railroad tracks were blocked with debris for up to 18 hours.

August 17, 1983: Portions of California City were flooded after heavy rain fell in the Tehachapi Mountains and caused Cache Creek to swell. Water was the height of car windows and some houses flooded.

In 1984, there was a significant debris/mud flow from Short Canyon, which deposited sediment up to eight feet deep on properties within the subdivision in the immediate vicinity of Short Canyon.

September 5, 1991: Near Inyokern, CA, heavy rain fell causing water and mud to cover Highways 178, 395 and SR-14.

September 5, 1997 - An evening thunderstorm unleashed heavy rain in the El Paso Mountains. The thunderstorm moved from southwest to northeast up the El Paso Mountains. Reports indicated that 4.5 inches of rain fell from this storm in a little over an hour's time. The resulting flash flood through Red Rock Canyon State Park brought 28,000 cfs down through the park, across SR-14 and the Redrock-Randsburg Road. Reports indicated that a 12-foot wall of water swept over Highway 14 and subsequently over Redrock-Randsburg Road. The flooding stranded one hundred motorists and swept four cars into the water.

July 23, 2005 - Monsoonal moisture swept northwestward into the south half of California early in the morning and lingered through the next day. The deserts and mountain areas received locally heavy rain from thundershowers that resulted in numerous areas of desert stream flows. Radar estimates indicated 1-hour precipitation amounts of 2-3 inches and storm totals in excess of 4 inches. Flooding was reported along Highway 14 near Redrock-Randsburg Road.

August 15, 2005 - Thunderstorms unleashed heavy rain in California City during the evening hours resulting in flash flooding. The California City Fire Department recorded 5 inches of rain in just an hour. Portions of Highway 14 and Highway 58 flooded.

STAFF'S HYDROLOGIC ANALYSES

Staff conducted hydrologic analyses to assess the reasonableness of the applicant's peak discharge estimate. The results of the analyses below are compared to the results from the applicant's HEC-HMS model results. Staff did not prepare a rainfall-runoff model for the Pine Tree Creek watershed. Staff used the following hydrologic methods to analyze the Pine Tree Creek Watershed hydrology:

- Bulletin 17B, Guidelines for Determining Flood Flow Frequency, to determine peak flow data at the following gauging stations: Pine Tree Canyon; Cottonwood Creek; and Cache Creek
- Developed Regional Regression based on FEMA FIS Data
- California Regional Regression - South Lahontan-Colorado Desert Region
- Hybrid regional regression equations
- USGS regional regression equations (WSP 2433)

Because little historical streamflow and precipitation data exist, Staff's hydrologic analyses are rough estimates. With little historic data, the possibility of accurately predicting discharge for a given frequency is low.

Flood Flow Frequency

Staff performed statistical flood-frequency analysis using the Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (Interagency Advisory Committee on Water Data, 1982) to perform a flood-frequency analysis. Staff obtained data from Water Supply Paper (WSP) 2433 – Methods for Estimating Magnitude and Frequency of Floods in the Southwestern United States (USGS, 1997a). Pine Tree Canyon stream gage data from 1958 through 1976 were used for the analysis. **Soil & Water Table C1** presents data collected by the USGS. The highest measured flow was approximately 30,000 cfs in 1961 although the data source noted a footnote for this event. Unfortunately, staff could not locate the actual footnote. The 1961 data point was omitted from the final analyses because staff could not find any other historic record of the extreme rainfall event and determined the data may be inaccurate. In addition, staff's flood-frequency analysis, with the data point included, showed values too extreme for the 1% annual chance flood (base flood).

Soil & Water Table C1
Annual Peak Flowrate measured from the Pine Tree Canyon Gauge

Year	Annual Peak Flow (cfs)		Year	Annual Peak Flow (cfs)
1959	7.6		1969	76
1960	6.9		1970	0
1961	30,000		1971	0
1962	103		1972	330
1963	1,220		1973	77
1964	5		1974	0
1965	10		1975	4,900
1966	660		1976	5.3
1967	60		1977	130
1968	0		1978	7,700

Pine Tree Canyon is a sub-watershed having much different characteristics from the remaining Pine Tree Creek watershed area. The canyon also represents less than half of the watershed area but has the greatest potential to influence peak flow rates to the BSEP site. Staff concludes that a direct area transformation of the gauge data would not be appropriate for this assessment.

Using standard statistical methods, Confidence Intervals (C.I.) were determined at one standard deviation, or 68% C.I. to identify the upper and lower limits of the standard error for the base flood flow derived from the flood-frequency analysis. The proposed base flood discharges from the BSEP assessment are considered reasonable if they are generally within one standard error (68-percent confidence intervals) (FEMA, 2008).

Regression Analyses

Soil & Water Table C2 below presents the results of several hydrologic studies conducted for watersheds having similar climatic characteristics as Pine Tree Creek. Each watershed peak discharge is plotted with its tributary area on the log-log scale plot. The following table shows which watersheds are plotted on **Soil & Water Figure C1**.

Soil & Water Table C2
100-year Peak Flowrate from the effective FEMA FIS

Watershed	Location	Tributary Area	Annual 1% chance Peak Flow (cfs)
Blackburn Creek	downstream of Tehachapi Blvd	28.2	12,030
Blackburn Creek	at Tehachapi Bldg & Dennison Rd	10.1	7,450
Blackburn Creek	at Western Corporate Limits	16.2	9,090
Blackburn Creek	Near Highline Road	4.5	5,290
Cache Creek	at Downstream Limit of Study	163.4	7,800
Jawbone Canyon Wash	at Munsey Road	280.4	36,000
Cottonwood Creek	at mouth	51.0	7,800
Erkskine Creek	At State Highway 179	37.7	7,700
Kelso Creek	At State Highway 178	159.5	22,700

Discharge-frequency values for Kelso Creek and Erskine Creek were determined by FEMA study contractors using NRCS Technical Release No. 20 (TR-20). This rainfall-runoff model is consistent with the BSEP's initial onsite hydrologic analyses. The model considers factors such as precipitation duration-frequency data, hydrologic soils groups and land use, time of concentration, and storm type. The FEMA study contractor for Kelso and Erskine Creeks compared results from the TR-20 computer model with the results of log-Pearson Type III analyses of nearby gauging station data (FEMA 2008). The results of these two rainfall runoff models produced a base flood flow within the range of the regional regression equations described below.

The authors of the California state-wide rural regression equations, Waananen and Crippen, mention that in the Lahontan region, the equations are defined for watersheds having a maximum drainage area limit of 25 sq. miles. Because the drainage area of the Pine Tree Creek watershed is 83.2 sq. miles, the California regression equations were

not used for estimating peak discharges. The authors also describe the regression equations standard error of estimate has a range of 60% to more than 100% (Waananen and Crippen, 1977).

Hybrid Regional Regression Equations

The California Department of Transportation, Division of Research and Innovation published the "Improved Highway Design Methods for Desert Storms" in August 2007 (West, 2007). This report was recommended to staff by Andrew Brandt, an engineer with Caltrans, District 9 (Brandt, Pers Comm, January 21, 2009). Using the following regression equation from the West study, the Q100 is 10,400 cfs.

$$Q = 557.31 * A^{0.662}$$

This regression equation is applicable for sites with a drainage area between 0.01 and 3090 square miles, with a mean annual precipitation of less than 15 inches and a mean basin elevation of less than 4500 ft. This regression equation is plotted on **Soil & Water Figure C1**.

USGS Regional Regression Equations

Water Supply Paper 2433 (WSP2433), Methods for Estimating Magnitude of Frequency of Floods in the Southern United States (USGS, 1997), identifies the BSEP site as being located in the USGS Southern Great Basin Area 10. Staff tested the USGS regional regression methods for the USGS Southern Great Basin. This method is applicable for drainage areas less than 200 square miles and below 8000 feet in elevation. The USGS regression equation for Q100 is shown above and plotted in **Soil & Water Figure C1.**

$$Q = 850.0 * A^{0.690}$$

The resulting USGS regression analysis peak flow for the site is 17,960 cfs. The envelope curve shown in **Soil & Water Figure C1** is reproduced from the USGS WSP2433, represents the maximum flow potential for a given area.

The Pine Tree Creek watershed is approximately 83.2 square-miles at the BSEP site. A range of peak flood predictions for the Base Flood Flow or Capitol Storm Design Discharge (CSDD) can be approximated from **Soil & Water Figure C1**.

SEDIMENT / BULKING FACTORS

The applicant did not provide sufficient information for staff to assess the potential for significant debris laden flows and their impacts. Sediment has a high potential for contributing to the volume of flow being transported during a flood. Kern County currently does not require increasing the volume of water discharge to account for high concentrations of sediment in the flow but does require sediment analyses per Division Four Chapter IV. This method is generally applied to the peak design flow to obtain a total (bulked) peak flow. Typical bulking factors are 1.11 – 1.25 for normal stream flow, 1.25 – 1.67 for hyperconcentrated flow, and up to 2.0 for debris (Bradley, 1986). Caltrans recommends selection of a larger bulking factor when the flow is confined to a single, well-defined channel (Caltrans 2006), such as the proposed diversion channel.

Determining the appropriate bulking factor would require a significant understanding of the watershed and its ability to produce sediment debris flow (West, 2007). The applicant conducted a preliminary sediment transport analysis (discussed below) and applied a bulking factor of 15% to the inflow boundary condition. The applicant also identified the potential for "high suspended sediment concentration during flood conditions" that can exceed concentrations of 100,000 parts per million by weight. Staff's Condition of Certification **Soil&Water-11** requires that the applicant determine a bulking factor, consistent for use on alluvial fans, as part of their hydrologic analyses to comply with Kern County Division Four Standards for Drainage, Chapter IV, Section 404-2. Compliance with this condition will ensure the diversion channel design mitigates the effects of sediment-laden flow.

GEOMORPHIC ASSESSMENT

Staff conducted a desktop geomorphic assessment and reconnaissance of Pine Tree Creek to develop an understanding of the current geomorphic conditions of the wash and assess the potential for the diversion channel to provide similar morphological conditions for successful mitigation. Staff used topographic maps, aerial photographs, and ground reconnaissance to estimate flood boundaries to show areas at risk from flooding. These boundaries were used to define the active channel and flood-prone areas that have undetermined magnitude or frequency.

Staff focused on fluvial erosion and deposition to be the main geomorphic processes affecting Pine Tree Creek. Aeolian deflation and deposition (winds' ability to erode, transport, and deposit materials) might have minor affects on the existing wash but could have a significant effect on the low-lying diversion channel to accumulate wind blown sands. It is important to note that ephemeral channels on alluvial fans are among the most unpredictable and unstable channel forms and attempts to predict their future evolution and behavior are subject to great uncertainty.

Staff initially compared the existing wash and proposed diversion channel slopes to the work conducted by Leopold and Wolman (1957), as shown in **Soil & Water Figure C2**, to establish the threshold between meandering and braided channel forms, based on a bankfull discharge and channel slope relationship.

The work performed by Leopold & Wolman, shown on **Soil & Water Figure C2**, help explain channel form, given channel slope and flow rate. Staff used **Soil & Water Figure C2** and data from the design to estimate potential channel form for the active channel. The longitudinal slopes of the diversion channel would be set to approximately 0.002 feet/feet (or mm^{-1}) with non-cohesive sediment forming the bed. The bankfull discharge is 877 cfs (24.8 cubic meters per second). Data from the study compared to the design slope-discharge suggest a meandering channel, as shown with the red dot. It is important to note that other factors such as sediment supply significantly affect whether channels are braided or not. The applicant has not provided evidence that a

significant amount of sediment supply is available from the Pine Tree Creek watershed to support a braided channel (see Sediment Transport Analysis discussion below).

REFERENCE REACH

Staff examined watersheds in the region to locate a likely candidate for a “reference reach” that had similar characteristics to the proposed channel. Due to past agricultural activities on the property, staff considered it likely that the natural morphology of Pine Tree Creek was altered, affecting its geomorphic response. Staff removed it as a potential reference reach for the diversion channel.

Immediately upstream (south) of the property line is a braided reach, with a slope of 0.01 feet/feet, which provides a good example of the desired channel form and size. This reference reach is a high gradient reach (approximately 1.0%) with bed and banks that appear to be composed of coarse sand. The solid black line in **Soil & Water Figure C3** delineates this reference reach. Due to the potential influence of small input channels, staff recommended omitting that portion of the reference reach. Staff’s recommended reference reach is delineated in **Soil & Water Figure C3** by the dashed tan line, and begins ~2,500 ft upstream of the property line and ends ~6,500 ft upstream of the property line. For the recommended reference reach, the average width of the active channel here is approximately 185 ft, with a maximum width of 300 ft and a minimum width of 112 ft.

SITE RECONNAISSANCE

During a visit to the proposed BSEP site, staff conducted a reconnaissance of Pine Tree Creek. The Cantil Valley Fault scarp separates two significantly different channel formations. Below the scarp, the ephemeral channel had vague channel definitions and a braided channel bottom consisting of unconsolidated sand. The active channel had scattered to dense populations of long-lived desert shrubs. Above the scarp, the wash tends to be more channelized with little vegetation up to the BSEP property line.

There is clear evidence of recent lateral channel movement upstream of the BSEP site. An exposed, ten-foot high bank has eroded along the right bank. This is clear evidence of an aggradational reach of the channel. Sediment transport in the bed of the channel was apparent from small deposits of sediment covering the root collars of shrubs. Minor gully head cutting was also apparent.

GEOMORPHOLOGICAL ASSESSMENT METHOD

Alluvial fan ecology is linked to alluvial fan geomorphology: the pattern of overflowing, laterally migrating channels, vegetation disturbance, creation of mid-channel bars, etc. Staff has determined that to reproduce the desired biological, hydrologic, and hydromorphic functions of the existing wash will depend on having a braided channel system. Staff conducted this geomorphic assessment to understand if the proposed hydraulic design would result in braiding of the diversion channel bed. Staff will use these basic criteria to assess impacts from the project to hydrologic functions of the

rerouted channel and to gage the success of the proposed mitigation plan. This section describes Staff's geomorphic assessment and Staff's review of the applicant's geomorphic assessment.

Staff has directed the applicant to submit a diversion channel design that recreates the form and function of an active alluvial stream. Braiding on alluvial fans is a function of high sediment load relative to transport capacity. This is not a stable channel form in the sense of transporting all the sediment delivered to the channel, which is the usual goal of a channel design. Staff, CDFG, and Lahontan RWQCB agree that a braided system of channels provides the most favorable outcome in terms of reestablishing biological character of the natural wash. To improve the chances for a braided channel, staff directed the applicant to design the system "slightly aggradational", and then deal with the consequences in terms of channel maintenance, should flood capacity be lost. Scouring channels and equilibrium channels, which do not become braided, should be avoided.

Staff studied the existing wash to develop an understanding of the carrying capacity of the bank full channel. Staff also approximated the extent of the floodplain and its capacity. Cross section 1 (XS 1), was cut from the recommended reference reach shown on **Soil & Water Figure C3**. The main active channel (or low flow channel) for XS 1 has an approximate capacity of 877 cfs (24.8 cubic meters per second), which matches the region's Hybrid Regional Regression results (West, 2007) for the 5-year event.

A second cross section was located on the southern property line, XS 2, to examine the channel capacity at property line and for staff to understand the change in cross sectional area between the natural channel and the diversion channel. According to staff's estimates, the approximate capacity of the natural channel at the property line is approximately 4,000 cfs. Flood flows greater than the active channel capacity would flow out of bank to the northeast and result in shallow flooding along uncertain paths. **Soil & Water Figure C4** illustrates the reference reach capacity at XS 1, the channel at the property line (XS 2) and its capacity and the typical diversion channel cross section.

Staff finds that active alluvial fan flooding is characterized by flow path uncertainty, abrupt deposition, and ensuing erosion of the sediment as the channel loses its capacity to carry material eroded from steeper, entrenched Pine Tree Canyon. The high level of uncertainty in hydrology, sediment, deposition, scour, and flow path ultimately results in uncertainty in defining the hazard associated with flooding. Staff concluded that shallow flooding would occur along highly unpredictable flow paths given the flow variability, flat topographic relief, and potential for channels to shift. Sediment and debris would be deposited or removed during or after a flood altering the flow path. Because flow paths and discharge are uncertain, staff estimates that without mitigation, nearly the entire area of the site is susceptible to an equal risk of shallow flooding.

Staff concludes that the natural wash upstream of BSEP does not have the capacity to deliver the contained design flood to the point of diversion. Peak floods would cause shallow flooding along the right and left banks. The shallow flooding would sheet flow

toward the northeast. The applicant confirmed Staff's PSA conclusions and shows the depth and extent of this shallow flooding as Pine Tree Creek approaches BSEP. The applicant has shown that the direction of flow would not converge at the point of entry to the diversion channel. In the BSEP- developed condition, the diversion channel grading does not fully would intercept the shallow flooding along the southernmost property line. As required in Condition of Certification **SOIL&WATER-11**, the applicant will extend the diversion channel grading to the west to intercept the extent of the natural channel floodplain and avoid significant flood damage to the solar field during a design discharge runoff event.

The applicant provided a Fluvial Geomorphic Assessment in their Project Design Refinements (DP 2009r) submittal. The applicant used aerial images to delineate the active channel and flood-prone areas that have undetermined magnitude or frequency. The applicant produced images from 1952 (pre-agriculture), 1983 (during agricultural practices), and a current 2007 aerial photo which provided a rough snapshot over a 55 year period. The photo coverage is primarily onsite and does not show much of the area to the south of BSEP. The applicant suggests that the lateral movement of the channel has been minimal. From the offsite area that is visible, it appears that the active channel has shifted between 1952 and 2007. Staff confirmed this lateral migration during the site reconnaissance. The applicant also included statements in their Geomorphic Assessment that support Staff's claim that the stream may have instabilities that contribute to channel degradation. These factors include relative small particle size of the silty sand and gravel surficial deposits, lack of vegetation and history of tectonic activity.

Channel morphology and geomorphic function are intimately linked to the balance between sediment delivery and sediment transport capacity. In the PSA, staff requested that the applicant provide a geomorphic assessment and provide engineering calculations that compare the sediment transport capacity of the existing wash compared to the proposed diversion channel. CDFG and Lahontan RWQCB also requested a geomorphic assessment of the engineered channel. The applicant's project design refinements included hydrodynamic, scour and sediment transport analysis (discussed below). While the applicant's studies provide a greater understanding of the system's sediment delivery and transport capacity, it is not clear that the future response of the diversion channel is fully-understood, or likely to preserve braiding. The reason for this ambiguity results from the uncertainty of computer models to predict accurately the channel response. A higher-level or additional sediment analysis is necessary to improve prediction and identify potential failure mechanisms related to sediment and floods. Completion of the analyses required as part of Condition of Certification **SOIL&WATER-13** will provide relevant information about sediment mobility needed to finalize the diversion channel design. The analysis results required under this condition would identify potentially damaging flood-related impacts caused by sediment aggradation or degradation. The analyses results will also be used to establish

maintenance metrics to manage sediment and improve the success of the desert wash mitigation. Channel monitoring and maintenance are required in Conditions of Certification **SOIL&WATER-7**, **SOIL&WATER-8**, and **BIO-18**.

The width of the diversion channel was largely determined based on the desire to convey the design discharge and maximize the area available for the solar field. Assuming the current diversion channel design would pass the design discharge, it is expected that additional widening would improve the hydraulic characteristics (velocity, shear stress, depth, etc), improve the longevity of the channel, and possibly require less maintenance. In the PSA, staff requested that the applicant consider a wider corridor to improve these conveyance characteristics and allow options to structural channel treatments such as soil cement. A wider channel would allow the low flow channel to migrate and erode / deposit to form a multi-stage channel similar to the existing wash and its floodplain. As proposed, the diversion channel would have roughly 200 feet to 250 feet to form a multi-stage channel. Staff estimated the reference reach width ranged from 185 to 300 feet, which suggests minor benching may occur at various locations of the channel.

Staff has assessed the potential for the proposed diversion channel to accumulate sediment, migrate laterally, downcut or erode. Staff concludes that the diversion (low flow) channel would potentially become a braided channel that could migrate along the base of the channel. To support this understanding, staff has concluded that the 0.2% channel bed slope would allow sediment to aggrade over time. The proposed diversion channel as designed for BSEP would have some degree of natural geomorphic function, including a limited ability to braid, meander and laterally migrate between Grade Control Structures (GCSs). Staff has determined that for the protection against the possibility that the channel would migrate towards and erode a section of the channel bank, bank toes would require adequate stabilization. Staff discusses bank stabilization methods below.

To ensure the hydraulic constraints of the proposed engineered channel meet the design standards of Kern County, staff is recommending compliance with Conditions of Certification **SOIL&WATER-12,** and **SOIL&WATER-13.** These conditions require engineering analyses for the transition and the 90-degree channel bend using appropriate hydraulic software capable of determining the appropriate hydraulic losses associated with these transitions. As a requirement of Condition of Certification **SOIL&WATER-6**, the preliminary design for these transitions are to be included as part of the CLOMR submittal to FEMA to demonstrate the stability of the channel under base flood conditions. These constrictions and other structural design elements or channel protection measures shall be designed in accordance with Kern County standards, and submitted to Kern County for review and comment as required in Condition of Certification **SOIL&WATER-9**. The ultimate design of the diversion channel must take into account the existing flood hazard upstream of the site, potential impacts to downstream properties, and recommendations from the County. Condition of Certification **SOIL&WATER-16** requires that the project owner evaluate potential geomorphic impacts to Pine Tree Creek wash upstream of BSEP in accordance with Kern County Division Four Standards for Drainage, Chapter IV Section 404-2.04.

HYDRAULICS

The applicant provided several computer models that simulated the existing Pine Tree Creek and the diversion channel hydraulics. Staff reviewed these models and the reported results in the Project Design Refinements (DB 2009r). Staff also conducted an independent technical assessment of the channel and its capacity to convey the design discharge (28,000 cfs) and meet the biologic, geomorphic, and hydromorphic recommendations of other state agencies. Staff's independent hydraulic analysis of the applicant's original plan published in the PSA is no longer valid because the proposed diversion channel design changed so significantly following the PSA workshop.

The applicant designed the new diversion channel and the setup hydraulic models to simulate the design flood and verify the basis-of-design. Staff is concerned with the channel's capacity to convey the design flood (28,000 cfs) and the other characteristics of the flow including: velocity, depth, shear stress, and Froude Number. The following equation determines the Froude Number:

$$\text{Froude Number} = V / (g * Y)^{(1/2)}$$

Where g is equal to 32.2 ft/s^2, Y is the depth of flow in feet, and the velocity (V) is in feet per second (fps).

The current, proposed diversion channel would intersect Pine Tree Creek at the BSEP property line where the natural channel enters the site. The diversion channel is planned as a trapezoidal channel having 3:1 or 4:1 side slopes, with a minimum bottom width of 200 feet to more than 4,000 feet at the outfall. For most of the diversion channel, the bottom width is approximately 250 feet. The total area available for revegetation (the long, gradually sloping channel bottoms between drop structures) is 53.0 acres measured from the point of diversion to the location of the proposed channel fan (Channel Station 36+00). This area is measured from toe-of-slope to toe-of-slope on the opposite bank and does not include the area proposed for soil cement in the bed of the channel from Station 143+50 to 135+00. The area in the channel bottom available for revegetation is 41.5 acres, which excludes hardened elements such as grade control structures, soil cement bank protection and channel bottom, or rock riprap constructed in the bed or along the banks.

The diversion channel design incorporates grade control structures that dissipate energy and establish an effective channel slope. The applicant presented a typical grade control structure (GCS) design in their Project Design Refinements. The applicant recommends eleven sloping soil cement GCS constructed at various locations along the channel, each 10 feet high (effective drop), and each fitted with a USBR Type IV stilling basin at their downstream bases. The GCSs would prevent significant downward cutting and dissipate energy. In addition, the GCSs would lower the base flood profile to an elevation below the tops of the adjacent ground, thereby, avoiding the need for levees.

At the point of diversion, the bed of the channel would be lined with rock to protect the natural channel transition from the diversion to the crest of the first sloping soil cement drop structure. The applicant plans to construct a drop structure (or grade control structure) at the point of diversion to lower the hydraulic profile below the elevation of

the solar fields to the north. The channel invert elevation would drop nearly 25 feet below the natural channel invert and be redirected toward the east. Staff estimated this bend at approximately 90 degrees with a centerline radius of 600 feet. Staff asked about this unique transition during the July 2009 workshop. The applicant has not provided any specific design details to date.

The diversion channel would continue to flow due east and make another 90 degree bend to the north before reaching the eastern property boundary. Roughly one mile north of the 90 degree bend, the channel widens through a transition and its alignment would be redirected toward the northeast corner of the BSEP property.

The applicant has provided typical channel section details showing banks protected with soil cement and the base of the channel lined with soil cement for approximately 800 feet along the centerline of the upper channel. During the July 2009 workshop, staff emphasized their concern with the proposed lining on the channel bottom, as that condition would limit the development of a naturally braided channel.

The applicant assigned the channel roughness for all areas of the channel at 0.025 to 0.030, depending on the hydraulic model. Rock would be located in the bed of the channel to protect the transition to and from the grade control structures. The applicant designed the channel to convey the design discharge with a maximum hydraulic depth of eight feet. The height of the banks includes a minimum of one foot of freeboard. The diversion channel segment would be approximately 14,000 feet long. The applicant would revegetate the channel with native vegetation following construction. Topsoil material excavated from Pine Tree Creek wash will be used to backfill the grade control structures in the diversion channel in accordance with Condition of Certification **SOIL&WATER-17** to prevent movement barriers or hazards for desert tortoise or other wildlife that may otherwise get trapped in the stilling basins.

The applicant designed the diversion channel with a transition near the outlet of the channel that widens to nearly 10 times the top width of the typical channel cross section. The intent of this design is to reduce flow depths and spread the channel flow onto a wide area to induce shallow flooding. The applicant proposes a concrete sill, or flow spreading structure, to disperse flood flows. The preliminary concrete sill design shows the structure keyed in to the proposed channel to a depth of 4 feet below the channel invert.

The hydraulic calculations made by the applicant indicated that the hydraulic depth of flow is between 4.5 to about 8.5 feet and the velocity would be between 8 to 13 feet per second (fps). These velocities are high for earthen channels. Velocities at the grade control structures are much higher. The structures, as proposed, would dissipate the energy of the flow and protect the channel from scour and erosion.

The resulting Froude Number provides a preliminary check on the flow regime. Froude numbers ranged between 0.75 and 0.90, which is within the range of natural channel flow. To ensure that the diversion channel design addresses Kern County Division four Standards for Drainage, staff is recommending adoption of Conditions of Certification **SOIL&WATER-11, SOIL&WATER-12** and **SOIL&WATER-13**, which establish the minimum design guidelines for the diversion channel. In accordance with

SOIL&WATER-4, the Froude Number in the open channel areas between GCSs shall maintain a subcritical value less than 0.80. A Froude number approaching 1.0 means the flow is approaching critical depth and may possibly transition into supercritical flow, which is not typical for a natural channel. Staff expects Froude Numbers to increase significantly above 1.0 at the GCS. The Froude Number values are important for GCS final design.

The BSEP hydraulic models report shear stress values along the channel and overbanks of the study reach. These shear stress results are relatively high for an earthen channel with sparse desert vegetation. High shear typically requires bank treatments to protect banks from erosion and failure. Staff examined several bank and channel treatments in the PSA and specified typical ranges of allowable shear stress for each. The applicant's proposed bank treatment method, soil cement, would be sufficient for preventing shear stress erosion.

SEDIMENT TRANSPORT ANALYSIS

The applicant conducted a preliminary scour and sediment transport analysis using FLO-2D v2007.06 and HEC-RAS. FLO-2D is a two-dimensional model designed to simulate unconfined shallow flooding similar to the current channel's flow regime. HEC-RAS is a one-dimensional model with the capability to simulate sediment transport in the proposed diversion channel. Staff agrees that these computer models are appropriate for estimating the transport efficiency of the existing wash and proposed diversion channel. Staff reviewed the analyses results in the Project Design Refinements (DB 2009r) and spoke with the applicant's engineer responsible for the sediment transport calculations. Staff recognizes the challenges of sediment transport modeling and is satisfied with the level of effort that went into setting up these preliminary computer models. The applicant's engineer tested various sediment transport methods, varied boundary conditions and other inputs, and simulated several flow regimes including the annual average and design discharge (Q_D=28,000 cfs).

Staff subsequently conducted sensitivity tests using the models provided by the applicant. Staff changed the sediment transport formula to Yang to coincide with the measured grain size characteristics of silty sand. Staff checked a reasonable range of possible hazard scenarios to assess the adequacy of flood control measures exposed to significant sedimentation hazards. Using the annual rainfall data derived by the applicant, staff ran the HEC-RAS model simulating 10-years of average-annual runoff to assess sediment accumulation over a ten-year period. Staff also tested the base flood model using Yang.

Staff's analyses show scour and aggradation occurs throughout the channel. In some locations between grade control structures sediment was dropping out at an acceptable rate. An acceptable rate of deposition would allow sediment to accumulate and form microfeatures on the channel bed. In other locations along the profile, the results show the channel scoured below the bed. The results of Staff's modeling were highly variable and produced a lot of "noise". Staff did not have the time to refine the model but

assumed the variability could be resolved with further study by the applicant. Staff concludes that with implementation of Condition of Certification **SOIL&WATER-15** the applicant would identify the final channel design slope that produces the most likely "slightly aggradational" conditions. This Condition of Certification supports **BIO-18** and will ultimately improve the opportunities for successful desert wash mitigation.

Channelizing the wash would tend to increase transport efficiency and switch the channel from braided to single thread, slightly sinuous. Braiding is also related to bank erosion: braided rivers erode their banks easily, widen, lose sediment transport capacity and deposit excess sediment on their beds in a positive feedback loop. The applicant has proposed hardened banks made of soil cement in order to preserve the character and capacity of the flood control channel. The hardened banks would deprive the creek of a source of sediment. With high sediment transport capacity and few in-channel sediment sources, recreating or preserve braiding is difficult to predict.

BANK AND TOE PROTECTION

The applicant has proposed various bank and toe protection treatments throughout the diversion channel. The applicant has provided riprap-sizing calculations for the channel bends, drop structure armoring, and side slope protection on the channel banks (BS 2008a Appendix C). At the point of diversion, BSEP has proposed a soil cement-lined channel (bed and banks) to protect the excavated channel through the transition to the proposed channel (Station 135+00 to 143+50). Soil cemented banks are shown in Exhibit 1-C to account for the entire channelized reach of the engineered channel (Station 36+00 to 143+50). The applicant proposes channel banks as steep as 3:1 from the channel bottom to the solar field. On the opposite bank, slopes would not be steeper than 4:1.

Regardless of the final design bank treatment, one aspect of the design that staff recommended in the PSA is a subsurface keyway. Condition of certification **Soil&Water-14** requires this continuous keyway or other type of toe protection, constructed along the toe of the bank slope to avoid significant flood-related impacts that would result from bank failure. Keyways are typically embedded below the anticipated channel bed and below the expected scour line to prevent bank failure. The keyway rock would be sized using appropriate methods to determine rock size, thickness, and depth. Toe protection and soil cement banks are constructed together as a homogenous slope protection, continuous along the channel.

In the July 2009 workshop, staff recommended a "slightly aggradational" diversion channel. It is important to recognize that lateral bank erosion is not just associated with channel incision. Channel aggradation can raise the channel bed and increase lateral movement of the active channel causing bank erosion.

The applicant has proposed riprap to protect the grade control structures from scour across bed transitions to the earthen channel. The rock protection would extend roughly 50 feet downstream and some distance upstream of each structure. The size, depth,

and rock coverage shall be determined during final design. When calculating the in-stream mitigation credit, staff will not include the areal coverage of riprap.

STAFF'S BANK PROTECTION CONCLUSIONS

Staff has concluded that proposed bank protection (bank treatments from the toe of slope up to the height of the freeboard elevation) options be selected based on the hydraulic response of the design flow. The type of protection would be selected to sufficiently prevent erosion of the newly constructed banks or significant lateral movement of the channel into areas where infrastructure, future homes (adjacent properties), structures, or higher public use may occur. Bank protection would be designed as a permanent treatment that would protect from the maximum hydraulic design criteria established for the channel.

In an effort to respond to CDFG comments, staff provided methods for establishing bank protection selection criteria to the applicant in the PSA. The selection criteria has been modified following subsequent analyses submitted by the applicant (DB 2009r). Various options for bank protection should be evaluated based the following selection criteria:

Selection Criteria

1. Examine Maximum Potential shear stress and velocity for the following conditions: at bends; in areas of fill; at contractions and expansions; along maintenance roads; and where the proposed channel ties into the existing natural channel

2. Use results from proposed conditions hydraulic analysis to determine channel velocity, left and right overbank velocity and shear stress. Summary tables and graphs provide a good overview of the channel response for velocities and shear stress.

3. If the criteria has been exceeded, select an appropriate bank protection option that meets the shear stress and velocity criteria or re-evaluate the channel design.

4. Use appropriate methods to estimate potential scour depth and height of bank protection - design bank protection to meet the Kern County Division Four, Standards for Drainage.

Bank Protection Options

In the PSA, staff identified a variety of bank protection methods considered appropriate for different applications: Vegetation, Biotechnical Solutions, Synthetic Geotextiles and Structural Methods. Each method relied on maximum thresholds for velocity, shear stress, bank slope and in some cases, plant moisture regime. Where the design flow shear stresses and velocities are low enough, staff emphasized use of bioengineering solutions over traditional engineering stabilization methods (e.g. rock or concrete armoring) to provide long-term resilience and habitat enhancement. The hydraulic characteristics of the channel were unknowns at the time of the PSA and are now mostly determined as a result of the BSEP Project Design Refinements (DB 2009r).

Staff reassessed the four main categories for potential bank protection options made available to the applicant in the PSA. Where shear stresses and velocities are higher than those that biotechnical solutions can withstand, staff had recommended approaches that rely upon hardened materials for their basic mechanical resistance. Staff had recommended incorporating live materials to enhance both strength and biological function but now believes that desert vegetation would not survive without irrigation.

Vegetal shear and particle shear resisting capacity of the floodplain reduces the potential for lateral migration of the low flow channel. The wider the floodplain the more the vegetation and earth that separates the low flow channel from the toe of slope. Staff has assumed three potential categories for the migration of the low flow channel at this time: Low, Medium and High potential. The potential for the channel to migrate is important for the selection of an appropriate bank treatment.

Staff has identified various permanent bank stabilization options and assessed their applicability at the site. The bank protection options may provide longitudinal protection, have transverse construction, or be used for erosion control during re-vegetation of the channel for mitigation. Bank treatment applications that incorporate vegetation are discussed but no longer recommended for in-channel use. Staff presented all four options for their potential use in non-diversion channel applications. A general introduction to these options follows.

Vegetation and Biotechnical Solutions - Bioengineering solutions achieve stability by incorporating live vegetation with more structural materials (e.g. rock, deep rooted vegetation). Over time, the vegetation establishment strengthens the bank at the surface (by increasing roughness and reducing shear stress) and subsurface (via the root matrix). Proper selection of the appropriate plant materials (e.g. shrubs) is critical for success. Unfortunately, staff was unable to identify native vegetation that would suit a biotechnical approach. Biotechnical approaches would also require sufficient soil moisture for plant establishment and subsequent survival, which is a limiting factor in the diversion channel. Staff does believe that the resulting shear stress, velocities, and anticipated meander of the low flow channel are within the range of using biotechnical solutions but without a reliable deep-rooted plant the success of the biotechnical solution is uncertain.

Synthetic Geotextiles – Synthetic geotextiles may be considered for specific cases requiring slope stabilization. Because of the limited opportunities to integrate vegetation with synthetic geotextiles, the potential for successful, long-term protection is low. Turf reinforced matting and fabrics are relatively inexpensive for certain applications compared to concrete and riprap and are typically less invasive. A wide variety of geotextiles are available to match specific needs, although few are specifically designed for desert application. Primary permanent uses of synthetic geotextiles would be above the toe slope protection. In-channel uses or as an erosion protection for swales would be limited unless manufacturer's recommendations are not exceeded. Given the difficulty for vegetative cover to establish, staff does not recommend the use of synthetic geotextiles for the diversion channel, bank protection treatment.

Planted Riprap Toe Protection – Staff identifies this protection measure for use where the proposed channel has a medium to high potential for lateral migration into the channel banks. The applicant, for select areas of the channel, has studied this option. Toe protection would protect the bank from local scour to a calculated depth below the stable bed. Kern County methods for bank protection and freeboard provide guidance for the riprap bank design. Staff agrees with the applicant that FHWA's HEC-11 "Design of Riprap Revetment" and NCHRP Report 569 "Riprap Design Criteria, Recommended Specifications, and Quality Control" are good design references but ultimately the final design would need to comply with Kern County design standards.

Planted rock contains voids that when filled with soil provides a means to establish vegetation. Unfortunately, staff has not identified an appropriate desert vegetative cover capable of maintaining cohesive root systems between the rocks. The applicant has not identified specific uses for planted riprap beyond bank protection. The applicant shall follow installation procedures that minimize voids in the planted riprap. Large voids create migration barriers for young desert tortoises and their existence would not comply with Condition of Certification **BIO-18**.

Structural Solutions - Channels where vegetation is difficult to establish and maintain as a defense provide a reasonable opportunity to consider hard armor (structural)_ protection. This option is also more likely for flood control channels that have a high potential for lateral migration into the channel banks. The applicant has proposed structural bank stabilization using soil cement. These types of solutions would prevent volunteer plant growth on the channel banks where the soil cement is applied. Benefits of soil cement include the ability to roughen the surface for wildlife migration, roughly 80% of the construction materials are already at the site, and the channel banks would require less maintenance.

Transverse Bank Protection - Additional channel stabilization options would provide benefits for protecting the channel banks. Permanent transverse options such as rock vanes, bend way weirs, or J-hooks may also be considered to provide additional protection for redirecting an active low flow channel, especially at significant bends in the channel, as proposed by the applicant.

Staff has identified several constraints that reduce the ability of the diversion to restore the beneficial uses of the existing wash. Staff concludes that the most favorable iterative design solution for the diversion channel would provide the greatest hydrogeomorphic benefit while ensuring the highest level of flood hazard protection. Staff has concluded that the impervious soil cement banks, proposed by the applicant, would offer the highest level of protection for the channel. Staff's assessment of the velocity and shear stress along the channel does suggest other non-structural options are possible. These other forms of bank protection would not promote vegetative cover but also would not prevent it. The trade-off is the value of unknown vegetal bank cover or a higher level of flood protection.

Staff has concluded that the proposed soil cement bank treatments would sufficiently protect the channel from the hydraulic forces anticipated from the design flow. Staff supports the embedment design for the toe protection to prevent the lateral migration of the low flow channel and protects the bank from under-cutting. Because the lateral

movement of the channel is mostly unpredictable in the straight reaches of the channel, staff is requiring as part of Condition of Certification **SOIL&WATER-14** that the bank protection for the channel include the installation of toe protection for the entire length of the channel. This Condition of Certification requires toe protection in the reach downstream of Station 36+00 to avoid potential bank failures caused by channel migration.

The BSEP channel protection treatments proposed by the applicant do not adequately respond to LRWQCB and CDFG comments that sought to restore distinctive vegetational types and distribution, found along the natural Pine Tree Creek, in the diversion channel. Staff concludes that the most favorable channel response will come from the integration of grade control structures set to make the channel slightly aggradational. The channel deposition shall be studied using advanced sediment transport methods that omit sediment sources from the banks and add sediment sources in the GCS stilling basins as part of Condition of Certification **SOIL&WATER-15**. These additional analyses, when applied to the channel's final design, shall improve the success of the desert wash mitigation by recreating characteristics of the natural wash in the bed of the diversion channel.

GRADE CONTROL

The applicant has controlled the diversion channel profile using GCS in the design to reduce the effective longitudinal slope of the channel. Typically, a controlled channel profile reduces potential bank erosion by improving the hydraulic characteristics and damage potential of the flow. The controlled flow regime reduces the shear stress on the banks and improves the success of the selected bank treatment to protect the banks from erosion and failure.

The use of 10-foot vertical drop structures may increase the tendency for the channel to incise and lose braiding because the structures are often located far apart. Immediately downstream of the drops the channel flows would be concentrated and deep armoring would be required to protect the earthen channel from scouring at the transition from the GCS. The hydraulic depth would drop gradually as the channel flow approaches the next drop structure.

Condition of Certification **SOIL & WATER-15**, requires the project owner to use the GCS design to set the final longitudinal channel grade to be slightly aggradational (depositional) to preserve braiding between GCSs. The current channel design establishes the finished channel slope at 0.2% (DB 2009r). The calculated slope is determined from rise over run. Run is the horizontal distance along the channel centerline from the downstream GCS crest to the sill at the upstream GCS. Rise is the difference in elevation between these endpoints. BSEP hydraulic and sediment transport analyses show 0.2% slope provides a stable corridor for the design discharge.

Staff expects sediment deposition near the uppermost GCS, at the point of diversion. Staff also expects sediment to deposit in the stilling basins of the GCS. The GCS stilling basin is a hydraulic design feature intended to keep the hydraulic jump from moving

downstream into the earthen reaches of the channel. Hydraulic jumps dissipate energy and the GCS stilling basin prevents the high energy from scouring the channel during a major runoff event. These stilling basins would be several feet below channel grade and create a significant impediment for wildlife. No potentially significant wildlife habitat/movement corridor impacts are expected as attributable to the grade control structure design if the project owner meets Condition of Certification **SOIL&WATER-8** that requires backfilling the stilling basins with topsoil from the channel excavation. This additional sediment supply benefits the sediment transport in the channel and complies with Condition of Certification **BIO-18**. The backfilled stilling basin would avoid significant trapping hazards for desert tortoise. Staff anticipates that the sediment in these basins would mobilize during a significant event and the GCS would function as intended.

CONCLUSIONS

The applicant's original concept for Pine Tree Creek, as presented in the BSEP AFC and currently in the Project Design Refinements has not significantly changed. As proposed, the BSEP would completely excavate or fill in the wash for the solar field, route the design discharge (28,000 cfs) around the solar field through an engineered channel, and defile the beneficial uses of the natural wash.

The challenge to design a diversion channel on an alluvial fan, for the design discharge, requires detailed engineering studies that form the basis of design. In the PSA, staff requested several additional studies and engineering analyses for staff to assess BSEP's plan to re-route Pine Tree Creek flows through an engineered channel. Staff included hydrologic, hydraulic, sediment transport, bank treatments, and grade control recommendations in the PSA to direct the applicant develop their design criteria and diversion channel basis of design. Staff requested that the applicant meet Kern County and FEMA's flood control requirements. Staff emphasized to the applicant that BSEP must address resource agency concerns through an iterative design process that results in the preservation of the biological and hydrological functions and values of the existing wash. On June 23, 2009, the applicant submitted the Project Design Refinements (Docket Log No. 52116), which included many of the studies requested by staff.

Staff relied on the results of the applicant's engineering studies to develop confidence in the project's ability to avoid potentially significant flood-related impacts and support in-channel mitigation. The iterative diversion channel design process resulted in trade-offs between the functional flood management elements and the ability to recreate the continuous biological and hydrological functions and values found in the existing wash. For instance, grade control structures would flatten the effective slope of the channel, prevent hazardous head-cuts, reduce flow velocities, and dissipate (erosive) energy in a flood. Grade control structures are impervious surfaces, which reduce the infiltration area within the channel but ultimately improve the resident time for nuisance flows passing through the channel. However, grade control structures are structural elements with steep facing inclines that segment the mitigation and disrupt wildlife habitat/ movement corridor. Similarly, soil cement provides protection from bank erosion and

failure, uses mostly in situ materials for construction, and allows the engineer to increase shear stress thresholds but prevents beneficial vegetal growth within a large portion of the channel. Rock bank protection is typically a preferred solution over an impervious cover such as soil cement. For the engineered channel, rock may become exposed and create voids that can trap desert tortoises and ultimately there is no guarantee that plants would establish within the rock-soil matrix.

Staff has reviewed the applicant's studies, calculations, and models to determine whether the overall design for the diversion channel has reached an adequate point in the final design process for staff to assertively require conditions of certification that address potential flood-related impacts and mitigation. Staff concludes that the basis of design and the applicant's related studies provide adequate information for staff to evaluate the diversion channel capacity and determine potentially significant flood impacts based on the channel's ability to function properly. Staff has identified several elements of the diversion channel design that have not reached a significant stage in the final design process but are important for understanding the potential for impacts related to the entire diversion channel concept and more importantly, operation. Staff believes that the diversion channel and all its elements need to function properly to avoid significant flood related impacts. Several structural channel elements (point of diversion, 90-degree channel bend, grade control structure, and bank protection) have only reached conceptual or preliminary design and staff has not reviewed final design drawings that provide the level of detail necessary to make a determination as to the suitability of these structural elements to function properly during a design discharge event.

Staff also concludes that the diversion channel presents a reasonable opportunity to recreate the biological and hydrological functions and values that exist in Pine Tree Creek. To reach this conclusion staff evaluated the sediment transport models associated with the diversion channel design. Based on these designs and models, a total of approximately 53 acres of gently sloping channel surface will be created between the diversion structure and the channel outlet, located at Station 36+00.

Staff recognizes the challenges and uncertainties associated with identifying sediment loads and simulating sediment transport in diversion channels constructed on alluvial fans. Staff also understands that the heavily armored diversion channel can withstand minor variations in longitudinal slope that can result in significant variations in the sediment transport characteristics. Staff believes with additional sediment transport analyses the iterative design would resolve the most appropriate channel bed slope that predicts a slightly aggradational condition in the channel. Staff recognizes that the effective channel slope would be fine-tuned using crest elevation adjustments at the grade control structure. Staff has concluded that the applicant must conduct additional sediment transport simulations to select the most accurate channel slope to minimize the amount of sediment accumulation to what would be necessary to support the channel bed mitigation and not compromise channel capacity.

Staff concludes that the uncertainty of the structural diversion channel elements to perform and the uncertainty related to the sediment transport in the diversion channel require a Maintenance District, in perpetuity, to monitor, inspect, and conduct maintenance to sustain the conveyance capacity up to the design discharge. Staff

believes that the BSEP flood control measures would effectively maintain flood protection with implementation of Condition of Certification **SOIL&WATER-8** that establishes a Maintenance District and a drainage easement for the channel and Condition of Certification **SOIL&WATER-9** that outlines the Channel Maintenance Program. These conditions of certification require CPM approval. The CPM will consider comments from the state resource agencies and Kern County. Condition of certification **SOIL&WATER-9** requires implementation of a Channel Maintenance Program in accordance with **Soil and Water - Appendix J**.

SOIL AND WATER RESOURCES - APPENDIX D

ANALYSIS OF ALTERNATIVE WATER SUPPLY AND COOLING TECHNOLOGIES

State Water Board Resolution 75-58 addresses the use of inland waters used for power plant cooling. The resolution defines unreasonable use, and promotes the consideration of alternative power plant cooling options. Pertinent statements contained in Resolution 75-58 follow:

- The loss of inland waters through evaporation in power plant cooling facilities may be considered an unreasonable use of inland waters.
- The source of power plant cooling water should come from the following sources in this order of priority depending on site specifics such as environmental, technical and economic feasibility consideration:
    1. Wastewater being discharged to the ocean,
    2. Ocean,
    3. Brackish water from natural sources or irrigation return flow,
    4. Inland wastewaters of low TDS, and
    5. Other inland waters.
- Use of fresh power plant cooling will be approved by the Board only when it is demonstrated that the use or other water supply sources or other methods of cooling would be environmentally undesirable or economically unsound.
- Studies associated with power plants should include an analysis of the cost and water use associated with the use of alternative cooling facilities employing dry, or wet/dry modes of operation.

The following sections describe our independent analysis of alternative water supply and cooling technologies.

The examination of alternative water supplies and cooling technologies begins with a determination of whether a project will use fresh water for cooling. The IEPR itself does not define what constitutes fresh water. Resolution 75-58, upon which the IEPR water policy is based, defines fresh inland waters as "*those inland waters which are suitable for use as a source of domestic, municipal, or agricultural water supply…*" (State Water Resources Control Board Resolution 75-58, p. 3.) Thus, fresh water is not given a narrow definition but is broadly defined by how it is used, evincing an intent to be as inclusive as possible. The groundwater proposed for use by the BSEP meets the definition of fresh inland water under Resolution 75-58 because it is used for agricultural and domestic use in the area.

Another indication of the suitability of this water as a domestic source is its compliance with the Drinking Water Standards found in Title 22 of the California Code of Regulations. As discussed in the groundwater quality section of the AFC, the BSEP proposes to use groundwater that has a TDS of 470 - 550 mg/l (AFC). This TDS level is well within the secondary maximum contaminant level (MCL) for TDS in drinking water of 1000 mg/l and near the recommended limit of 500 mg/l (Cal. Code Regs., tit. 22, §§ 64431, 64449). Secondary MCLs are based on aesthetics and intended to protect odor, taste and appearance. Exceeding these secondary MCLs does not necessarily preclude the use of that water for drinking.

BSEP has proposed to use this onsite fresh groundwater for all plant needs including cooling and steam generator feed water as well as potable uses. Cooling would be provided by a mechanical draft cooling tower. Plant wastewater (from all sources) would be sent to evaporation ponds for final disposal. No backup cooling water supply is proposed by the applicant although they offer to use future tertiary treated effluent from California City if it becomes available.

In the AFC, the applicant estimates water use as follows:

Soil & Water Table D1
Proposed Annual Operational Water Demands

Water Use			
Water Use	Annualized Average Rate[1], gpm	Peak Rate[2], gpm	Estimated Annual Use, Acre Feet
Plant Operation	990	4,054	1,388
Potable Water	5	5	8

1. The estimated groundwater usage in gallons per minute is based on an average daily consumption.
2. The peak rate is the instantaneous maximum for summer usage.

Water uses would include cooling tower makeup, closed cooling system makeup, steam generator makeup, mirror washing, plant wash down (housekeeping and maintenance), dilution water for chemical feed systems, etc. Well water would also be used for potable uses - drinking, showers, sinks, and toilets. Well water would be stored on site in the Raw Water Tank. Most of the water would be treated using ion exchange utilizing strong acid cation (SAC) and strong base anion (SBA) and stored in the Process Water Tank. Process water would be used for cooling tower makeup. A portion of the process water would be treated further for steam generator makeup and mirror washing utilizing portable demineralizers (these are regenerated offsite and generate no wastewater).

ALTERNATIVE WATER SUPPLY

Resolution 75-58 is clearly intended to broadly protect beneficial uses of the State's water resources. In this vein, the SWRCB states that "*in considering issuance of a permit or license to appropriate water for power plant cooling, the Board will consider the reasonableness of the proposed water use when compared with other present and future needs for the water source and when viewed in the context of alternative water sources that could be used for the purpose*" (Resolution 75-58, pgs. 5 & 6). Although no appropriative right is at issue in this case, increasing groundwater demands on a fresh

water supply dictate that the Energy Commission consider the reasonableness of allowing BSEP to use groundwater of a quality suitable for domestic use when a source of lower quality water (TDS in excess of 1000 mg/L) that cannot be used for domestic purposes without extensive treatment is available in the aquifer approximately 5 miles to the east of the site in the vicinity of Koehn Lake. Staff considers the higher TDS (brackish) groundwater located near Koehn Lake to be a possible alternative to the proposed use of high quality fresh groundwater located beneath the proposed project site.

The brackish groundwater located southwest of Koehn Lake is the same water source considered for all of the alternatives (1 through 5). Each to-be-constructed well is assumed to be 500 feet deep. The pipeline diameter for Alternatives 1 and 3 is 14 inches and for Alternatives 2, 4 and 5, 12 inches. The size differences are a function of water demand for each alternative. For this analysis, the line was sized to operate 24 hours per day at half the water demand rate.

WATER TREATMENT PROCESSES

With alternative water supply sources, alternative water treatment processes must be considered. Each of the five alternatives uses a combination of water treatment processes. All of the processes shown in **Soil & Water Table D2** are well established commercial technologies. A discussion of each water treatment process is provided below:

SAC-SBA

As mentioned above, SAC-SBA vessels contain ion exchange resin specifically designed to remove cations (positive ions) and anions (negative ions) from water. This process is the same ion exchange process proposed by BSEP and would be used in Alternatives 1, 2 and 4.

REVERSE OSMOSIS (RO)

RO is a technology that utilizes permeable membranes (under relatively high pressure) to repel salt and pass water. Most of the dissolved salts are repelled by the membrane surface (95% to 98% for most ions) allowing only water to pass through the membrane. RO must have highly filtered water with modified chemistry (usually pH adjustment) to operate successfully. In the alternatives utilizing RO, the water would be filtered by the use of microfiltration (MF). MF is also a membrane process that is commonly used with RO in difficult industrial or reuse applications. This process would be used in two ways, 1) as Makeup treatment or 2) in a wastewater recovery configuration.

RO would be used to directly treat cooling tower makeup, steam generator makeup and mirror washing water in alternatives 2 and 5, and would be used to treat cooling tower blowdown to recover used water and reduce overall wastewater volume either for disposal or as a pretreatment to an evaporator in Alternatives 2, 3 and 5.

EVAPORATOR/CRYSTALLIZERS

This process would be used to reduce wastewater volume to essentially zero. In the evaporator, 90% to 95% of the wastewater would be recovered. Brine from the evaporator would be sent to a crystallizer to further recover water. Waste from the crystallizer would be in the form of highly concentrated salt brines that would crystallize to solid form for offsite disposal. This process would be used in Alternatives 4 and 5. A recovery RO would be used to pre-concentrate the wastewater stream to the evaporator as shown in Alternative 5.

WATER TREATMENT ALTERNATIVES

As a means of conserving high quality (fresh) onsite groundwater, staff has analyzed alternatives to using 100% fresh groundwater. In the analysis, five treatment alternatives were evaluated utilizing offsite brackish water (See **Soil & Water Table D2**). All of the alternatives would utilize well water from a brackish makeup source. The water is considered brackish because its total dissolved solids (TDS) content is at least twice that of onsite well water (1,000 mg/l versus 500 mg/l). The brackish aquifer is accessible at the southwest corner of Koehn Lake approximately 5 miles from the project site. It was assumed that four wells would be required to supply BSEP needs. In all of the alternatives, well water would be transported to the site via a 12-inch or 14-inch pipeline (depending on water demand).

Five water treatment alternatives have been identified and analyzed to determine the most effective alternatives to using fresh on-site groundwater. These five alternatives are shown on **Soil and Water Table D2** and discussed below:

Soil & Water Table D2
Offsite Brackish Water Alternatives

	SAC-SBA	Makeup RO	Recovery RO	Evap/Crys	Evap Ponds
Alternative 1	X				X
Alternative 2	X		X		X
Alternative 3		X	X		X
Alternative 4	X			X	
Alternative 5		X	X	X	

ALTERNATIVE 1

Alternative 1 utilizes brackish water from offsite wells for plant needs, e.g. cooling tower makeup, closed cooling system makeup, steam generator makeup, mirror washing, etc. Steam generator blowdown and plant drains would be recycled to the cooling tower. That is the same process proposed by BSEP. In Alternative 1, well water from onsite wells would still be used for potable needs. Plant wastewater would be sent to an evaporation pond for final disposal. The evaporation ponds needed in Alternative 1 would be about 15% larger than those proposed by BSEP because more wastewater would be generated by the SAC-SBA treating brackish water.

ALTERNATIVE 2

This alternative combines Alternative 1 (SAC-SBA) with a recovery RO to reduce the cooling tower blowdown portion of the wastewater stream. MF would be used as pretreatment for the recovery RO. The evaporation ponds would be slightly smaller than the ponds proposed by BSEP.

ALTERNATIVE 3

In this alternative, offsite water would be treated with MF and RO prior to storage in the Process Water Tank (replacing SAC-SBA). A portion of cooling tower blowdown would also be recovered via RO prior to discharge to evaporation ponds. MF would be used as pretreatment for the makeup and recovery RO. Steam generator blowdown and plant drains would be recycled to the cooling tower. RO permeate would be recovered to the cooling tower. This alternative would generate more wastewater than Alternatives 1 or 2 and would require significantly larger evaporation ponds.

ALTERNATIVE 4

This alternative combines Alternative 1 (SAC-SBA) with an evaporator/crystallizer and would essentially eliminate a liquid waste stream. There would be no evaporation pond in this alternative. Crystallizer solid waste would require offsite disposal. Steam generator blowdown and plant drains would be recycled to the cooling tower. Cooling tower blowdown and SAC-SBA wastewater would be fed to the evaporator/crystallizer. Distillate from the evaporator/crystallizer would be recovered to the cooling tower.

ALTERNATIVE 5

This alternative combines Alternative 3 (makeup RO/recovery RO) with an evaporator/crystallizer and would essentially eliminate a liquid waste stream, i.e. there would be no evaporation pond in this alternative. Crystallizer solid waste would require offsite disposal. Steam generator blowdown and plant drains would be recycled to the cooling tower. Cooling tower blowdown and makeup RO wastewater (known as reject) would be fed to the evaporator/crystallizer. Distillate from the evaporator/crystallizer would be recovered to the cooling tower.

Alternatives 4 and 5 would be the only Alternatives employing treatment options that would require offsite waste disposal.

Soil & Water Table D3 provides a comparative summary of using onsite fresh water versus using offsite brackish water for BSEP makeup. The analysis was based on typical summer conditions. Note the evaporation pond sizing for the BSEP-proposed treatment.

Wastewater sources include cooling tower blowdown, steam generator blowdown, plant drains, water treatment waste streams, etc. Cooling tower blowdown and SAC-SBA neutralized wastewater would be sent to three 8.3 acre evaporation ponds. Steam generator blowdown and plant drains would be recycled to the cooling tower. The applicant claims that the ponds are sized to accommodate all solids residue generated throughout the life of the plant.

The treatment process proposed by BSEP was driven by the PM10 requirements that would be placed on the cooling tower by the Air Quality Management District. The total dissolved solids (TDS) of the circulating water must be less than 1,600 mg/l to meet the PM10 limit. Also, BSEP plans to operate the cooling tower at 15 cycles of concentration (the ratio of feedwater flow to blowdown flow is 15) to minimize wastewater generation. This also means that the TDS of the makeup water (onsite wells) must be reduced to approximately 100 mg/l. BSEP proposes using SAC-SBA ion exchangers to accomplish this. SAC-SBA vessels contain ion exchange resin specifically designed to remove cations (positive ions) and anions (negative ions) from water.

The SAC and SBA vessels have a fixed capacity to remove ions, and therefore, must be removed from service frequently and regenerated. This is accomplished by passing dilute sulfuric acid through the SAC vessel (strong acid cation) and dilute sodium hydroxide through the SBA vessel (strong base anion). Water treatment waste, which can have very high or low pH, will require neutralization prior to disposal.

In the applicant's water balance for typical annual conditions, they show a wastewater rate to the evaporation ponds of 471 gpm (BS 2008a, Section 2, Figure 2-13). This consists primarily of cooling tower blowdown and wastewater from water treatment. They plan to operate at an annual 26.5% capacity factor (94% capacity factor during daylight periods). Adjusting wastewater flow to a 24-hour operating basis, flow to the evaporation ponds would be 125 gpm (471 gpm x 26.5%). In this scenario, all wastewater disposal ponds, as designed, would have to operate for the entire year to accommodate this flow. Stated another way, the evaporation rate from the ponds would have to be 97 inches per year.

Evaporation pan data for this area is about 120 inches per year. Pan data is a measure of net evaporation rate and is determined with a National Weather Service Class A pan (measuring 48" diameter x 10" deep). Evaporation rate for small ponds[25] is calculated as follows:

$$Evaporation\ Rate = k_1\ x\ k_2\ x\ Class\ A\ Pan\ Evaporation\ Rate$$

Where k_1 is the pan coefficient and k_2 is the salinity coefficient.[26] For evaporation ponds, a small pond pan coefficient of 0.7 should be used. The salinity factor can range from 1 (insignificant salt concentration) to 0.7 concentrated brines. It could be argued that the brine in the BSEP ponds will reach saturation, i.e. all the salt (as ions) that enters the pond will saturate and start to precipitate. If a midpoint k_2 factor of 0.85 is used, the corrected evaporation rate would be approximately 72. The BSEP ponds are marginally sized to contain expected flow and a fourth pond will likely be required. Also, if water use in the plant is greater than that described in the water balance[27], additional pond

[25] These could be naturally formed ponds, wastewater evaporation ponds, solar brine ponds, etc.

[26] Linsley, R. K. and Franzini, J. B., 1972, *Water Resources Engineering,* 2nd edition, McGraw-Hill Inc.,

New York, New York.

[27] Figure 2 in the applicant's Project Description.

area will be required. Staff calculated a pond size (utilizing the criteria discussed above) of 43.5 acres versus the 25 acres identified in the BSEP project description.

Soil & Water Table D3
Water Treatment Summary

Typical Summer Conditions Basis						
		Offsite Wells - Koehn Lake Source Water				
	BSEP Onsite Wells SAC-SBA	Alternative 1 SAC-SBA	Alternative 2 SAC-SBA Recov RO	Alternative 3 MU- RO Recov RO	Alternative 4 SAC-SBA Evap-Crys	Alternative 5 MU-Recov RO Evap-Crys
Water Demand - Instantaneous						
Onsite Wells Demand, gpm	4,038	5	5	5	5	5
Koehn Lake Water Demand, gpm	N/A	4,086	3,772	3,959	3,463	3,480
Total Wastewater, gpm	572	650	565	801	0	0
Water Demand - Annual Average Conditions						
Annual Capacity Factor	26.5%	26.5%	26.5%	26.5%	26.5%	26.5%
Onsite Wells Demand, gpm	1,070	5	5	5	5	5
Koehn Lake Water Demand, gpm	N/A	1,083	1,000	1,049	918	922
Onsite Wells Demand, AF/yr	1,726	8.1	8.1	8.1	8.1	8.1
Koehn Lake Water Demand, AF/yr	N/A	1,747	1,612	1,692	1,480	1,488
Total Wastewater, gpm	152	172	150	212	0	0
Evap Pond, acres[1]	43.5	49.4	42.9	60.8	0	0

Notes.....
1. BSEP project evap pond size was altered from that presented in the AFC based on CEC staff calculations.

COST ANALYSIS

Soil & Water Table D4 presents a cost analysis of using fresh groundwater obtained from BSEP onsite wells versus obtaining and using offsite brackish water. From a capital perspective, Alternative 1 (SAC-SBA) and Alternative 2 (SAC-SBA with recovery RO) are the least costly of the offsite alternatives, and would cost an additional $12.6 million and $12.1 million, respectively. Alternatives 1 and 2 also have the lowest operating cost of the mentioned alternatives, exceeding the BSEP design by $0.8 million per annum. Lastly, when the installed cost is capitalized (amortized at 7% for 20 years), Alternatives 1 and 2 are still the least costly of the five offsite alternatives. However, its annual cost would exceed BSEP costs by $2 million per year.

Again, Alternatives 1 and 2 achieve the goal of using non-potable quality water for project cooling. Given the budget level of analysis, the costs of these alternatives are quite close and should be considered equivalent.

Soil & Water Table D4
Water Treatment Summary & Cost Analysis

Typical Summer Conditions Basis

		Offsite Wells - Koehn Lake Source Water				
	BSEP Onsite Wells SAC-SBA	Alternative 1 SAC-SBA	Alternative 2 SAC-SBA Recov RO	Alternative 3 MU RO Recov RO	Alternative 4 SAC-SBA Evap-Crys	Alternative 5 MU-Recov RO Evap-Crys
Equipment & Evap Pond Installed Cost						
SAC-SBA	$20,610,000	$20,610,000	$20,610,000	N/A	$20,610,000	N/A
MU-Recovery RO	N/A	N/A	$3,380,000	$23,840,000	N/A	$21,160,000
Evaporator Crystallizer	N/A	N/A	N/A	N/A	$33,750,000	$36,190,000
Common Tankage & Pumping	$11,140,000	$11,270,000	$10,520,000	$10,970,000	$9,770,000	$9,810,000
Water Treatment Subtotal	$31,750,000	$31,880,000	$34,510,000	$34,810,000	$64,130,000	$67,160,000
Evaporation Pond	$10,960,000	$12,460,000	$10,820,000	$15,340,000	N/A	N/A
Total Water & Wastewater	$42,710,000	$44,340,000	$45,330,000	$50,150,000	$64,130,000	$67,160,000
Pipeline from Koehn Lake						
4 Wells	N/A	$880,000	$880,000	$880,000	$880,000	$880,000
Pump Station	N/A	$3,080,000	$3,000,000	$3,050,000	$2,910,000	$2,910,000
5 Mile Carbon Steel Pipeline	N/A	$6,970,000	$5,580,000	$6,970,000	$5,580,000	$5,580,000
Total	N/A	$10,930,000	$9,460,000	$10,900,000	$9,370,000	$9,370,000
Total Installed Water Treatment Costs	$42,710,000	$55,270,000	$54,790,000	$61,050,000	$73,500,000	$76,530,000
	Base	$12,560,000	$12,080,000	$18,340,000	$30,790,000	$33,820,000
Total Annual Operating Costs	$1,215,000	$2,056,000	$2,075,000	$2,235,000	$3,781,000	$4,215,000
	Base	$841,000	$860,000	$1,020,000	$2,566,000	$3,000,000
Capitalized Equipment Costs[1]	$4,032,000	$5,218,000	$5,172,000	$5,763,000	$6,938,000	$7,224,000
	Base	$1,186,000	$1,140,000	$1,731,000	$2,906,000	$3,192,000
Annual Operating & Capital Cost	$5,247,000	$7,274,000	$7,247,000	$7,998,000	$10,719,000	$11,439,000
	Base	$2,027,000	$2,000,000	$2,751,000	$5,472,000	$6,192,000

Notes.....
1. Capitalized at 7% per year for 20 years.

Soil & Water Table D5 shows the cost sensitivity of increased TDS in the offsite wells. Refer to the following for an analysis comparing the costs of offsite well alternatives if well water TDS were 2,500 mg/l instead of 1,000 mg/l. The operating costs of Alternatives 1, 2 and 4, which utilize SAC-SBA treatment, would increase by 61.0% to 67.9%. The additional ion loading would require larger and/or more ion exchange vessels. Alternative 3 (makeup RO/recovery RO) operating costs increased by 3%. The operating pressure of the RO equipment would be higher at higher feed TDS. Equipment costs also increased for Alternatives 1, 2 and 4 by 45.9% to 48.8%. Alternative 3 will be carried forward in this evaluation (along with Alternatives 1 and 2) because it offers more operating flexibility from an operating and capital viewpoint.

Soil & Water Table D5
Water Treatment Cost Comparison – Increase in TDS from Offsite Wells

Typical Summer Conditions Basis							
			Offsite Wells - Koehn Lake Source Water				
	BSEP Onsite Wells SAC-SBA	Koehn Lake TDS, mg/l	Alternative 1 SAC-SBA	Alternative 2 SAC-SBA Recov RO	Alternative 3 MU RO Recov RO	Alternative 4 SAC-SBA Evap-Crys	Alternative 5 MU-Recov RO Evap-Crys
Annual Operating Costs	$1,215,000	1,000	$2,056,000	$2,075,000	$2,235,000	$3,781,000	$4,215,000
		2,500	$3,452,000	$3,341,000	$2,302,000	$6,228,000	$4,750,000
		Pct Change	67.9%	61.0%	3.0%	64.7%	12.7%
Install Equipment Cost	$42,710,000	1,000	$55,270,000	$54,790,000	$61,050,000	$73,500,000	$76,530,000
		2,500	$81,350,000	$81,550,000	$62,590,000	$107,200,000	$78,510,000
		Pct Change	47.2%	48.8%	2.5%	45.9%	2.6%
Annual Op & Cap Cost	$5,247,000	1,000	$8,767,000	$8,625,000	$7,998,000	$12,140,000	$11,439,000
		2,500	$11,131,000	$11,039,000	$8,211,000	$16,347,000	$12,161,000
		Pct Change	27.0%	28.0%	2.7%	34.7%	6.3%

COOLING ALTERNATIVES

BSEP evaluated three Air Cooled Condenser (ACC) dry cooling alternatives (refer to Worley Parsons report "FPLE Beacon Solar Energy Project Dry Cooling Evaluation", dated February 1, 2008). The report evaluated three ITD scenarios (35 °F, 40 °F and 45 °F). Each ITD scenario yields a slightly different operating profile. For evaluation purposes, the 40 °F scenario was compared to wet cooling alternatives, i.e. the BSEP base case and Alternatives 1, 2 and 3. In the Worley Parsons study, the cost for solar arrays was increased to provide 250 MW (i.e. same as base case) on the hottest summer day to offset energy use for ACC.

A summary of cooling system comparisons is presented in **Soil & Water Table D6**. Note that the cooling system (cooling tower) costs remain the same for the base case and Alternatives 1, 2 and 3. After combining the costs for the cooling systems (wet and dry), water treatment and additional solar arrays, the BSEP base case is the lowest estimated capital cost followed by Alternatives 1, 2 and 3 (in that order) and dry cooling. As can be seen in this analysis, the additional solar arrays strongly affect the capital cost comparisons. The annual operating costs were calculated by adding power for the wet and dry cooling system to the annual cost for water treatment. Other power costs (outside the cooling loop) were considered equivalent. Of note, the dry cooling alternative has the lowest operating costs of all the Alternatives and is $403,000 less than the BSEP base case.

Soil & Water Table D6
Cooling System Cost Comparison

Cooling System Comparison Summary					
Typical Summer Conditions Basis					
	BSEP Base Case	Alternative 1 Offsite Wells SAC-SBA	Alternative 2 Offsite Wells SAC-SBA Recov RO	Alternative 3 Offsite Wells MU/Recov RO	ACC 40F ITD
Cooling System					
Cooling Tower Cells	11				N/A
ACC Cells	N/A				40
Power Requirements					
Fan Power, HP	250				200
Circ Pump Power, HP	2509				N/A
Total Power, HP	5259				8000
Total Power, kw	3918				5960
Average Op Capacity	26.5%				26.5%
Power, kw-hr/year	9,096,000				13,836,000
Power Cost, $/year	$1,364,400	$1,364,400	$1,364,400	$1,364,400	$2,075,400
Cooling System Costs					
HTF Pumps	$3,000,000				$3,000,000
BFW Pumps	$2,300,000				$2,400,000
SG Heat Exchanger	$12,500,000				$14,100,000
Additional Solar Arrays[1] (installed)	Base				$53,000,000
Cooling Tower	$4,275,000				N/A
CT Basin	$1,500,000				N/A
Circ Water Pumps	$600,000				N/A
Surface Condenser	$3,500,000				N/A
Circ Water Piping	$1,300,000				N/A
Circ Water Piping Install	$520,000				N/A
ACC Equipment	N/A				$36,900,000
ACC Install	N/A				$11,500,000
Closed Cycle Aux Cooler	N/A				$450,000
Total Cooling System Cost	$29,495,000	$29,495,000	$29,495,000	$29,495,000	$121,350,000
Water Treatment Costs	$42,710,000	$55,270,000	$54,790,000	$61,050,000	$4,600,000
Total System Cost	$72,205,000	$84,765,000	$84,285,000	$90,545,000	$125,950,000
	Base	$12,560,000	$12,080,000	$18,340,000	$53,745,000
Annual Operating Costs					
Water Treatment	$1,215,000	$2,056,000	$2,075,000	$2,235,000	$101,000
Cooling System Power	$1,364,400	$1,364,400	$1,364,400	$1,364,400	$2,075,400
Total Operating Cost[2]	$2,579,400	$3,420,400	$3,439,400	$3,599,400	$2,176,400
	Base	$841,000	$860,000	$1,020,000	-$403,000
Capitalized Equipment Costs[3]	$6,820,000	$8,010,000	$7,960,000	$8,550,000	$11,890,000
	Base	$1,190,000	$1,140,000	$1,730,000	$5,070,000
Annual Operating & Capital Costs	$9,399,400	$11,430,400	$11,399,400	$12,149,400	$14,066,400
	Base	$2,031,000	$2,000,000	$2,750,000	$4,667,000

Notes.....

1. Costs extracted from Worley Parsons report, "FPLE - Beacon Solar Energy Project Dry Cooling Evaluation" dated Feb February 1, 2008.
2. Water treatment costs plus cost for cooling system power. All other power costs were assumed to be equivalent.
3. Capitalized at 7% per year for 20 years.

Typical Summer Conditions Basis			
	BSEP Base Case	Alternative 3 Offsite Wells MU/Recov RO	ACC 40F ITD
Cooling System			
Cooling Tower Cells	11		N/A
ACC Cells	N/A		40
Power Requirements			
Fan Power, HP	250		200
Circ Pump Power, HP	2509		N/A
Total Power, HP	5259		8000
Total Power, kw	3918		5960
Average Op Capacity	26.5%		26.5%
Power, kw-hr/year	9,096,000		13,836,000
Power Cost, $/year	$1,364,400	$1,364,400	$2,075,400
Cooling System Costs			
HTF Pumps	$3,000,000		$3,000,000
BFW Pumps	$2,300,000		$2,400,000
SG Heat Exchanger	$12,500,000		$14,100,000
Additional Solar Arrays[1] (installed)	Base		$53,000,000
Cooling Tower	$4,275,000		N/A
CT Basin	$1,500,000		N/A
Circ Water Pumps	$600,000		N/A
Surface Condenser	$3,500,000		N/A
Circ Water Piping	$1,300,000		N/A
Circ Water Piping Install	$520,000		N/A
ACC Equipment	N/A		$36,900,000
ACC Install	N/A		$11,500,000
Closed Cycle Aux Cooler	N/A		$450,000
Total Cooling System Cost	$29,495,000	$29,495,000	$121,350,000
Water Treatment Costs	$42,710,000	$61,050,000	$4,600,000
Total System Cost	$72,205,000	$90,545,000	$125,950,000
	Base	$18,340,000	$53,745,000
Annual Operating Costs			
Water Treatment	$1,215,000	$2,235,000	$101,000
Cooling System Power	$1,364,400	$1,364,400	$2,075,400
Total Operating Cost[2]	$2,579,400	$3,599,400	$2,176,400
	Base	$1,020,000	-$403,000
Capitalized Equipment Costs[3]	$6,820,000	$8,550,000	$11,890,000
	Base	$1,730,000	$5,070,000
Annual Operating & Capital Costs	$9,399,400	$12,149,400	$14,066,400
	Base	$2,750,000	$4,667,000

Notes.....

1. Costs extracted from Worley Parsons report, "FPLE - Beacon Solar Energy Project Dry Cooling Evaluation" dated February 1, 2008.
2. Water treatment costs plus cost for cooling system power. All other power costs were assumed to be equivalent.
3. Capitalized at 7% per year for 20 years.

Lastly, the Worley Parsons study determined that the net output for the 40 °F ITD ACC would be 7.50% less than that of the base case. The base case would include the BSEP proposed cooling configuration or Alternative 3 (offsite wells with makeup and

recovery RO). At high ambient dry bulb temperatures (summer conditions), the ACC cannot cool as efficiently as wet cooling resulting in higher condenser backpressure and reduced turbine output. **Soil & Water Table D7** provides a comparison of annual net output for the wet and dry alternatives. The difference in generating output is an indirect measure of ACC cooling efficiency relative to wet cooling.

Soil & Water Table D7
Net Output Comparisons

	BSEP Wet Cooling	ACC 40° F ITD
Design Point Ambient Temperature, F	68 °F WB	103.5 °F DB
Design Point Backpressure, "Hg	2.1	7.1
Plant Output, MW_{Net}	250	250
Annual Average Backpressure, "Hg	1.5	2.0
Estimated Annual Output, MW-hr	602,527	557,365
Est Annual Output Difference, MW-hr	Base	45,162
Pct Difference to Base	Base	-7.50%

The design requirement for the ACC is rigorous in that the ACC must meet design point summer conditions. To compensate for reduced efficiency and to achieve 250 MW net output based at a design point of 103.5 °F (DB temperature)[28], the applicant increased the size of the solar array. Additionally, the ACC alternatives were sized to provide 2" mercury (Hg) of backpressure based on annual average conditions as compared to the 1.5" Hg expected for wet cooling. The loss of output was calculated based on the difference in annual average backpressure, i.e. 1.5" Hg for wet cooling versus 2" Hg for dry cooling. The installed cost (and presumably collector area) of the solar arrays would have to be increased by 12.9 percent to achieve their design requirements.

The applicant should review their design criteria to minimize the impact on the solar array. For example for slightly lower design points, review ACC size versus required solar filed array. Incrementally increasing the size of the ACC (e.g. 36 fans to 40 fans) is much less costly than increasing the size of the solar array.

CONCLUSIONS

1. The BSEP waste disposal evaporation ponds are marginally sized and a fourth pond will likely be required. Also, if water use in the plant is greater than that described in the water balance, additional pond area will be required.

2. Alternative 1 (SAC-SBA), Alternative 2 (SAC-SBA with recovery RO) and Alternative 3 (makeup RO/recovery RO) are viable non-potable (high TDS) water options in lieu of using onsite high-quality fresh groundwater. Alternative 3 is much less sensitive to higher TDS groundwater available from offsite wells.

[28] The design temperature is the average of the July, August and September ASHRAE summer peak 2% dry bulb (DB). It is within the 0.4% and 1% annual occurrences of high temperatures for this area.

3. The applicant should review their design criteria for the ACC. The rigorous design point (103.5 ºF DB) forces them to expand the collector array area by 12.9 percent. The applicant should review their design criteria to minimize the impact on the solar array. For example, for slightly lower design points, ACC size versus required solar filed array should be evaluated.

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SOIL AND WATER RESOURCES - APPENDIX E

FACTS FOR WASTE DISCHARGE

1. Reason for Action and Regulatory Authority

   The applicant filed an Application for Certificate (AFC) with the Energy Commission on March 13, 2008. The AFC proposed the construction and operation of a solar power plant at the Facility site. In conjunction with Facility construction, the applicant proposes to discharge wastes, dredged, and/or fill material to State waters.

   Under the Warren-Alquist Act, and Governor's Executive Order S-14-08, the California Energy Commission (Energy Commission) has the authority to streamline permitting for renewable energy generation facilities. The Energy Commission implements an "in lieu of" permit process by incorporating the regulatory requirements and conditions of the various local and State agencies in its certification process. All necessary State and local permits for this Facility, including those permits typically issued by the Water Board are issued to the applicant through the Energy Commission's certification process. The Water Board has cooperated with the Energy Commission in evaluating the Beacon Solar Energy Project (BSEP) and provided to the Energy Commission the Board's analysis and recommended waste discharge requirements, herein, which staff has independently evaluated and hereby adopts as its own.

   In a February 5, 2008 letter, the U.S. Army Corps of Engineers (USACE) determined that the ephemeral drainages on the site are not waters of the United States (U.S.). The USACE stated that the basis for this non-federal jurisdiction determination was because the waters did not meet the requirements of Code of Federal Regulations 33 parts 328.3(a)(3)(iii) and 328.3(a)(1). However, the drainages affected by the Facility are waters of the State, as defined by California Water Code (Water Code) section 13050, and are subject to State requirements in accordance with Water Code section 13260 and to the Water Quality Control Plan for the Lahontan Region (Basin Plan). All actions impacting or potentially impacting these drainages, including dredge and fill activities and construction and industrial activities, will be regulated through these requirements, which will be incorporated in the Energy Commission's certification process.

2. Waste Discharge Requirements History

   The Facility is a new project. There are no previous Lahontan Water Board actions at this Facility or location. These requirements for waste discharge address storm water, dredge and fill, and groundwater requirements for the Facility.

3. Climate

   The Mojave Desert has a typical desert climate, i.e., extreme daily temperature changes, low annual precipitation, strong seasonal winds, and mostly clear skies.

The annual highest temperature in the Mojave Desert exceeds 100 degrees Fahrenheit. Winter temperatures are more moderate, with mean maximum temperatures in the 60s and lows in the 30s.

Nearby California City has a total average annual precipitation of less than 7 inches. Over 70 percent of the precipitation occurs between December and March. However, occasional heavy precipitation occurs in the summer due to thunderstorms.

4. Site Geology

a. Setting

The Facility is located in Fremont Valley at the northwest edge of the Mojave Desert Geomorphic Province. Fremont Valley is a deep structural depression, i.e., a pull-apart basin, formed between two sections of the Garlock fault. The unconsolidated deposits of Fremont Valley are over 10,000 feet thick. Shallow deposits consist of Holocene (11,000 years and younger) alluvium, lacustrine, and playa deposits. Deeper deposits consist of older alluvium. The Holocene and older alluvium are comprised of mixtures, layers, and lenses of silt, sand, and gravel. The lacustrine and playa deposits are generally finer grained, consisting of sands, silts, and clays. These deposits overlie igneous or metamorphic basement rocks at depth.

The Facility site is located at the northwestern edge of the Fremont valley on the apron of coalesced alluvial fans formed at the base of the Sierra Nevada. The elevation of the Facility ranges from 2,030 feet to 2,260 feet above mean sea level.

b. Faulting and Seismicity

The Facility is located in a highly seismic region of southern California and within the influence of several active fault systems. The nearest fault system is the southwest/northeast trending Garlock fault. The U.S. Geologic Survey (USGS) classifies the Garlock fault as a “major Holocene active fault.” The USGS divides the fault into western, central, and eastern sections. Based on USGS maps, the Facility is located in the structurally complex area where fault movement steps from the western section to the central section of the Garlock fault. The western section (also locally referred to as the Cantil or Cantil Valley fault) crosses through the center of the site. At the Facility, the fault trace of the western section is expressed as an eroded escarpment with the southeastern side approximately 15 to 25 feet higher than the northwestern side. The central section of the Garlock fault is approximately 2,000 feet northwest of the site. North to north-northwest trending secondary faults from the western and central sections are mapped by the USGS as extending into northern portions of the Facility.

Both fault sections of the Garlock fault and the secondary faults are designated by the State of California as Alquist-Priolo Fault Zones. The intent of the 1972 Alquist-Priolo Earthquake Fault Zoning Act was to mitigate the hazard of surface fault rupture to structures intended for human occupancy. The width of the

Alquist-Priolo Fault Zone associated with the western section on the Facility ranges from approximately 800 to 400 feet. Alquist-Priolo Fault Zones for the secondary faults covers much of the northeastern corner of the Facility and a small portion in the northwest portion of the Facility. The USGS estimates a peak ground acceleration of 70 percent for both the western and central sections of the fault.

c. Soils

Most of the Facility is covered by soil types that have rapid (i.e., high) permeability and negligible to low runoff potential. The exceptions are areas underlain by clay loams, which have moderate runoff potential and moderate to moderately slow permeability (i.e., low permeability). Clay loam soils are present in the northeast portion of the Facility and are slightly to moderately saline.

5. Groundwater

The Facility is located in the northwestern portion of the Fremont Valley groundwater basin (Department of Water Resources [DWR] groundwater basin No. 6-46). The Fremont Valley groundwater basin is divided into several sub-basins based on the presence of bedrock barriers and faults that influence groundwater movement.

The Facility site overlies the Koehn groundwater sub-basin, which is in the northern portion of Fremont Valley groundwater basin. The unconsolidated deposits comprising the sub-basin may be as thick as 1,900 feet and consist of mixtures of silt, sand, and gravel with some clay lenses. Depth to groundwater varies from as shallow as 14 feet in the vicinity of Koehn Lake to more than 300 feet in areas more distal from the lake. The groundwater flow direction in the sub-basin is generally toward Koehn Lake. The primary source of water to the groundwater basin is from surface infiltration at the base of the mountains and in ephemeral washes. Additionally, there may be some flow into the Koehn sub-basin from the adjacent sub-basins.

Depth to groundwater measured at the Facility in October 2007 ranged from approximately 200 to over 400 feet below ground surface. The groundwater flow direction is to the east-northeast at a gradient of approximately 0.012 foot per foot. Historic well level data show that from the 1970s to the 1980s groundwater pumping for agricultural use lowered the groundwater level in the vicinity of the Facility by as much as 250 feet. Since agriculture use ceased in 1988, groundwater levels have slowly recovered to within 100 to 130 feet of 1970s levels. A groundwater depression still exists in the northeastern portion of the site. Fourteen agricultural groundwater wells are proposed to remain on the Facility site. Several of these wells are proposed to be used for providing water for the construction of the Facility. These wells may also be used for Facility operations. In accordance with State Water Resources Control Board (State Water Board) Resolution No. 75-58, *Water Quality Control Policy on the Use and Disposal of Inland Waters Used for*

Powerplant Cooling and Resolution No. 77-01, *Policy with Respect to Water Reclamation in California*, staff is evaluating alternative water sources for Facility operation.

In the vicinity of Koehn Lake, some groundwater wells produce water with high total dissolved solids (TDS). Groundwater quality is generally good outside of the immediate vicinity of the lake.

6. Surface Water

Surface water flow in Fremont Valley is to Koehn Lake, a saline wet playa. The playa is a flat, unvegetated area in the lowest part of this undrained valley.

All drainages in this portion of the valley exist as ephemeral washes. There are two major washes in the vicinity of the Facility: Pine Tree Creek and Jawbone Creek. Pine Tree Creek drains the Sierra Nevada via Pine Tree Canyon, southwest of the Facility site. Pine Tree Creek continues north-northeast across the Facility site and discharges to Jawbone Creek which runs along the Facility's northern boundary. Jawbone Creek continues to Koehn Lake, 5 miles to the northeast. A smaller unnamed drainage crosses into the western portion of the site and discharges to Jawbone Creek at the northern boundary of the Facility.

The portion of Pine Tree Creek that crosses the Facility is mapped as a 100-year flood hazard zone by the Federal Emergency Management Agency (FEMA). The applicant has completed a modeling effort based on the 1986 Kern County Hydrology Manual, U.S. Army Corps of Engineers Hydrology Engineering Center (HEC) and FEMA-approved software. The site-specific analysis found that the flow during the 100-year event would largely be contained in the well-defined channel south of the Garlock fault escarpment. However, a gradient change on the north side of the Garlock fault would cause the 100-year event to spread outside of the channel and cover much of the northern portion of the Facility.

7. Land Uses and Existing Site Conditions

Land use in the vicinity of the Facility site is primarily open desert land, typified by creosote bush scrub vegetation with patches of desert saltbush scrub, desert wash scrub, and agriculture (mostly abandoned). A residential area exists approximately 0.5 miles north and an automotive test center is 0.8 mile northeast of the site.

The 2,012-acre site is largely vacant and previously disturbed from agriculture activities, which ceased in the 1980s. Although vegetation in the Facility's dry washes has been degraded by past agricultural activities, these washes are characterized by natural processes that support recruitment of native desert wash vegetation and provide wildlife habitat. A 2008 report by the U.S. Environmental Protection Agency, *The Ecology and Hydrological Significance* of *Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest* states that ephemeral and intermittent streams provide the same ecological and hydrological functions as perennial streams by moving water, nutrients, and sediment throughout the watershed.

8. Description of Direct Impacts to State Waters

According to the Energy Commission's *Preliminary Staff Assessment* (April 2009), one of the most significant impacts of the Facility is the re-routing of Pine Tree Creek and the channelization of an unnamed ephemeral wash on the west side of the Facility. These dredge and fill activities will result in the loss of 16 acres of jurisdictional waters of the State. The applicant proposes to replace the existing Pine Tree Creek channel with an engineered channel, which will be aligned along the south and east boundaries of the Facility site. The design of this channel will incorporate components designed to replicate the hydrological and biological functions and processes in this new drainage. The applicant also proposes rerouting and channelizing the unnamed wash. The unnamed wash will discharge to the rerouted Pine Tree Creek.

The Facility involves the proposed discharge of structural materials and/or earthen wastes (fill) to all of approximately 16 acres of natural watercourses. Impact areas and linear feet are shown in the table below.

Table 1: Impacts to Waters of the State

Water Body	Area (acres)			Linear	Impacts	
Name	Wetlands	Vegetated	Unvegetated	Feet	Feet	Area (acres)
Pine Tree Creek	0	2.4	12.56	10,900	10,900	14.96
Unnamed wash	0	0	1.04	2,500	2,500	1.04
Total (Temp)	0	0	0	0	0	0
Total (Perm)	0	2.4	13.6	13,400	13,400	16.0
Total	**0**	**2.4**	**13.6**	**13,400**	**13,400**	**16.0**

9. Mitigation and Monitoring Plan (and long-term management)

The FSA specifies that the applicant shall mitigate the effects of the discharges of fill through:

- 1:1 replacement ratio for permanent impacts to unvegetated State waters,
- 2:1 replacement ratio of permanent impacts to State waters vegetated with southern alluvial fan scrub.

The applicant proposes to achieve these mitigation measures by replicating the hydraulic and biological function of the existing waters in the rerouted engineered channel for Pine Tree Creek. The channel will be designed to allow low flows to meander across the 250-foot width of the channel. Based on the applicant's analysis of the design, there should be little or no change in the sediment transport or scour from pre-development conditions.

The FSA specifies various requirements for the mitigation effort under its Condition of Certification, Biology–18. These requirements include the submittal of a Desert Wash Revegetation Plan for the approval of the Energy Commission and California Department of Fish and Game. The FSA concludes that there is a significant level of uncertainty as to whether the Facility's revegetation criteria can be met and includes various remedial actions. If the revegetation criteria are not obtained within 10 years after initiation of the revegetation effort, the FSA specifies that the applicant shall acquire, in fee or in easement, 16 acres of State jurisdictional waters. The acquired waters of the State will be in the same watershed and similar in hydraulic and biological function to the waters of the State at the site prior to Facility construction.

10. Storm Water Discharges

Under pre-development conditions, the Facility site has a low gradient (between 1 and 3 percent) and storm water moves via sheet flow to Pine Tree Creek or Jawbone Creek. These conditions will be permanently modified by construction of the Facility.

The following requirements regulate waste discharges in storm water runoff and other discharges associated with Facility construction activity and industrial storm water runoff.

The requirements also direct the applicant to maintain pre-development infiltration, surface retention and recharge rates in order to minimize post-development impacts to offsite water bodies and underlying groundwater. The applicant is required to avoid adverse effects of altering the hydrologic characteristics (hydromodification) of the Facility by site design and construction practices in accordance with these requirements.

a. Construction Storm Water Management

The applicant estimates that the construction phase will last 25 months, during which time the entire Facility site will be regraded and Pine Tree Creek and the unnamed wash will be rerouted and channelized. Site drainage will be managed in accordance with the best management practices (BMPs) as described in the Final Storm Water Pollution Prevention Plan (SWPPP) and Final Drainage, Erosion, and Sediment Control Plan (DESCP).

A primary component of storm water management involves the design of the rerouted Pine Tree Creek channel. As noted in Section 6, above, the applicant's analysis of the effects of flooding under pre-development conditions, determined that much of the northern portion of the Facility would be inundated by a 100-year flood event. The applicant has proposed a channel design that will convey the 100-year flood event (28,000 cubic feet per second) around the southern and eastern boundaries of the site without overtopping the banks. The channel will redirect flows back into the natural drainage at the northeastern corner of the Facility. The rerouted channels will be completed prior to any modifications to the existing channels.

b. Post-Construction Storm Water Management

The applicant proposes to manage storm water, erosion and sedimentation at the completed Facility through a comprehensive system of source controls, treatment BMPs, and site design. The final storm water management system must replicate pre-development hydrographs for the 2-year through the 10-year, 24-hour storm events. At a minimum, the applicant proposed to adhere to Kern County's detention and retention requirements.

Onsite storm water will be diverted to approximately 30 detention areas distributed throughout the Facility. The detention areas will be designed to infiltrate the runoff within 72 hours, which will allow for storm water treatment. Offsite flow in the unnamed wash will be conveyed across the site, without any input from onsite flows, and discharged into the rerouted Pine Tree Creek with appropriate dissipation structures. The power block will drain via sheet flow away from equipment foundations to the solar field and the detention areas. Local area containments will be provided around areas containing chemicals or compounds that could impact water quality, such as oil-filled transformers and chemical storage areas. Storm water from these areas will be conveyed to an onsite oil-water separator and then added to the plant cooling water. Good housekeeping and prompt removal of spills and leaks will be implemented to minimize storm water contact with contaminated materials.

11. Receiving Waters

The receiving waters are the minor surface waters of the Koehn Hydrologic Area (Hydrologic Subunit 625.40) and groundwater of the Fremont Valley Ground Water Basin (DWR No. 6-46).

12. Lahontan Basin Plan

The Lahontan Water Board adopted a Water Quality Control Plan for the Lahontan Basin (Basin Plan), which became effective on March 31, 1995. These requirements implement the Basin Plan.

13. Beneficial Uses -Surface Waters

The Basin Plan designates beneficial uses for surface waters in each watershed of the Lahontan region. Beneficial uses of surface waters within the Facility area and vicinity that could be impacted by the Facility include:

a. municipal and domestic water supply (MUN),

b. agricultural supply (AGR),

c. groundwater recharge (GWR),

d. navigation (NAV),

e. water contact recreation (REC-1),

f. non-contact water recreation (REC-2),

g. warm freshwater habitat (WARM),

h. wildlife habitat (WILD).

14. Beneficial Uses -Groundwater

The Basin Plan designates beneficial uses for groundwater in each watershed of the Lahontan region. Beneficial uses of groundwater within the Facility area and vicinity that could be impacted by the Facility include:

a. municipal and domestic water supply (MUN),

b. agricultural supply (AGR),

c. industrial surface supply (IND),

d. freshwater replenishment (FRSH).

15. Non-Degradation

The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16 (*Statement of Policy with Respect to Maintaining High Quality of Waters in California*). Resolution No. 68-16 requires that existing quality of waters be maintained unless degradation is justified based on specific findings or facts. The Basin Plan implements, and incorporates by reference, state antidegradation policies. The permitted discharge is consistent with the antidegradation provision of Resolution No. 68-16.

In accordance with State Water Board Resolution No. 68-16 and the Basin Plan, the following conditions must be met prior to any degradation of water of the State:

a. Any change in water quality must be consistent with maximum benefit to the people of the State;

b. The degradation will not unreasonably affect present and anticipated beneficial uses;

c. The degradation will not result in water quality less than that prescribed in the Basin Plan;

d. Discharges must use the best practicable treatment or control to avoid pollution or nuisance and maintain the highest water quality consistent with maximum benefit to the *people of the State.*

16. Other Considerations and Requirements for Discharge

Pursuant to Water Code section13241, these requirements take into consideration:

a. *Past, present, and probable future beneficial uses of water*.

These requirements identify past, present and probable future beneficial uses of water as described in Facts Nos. 16 and 17. The proposed discharge will not

adversely affect present or probable future beneficial uses of water, including domestic water supply, agricultural supply, industrial supply, and freshwater replenishment.

b. *Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto*.

Facts Nos. 6 through 13 describe the environmental characteristics and quality of water from this hydrographic unit.

c. *Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area.*

These requirements will not result in any significant changes to groundwater quality. Adverse effects to surface water quality will be minimized.

d. *Economic considerations*.

These requirements authorize the Discharger to implement closure and post-closure maintenance actions at the Facility as proposed by the Discharger. These requirements accept the Discharger's proposed actions as meeting the best practicable control method for protecting water quality from impacts from the Facility.

e. *The need for developing housing within the region*.

The Discharger is not responsible for developing housing within the region.

f. *The need to develop and use recycled water*.

The Energy Commission is currently evaluating the feasibility of using recycled water as the water source for Facility operations.

SURFACE IMPOUNDMENTS

17. Description of Surface Impoundments (evaporation ponds)

The three proposed surface impoundments are lined evaporation ponds used for disposal of process wastewater generated primarily as spent cooling water and process water. The surface impoundments are waste management units. The total dissolved solids concentrations of the wastewater could vary between 60,000 to 120,000 milligrams per liter (mg/L) [Source June 2009 Report of Waste Discharge (ROWD) see also March 2009 ROWD)]. Wastewaters are co-mingled in the surface impoundments which provide a combined evaporation surface of approximately 8 acres (three surface impoundments each with a nominal surface area of 2.7 acres are required). The collective operating capacity of the surface impoundments is designed to accommodate a summer peak discharge rate of 56 gallons per minute (gpm) or 0.081 million gallons per day, and an annual discharge rate of 46 gpm (0.066 million gallons per day).

Saturated or equilibrium concentrations of impounded wastewaters result in precipitation of solids out of solution. For safety and operational purposes, accumulated solids are to be removed from the surface impoundments when the solids reach a depth of three feet. The surface impoundments must be designed to contain the 1,000-year, 24-hour precipitation storm event (pursuant to California Code of Regulations (CCR), title 27, section 20310) while maintaining the mandatory 2-foot freeboard requirement.

18. Surface Impoundments Construction Design

The proposed design for the three surface impoundments, from the surface downwards, consists of the following:

a. A hard surface/protective layer with granular fill/free draining sub-base over geotextile;

b. A primary 60 mil high-density polyethylene (HDPE) liner;

c. An interstitial leak detection and removal system (LDRS) comprising a geomembrane geonet and collection piping;

d. A secondary 40 mil HDPE liner; and

e. A base layer consisting of either a geosynthetic clay liner (GCL) or 2 feet of onsite material with a hydraulic conductivity of less than 1 x 10-6 centimeter per second of which 30 percent, by weight, shall pass through a No. 200 standard sieve

f. A moisture detection system beneath the secondary liner.

19. Leachate Collection and Removal System (LCRS)

In accordance with CCR, title 27, section 21600, subdivision (b)(8)(C), there is a LCRS proposed to be located beneath the primary liner in the surface impoundment. Additionally, a LCRS will be located between the primary and secondary liners underlying each surface impoundment. The LCRS will comprise of a layer of geonet sloped to a leak detection sump in each surface impoundment. The leak detection sump will include a 16-inch diameter leak-detection-and-removal-well fitted with an electronic leak sensor and a submersible pump to allow removal of collected fluids. The pump will discharge back into the surface impoundment. The discharge pipe shall be equipped with a recording flow totalizer to allow monitoring of the amount of fluid removed over time and calculation of leakage rates. The inspection and maintenance requirements for the LCRS are outlined in Section 12 of the June 2009 ROWD.

20. Action Leakage Rate of Surface Impoundment Liners

The Action Leakage Rate (ALR) is the allowable leakage from the primary liner system above which a spill prevention, control, and countermeasure (SPCC) plan actions are triggered (Section 13 of the March 2009 ROWD and June 2009 ROWD). According to Code of Federal Regulations, title 40, section 264.222, the ALR is

defined as "…the maximum design flow rate that the leak detection system can remove without the fluid head on the bottom liner exceeding 1 foot." The ALR must also include an adequate safety margin to allow for variability in the containment system design (e.g. liner and collection pipe slope, interstitial fill hydraulic conductivity, thickness of drainage material, etc.). The estimated ALR for the surface impoundments as documented in the June 2009 ROWD is 2,750 gallons per acre per day. This is based on one standard hole per acre, a drainage layer geonet with hydraulic conductivity of 0.06 meters per second and a 50 percent safety factor. The assumption underlying this ALR calculation will be verified in the actual constructed surface impoundments. Based on a 2.7-acre pond, each surface impoundment would have an ALR of 7,425 gallons per day. However, the ALR will need to have field verification because this rate will vary depending on actual drainage material used and its hydraulic conductivity. A final ALR will be submitted to the California Energy Commission based on field analysis. A large hole in the geomembrane may cause a rapid large leakage rate (RLLR) of approximately 9,500 gallons per acre per day. This would equate to a RLLR of 25,650 gallons per day per surface impoundment. The RLLR is provided for informational purposes only. The recording flow totalizer at each sump will be monitored at least daily to determine the leakage rate through the primary liner. If the leakage rate exceeds the ALR, then the appropriate actions in the SPCC Plan will be implemented.

LAND TREATMENT UNIT

21. Description of Land Treatment Unit

The Land Treatment Unit (LTU) is a waste management unit and will cover an area of approximately 800 feet by 800 feet. The LTU will not incorporate a liner containment system or LCRS, but will be constructed with a prepared base consisting of 2 feet of compacted, low permeability, lime-treated material. This base will serve as a competent platform for land treatment activities, and will serve to slow the rate of surface water infiltration in the treatment area. The treatment zone consists of compacted and native soil beneath the land farm unit to a depth of 5 feet. The lime treated layer is to be compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557 and have a low permeability.

The compacted and native soil beneath the LTU is designated as a "treatment zone" to a depth of 5 feet. Although the LTU will be taking vehicle traffic, no hard surface will be required, as there is no liner system to protect. A staging area is allocated in the LTU for storage of HTF-impacted soils while they are being characterized. Soil characterized as hazardous will be removed from the site; therefore, no additional liner system is required in the LTU for the hazardous waste.

The LTU will be surrounded on all sides by a 2-foot high compacted earthen berm with side slopes of approximately 3:1 (horizontal: vertical). These berms will control and prevent potential inflow (run on) of surface storm water into the LTU or runoff of storm water from the unit. CCR, title 27, section 20250 (b)(5) prescriptive requirements require that no waste shall migrate below 5 feet below the treatment zone.

Approximately 2.4 million gallons of HTF (Therminol VP-1 [Diphenyl ether (73.5%) and Biphenyl (26.5%)]) will be utilized at any one time within the Facility. However, the anticipated volume of soil within the LTU contaminated with HTF would not exceed 750 cubic yards. Based on available operation data from other sites, it is anticipated that approximately 750 cubic yards (on average) of HTF-affected soil may be treated per year. Larger or smaller quantities could be generated during some years, depending on the frequency and size of leaks and spills. A SPCC plan will be developed for the Facility (June 2009 ROWD Section 13.4).

HTF spill or leak reporting requirements will be incorporated into the SPCC Plan for the Project as follows:

- Project personnel will be required to submit an internal report detailing a HTF spill, regardless of size.
- A release of 20 gallons or more is reportable to the California Energy Commission.

Storm water may occasionally accumulate in the LTU. This storm water would be pumped to the surface impoundments only after visual observation establishes that the water is free from HTF product and sheen. Based on conditions at similar sites in the area, it is anticipated that such discharge, if necessary, would only occur approximately once every three to five years.

22. Waste Management Units Classification

Pursuant to CCR, title 27, section 20250, the surface impoundments and the land treatment unit are classified as Class II waste management units. Pursuant to CCR, title 27, section 20310, the units will be located outside of the 100-year flood plain and seismic hazard zones. In addition, the base of the waste management units will have a greater than 5-foot separation to the underlying groundwater.

23. Waste Classification

Hazardous wastes, per California Health and Safety Code section 25208 (Toxic Pits Cleanup Act), are prohibited from being either discharged into, being stored or accumulating via evaporative process within the surface impoundments. The nonhazardous wastewater discharged to the surface impoundments is hereby classified as a liquid designated waste. Residual solids remaining after evaporation are expected (June 2009 ROWD) to contain inorganic salts below hazardous waste levels.

The anticipated wastewater concentrations have been compared to the Soluble Threshold Limit Concentrations (STLCs) as reported in the CCR, title 22, section 66261.24 “Characteristics of Toxicity”, and compared to Toxicity Characteristic Leaching Procedure (TCLP) values as reported in the Code of Federal Regulations (CFR) Part 261, section 261.24. The anticipated concentration of chemical constituents in wastewater discharging into the evaporation ponds is less than the STLC and TCLP for all reported parameters. Therefore, the wastewater is not considered a hazardous waste under State or Federal regulations.

The Department of Toxic Substances Control will determine a hazardous waste concentration (in milligrams of HTF per kilogram of soil) for HTF-contaminated soil. HTF-contaminated soil will be considered inert if the concentration is less than or equal to 100 milligrams per kilogram (mg/kg) or is 1/100 of the hazardous waste level, whichever is more conservative. (Hazardous waste classification at another similar site for HTF-contaminated soil is 10,000 mg/kg.) HTF-contaminated soil at concentrations between the hazardous waste concentration and the inert concentration is classified as designated waste.

The Water Code section 13173 defines a designated waste as:

a. Hazardous waste that has been granted a variance from hazardous waste management requirements pursuant to Health and Safety Code, section 25143 ; or

b. Nonhazardous waste that consists of, or contains, pollutants that, under ambient environmental conditions at a waste management unit, could be released in concentrations exceeding applicable water quality objectives, or that could reasonably be expected to affect beneficial uses of the waters of the state as contained in the appropriate state water quality control plan.

The wastewater discharged into the surface impoundments is expected to be nonhazardous; however, the wastewater will contain pollutants (e.g., TDS, fluoride) which could exceed water quality objectives if released, or that could be expected to affect the beneficial uses of waters of the state. Therefore, the wastewater is classified as a “designated waste.” This classification is consistent with CCR, title 27, section 20210.

GROUNDWATER MONITORING NETWORK

24. Groundwater Monitoring Network (GMN)

The June 2009 ROWD proposes a Groundwater Monitoring Network (GMN) for two scenarios: an on-site industrial water supply scenario, and, an off-site industrial water supply scenario. Both proposed GMN layouts include three categories of monitoring wells: (1) background wells (located upgradient of the surface impoundments and land treatment unit); (2) detection wells (located adjacent to the surface impoundments and land treatment unit); and (3) compliance wells. For both onsite and offsite water supply scenarios, the detection wells are comprised of three proposed wells (MW-1 through MW-3) located immediately adjacent to the surface impoundments. The Point of Compliance as defined in CCR, title 27, section 20405 is "a vertical surface located at the hydraulically down gradient limit of the Unit that extends through the uppermost aquifer underlying the Unit.”

The GMN layouts for the two water supply scenarios are:

Onsite Water Supply Scenario (Figure 4-1A of the June 2009 ROWD):

Background Wells – Well 47, Domestic Well, Well 50 and USGS Well. As shown in Figure 4-1A in the June 2009 ROWD, a cone of depression will develop under the

surface impoundments due to the location of primary pumping Wells 49 and Well 63 and backup Well 41 and Well 42. Under pumping conditions, groundwater is predicted to move toward the primary pumping well(s) from all points of the compass. Thus, all wells, except the pumping well(s), become background wells.

Detection Wells – MW-1, MW-2 and MW-3

Compliance Well(s) – The compliance well(s) will be the primary pumping well(s) that is/are active, either Well 49, Well 63, Well 41 or Well 42.

Offsite Water Supply Scenario (Figure 4-1B of the June 2009 ROWD):

Background Wells – Well 47, Domestic Well and Well 41

Detection Wells – MW-1, MW-2 and MW-3

Compliance Wells – Well 50, Well 51 and USGS Well

MONITORING PROGRAMS

25. Statistical Methods

Statistical analysis of monitoring data is necessary for the earliest possible detection of a statistically significant evidence of a release of waste from the Facility. CCR, title 27 requires statistical data analysis. The Monitoring and Reporting Programs (MRPs) includes methods for statistical analysis. The monitoring parameters listed in the MRPs are believed to be the best indicators of a release from the Facility.

26. Detection Monitoring Program

Pursuant to CCR, title 27 section 20420, the applicant has proposed a detection monitoring program for the Facility. The detection monitoring program for the surface impoundments consists of monitoring the LCRS, moisture detection network (neutron probe network), and monitoring wells for the presence of liquid and/or constituents of concern. The program to monitor the LCRS and water bearing media for evidence of a release, as well as the monitoring frequency is specified in the MRP. The detection monitoring program for the Land Treatment Unit consists of collecting and analyzing samples of the native soil in, and underneath, the treatment zone for the presence of HTF. The frequency of monitoring is specified in the MRP.

27. Evaluation Monitoring Program

An Evaluation Monitoring Program (EMP) is required, pursuant to CCR, title 27 section 20425, to evaluate evidence of a release if detection monitoring and/or verification procedures indicate evidence of a release.

28. Corrective Action Program

A Corrective Action Program (CAP) to remediate detected releases from the surface impoundments or land treatment unit may be required pursuant to CCR, title 27, section 20430, if results of an EMP warrant a CAP.

29. Closure and Post-Closure Maintenance Plan for the Surface Impoundments

The applicant submitted a preliminary closure plan for the surface impoundments.

30. Reasonably Foreseeable Release for the Surface Impoundments

The applicant submitted a CAP to address a reasonably foreseeable release. The scenario presented in the CAP is a dike failure in which the applicant is required to remediate and clean up soil that may become contaminated due to a release from the surface impoundments.

31. Closure and Post-Closure Maintenance Plan for the Land Treatment Unit

The applicant submitted a Preliminary Closure and Post-Closure Maintenance Plan which proposes that the Land Treatment Unit will be Clean Closed in accordance with the requirements of CCR, title 27, section 21090, subdivision (f).

32. Reasonably Foreseeable Release for the Land Treatment Unit

The applicant submitted a CAP to address a reasonably foreseeable release from the Land Treatment Unit. The scenario presented in the CAP for the Land Treatment Unit is a release to native soil underlying the five-foot treatment zone. A five-foot treatment zone is specified in CCR, title 27, section 20250 (b)(5).

Corrective action includes excavation and proper disposal of HTF-contaminated soil from the Land Treatment Unit and replacing the excavation with clean native soil.

33. Narrative and Numerical Water Quality Objectives

The Basin Plan incorporates narrative and numerical water quality objectives that apply to all ground and surface waters within the Lahontan Region. In general, where more than one objective is applicable, the stricter objective applies.

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SOIL AND WATER RESOURCES - APPENDIX F

REQUIREMENTS FOR WASTE DISCHARGE

I. DISCHARGE SPECIFICATIONS

A. Storm Water Discharges

Waste in discharges of storm water must be reduced or prevented to achieve the best practicable treatment level using controls, structures, and management practices. The applicant shall comply with all requirements (with the exception of purely administrative requirements, e.g., filing a Notice of Intent) contained in State Water Board's *Waste Discharge Requirements For Discharges of Storm Water Discharges Associated With Construction Activity, General Permit No. CAS00002* and *Waste Discharge Requirements For Discharges of Storm Water Associated With Industrial Activities, General Permit No. CAS00001* and all subsequent revisions and amendments.

These requirements do not preclude the applicant from requirements imposed by municipalities, counties, drainage districts, and other local agencies regarding discharges of storm water to separate storm sewer systems or other water, conveyances and water bodies under their jurisdiction.

B. Receiving Water Limitations

Surface Water and Groundwater Objectives

Receiving water limitations are narrative and numerical water quality objectives contained in the Water Quality Control Plan for the Lahontan Basin (Basin Plan) for all surface waters and groundwater of the Lahontan Region. As such, they are required to be met. The discharge of waste to surface waters shall not cause, or contribute to, a violation of the following water quality objectives for waters of the Koehn Hydrologic Unit.

a. Ammonia

Ammonia concentrations shall not exceed the values listed in Tables 3-1 to 3-4 of the Basin Plan for the corresponding conditions in these tables. Tables 3-1 to 3-4 of the Basin Plan are incorporated into these requirements by reference.

b. Bacteria, Coliform

i. Waters shall not contain concentrations of coliform organisms attributable to anthropogenic sources, including human and livestock wastes.

ii. The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 milliliter (ml), nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml. The log mean shall ideally be based on a minimum of not less than five samples collected as evenly spaced as practicable during any 30-day period. However, a log

mean concentration exceeding 20/100 ml, or one sample exceeding 40/100 ml, for any 30-day period shall indicate violation of this objective even if fewer than five samples were collected.

c. Biostimulatory Substances

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect the water for beneficial uses.

d. Chemical Constituents

i. Waters designated as MUN (a beneficial use of surface water of the Koehn Hydrologic Unit) shall not contain concentrations of chemical constituents in excess of the maximum contaminant level (MCL) or secondary MCL based upon drinking water standards specified in provisions of the CCR, Title 22, Division 4, Chapter 15, hereby incorporated by reference into these requirements. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

ii. Waters shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses.

e. Chlorine, Total Residual

For the protection of aquatic life, total chlorine residual shall not exceed either a median value of 0.002 milligrams per liter (mg/L) or a maximum value of 0.003 mg/L. Median values shall be based on daily measurements taken within any six-month period.

f. Color

Waters shall be free of coloration that causes nuisance or adversely affects the water for beneficial uses.

g. Dissolved Oxygen

i. The dissolved oxygen concentration as percent saturation shall not be depressed by more than 10 percent, nor shall the minimum dissolved oxygen concentration be less than 80 percent of saturation.

ii. For waters with the beneficial uses of WARM (a beneficial use of surface water in the Koehn Hydrologic Area), the minimum dissolved oxygen concentration shall not be less than that specified in Table 3-6 of the Basin Plan. Table 3-6 of the Basin Plan is incorporated herein by reference.

h. Floating Materials

i. Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect the water for beneficial uses.

ii. The concentrations of floating material shall not be altered to the extent that such alterations are discernible at the 10 percent significance level.

i. Oil and Grease

i. Waters shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses.

ii. The concentration of oils, greases, or other film or coat generating substances shall not be altered.

j. Pesticides

i. For the purposes of these requirements, pesticides are defined to include insecticides, herbicides, rodenticides, fungicides, piscicides and all other economic poisons. An economic poison is any substance intended to prevent, repel, destroy, or mitigate the damage from insects, rodents, predatory animals, bacteria, fungi, or weeds capable of infesting or harming vegetation, humans, or animals (California Agriculture Code 12753).

ii. Pesticide concentrations, individually or collectively, shall not exceed the lowest detectable levels, using the most recent detection procedures available. There shall not be an increase in pesticide concentrations found in bottom sediments. There shall be no detectable increase in bioaccumulation of pesticides in aquatic life.

iii. Waters designated as MUN shall not contain concentrations of pesticides or herbicides in excess of the limiting concentrations set forth in the CCR, Title 22, Division 4, Chapter 15. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

k. pH

i. In fresh waters with designated beneficial use of WARM, changes in normal ambient pH levels shall not exceed 0.5 pH units.

ii. The California Energy Commission recognizes that some waters of the Lahontan Region may have natural pH levels outside of the 6.5 to 8.5 range. Compliance with the pH objective for these waters will be determined on a case-by-case basis.

l. Radioactivity

i. Radionuclides shall not be present in concentrations, which are deleterious to human, plant, animal, or aquatic life nor which result in the accumulation of radionuclides in the food web to an extent, which presents a hazard to human, plant, animal, or aquatic life.

ii. Waters designated as MUN shall not contain concentrations of radionuclides in excess of the limits specified by the more restrictive of the CCR Title 22 Division 4, Article 5 sections 64441 et seq. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

m. Sediment

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect the water for beneficial uses.

n. Settleable Materials

Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or that adversely affects the water for beneficial uses. The concentration of settleable materials shall not be raised by more than 0.1 milliliter per liter.

o. Suspended Materials

i. Waters shall not contain suspended materials in concentrations that cause nuisance or that adversely affect the water for beneficial uses.

ii. The concentration of total suspended materials shall not be altered to the extent that such alterations are discernible at the 10 percent significance level.

p. Taste and Odor

Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish or other edible products of aquatic origin, that cause nuisance, or that adversely affect the water for beneficial uses. The taste and odor shall not be altered.

q. Temperature

i. The natural receiving water temperature of all waters shall not be altered unless it can be demonstrated to the satisfaction of the California Energy Commission that such an alteration in temperature does not adversely affect the water for beneficial uses.

ii. For waters designated WARM, water temperature shall not be altered by more than 5 degrees Fahrenheit above or below the natural temperature.

r. Toxicity

i. All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.

ii. The survival of aquatic life in surface waters subjected to a waste discharge, or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge, or when necessary, for other control water that is consistent with the requirements for "experimental water" as defined in the most recent edition of *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, et al.).

s. Turbidity

Waters shall be free of changes in turbidity that cause nuisance or adversely affect the water for beneficial uses. Increases in turbidity shall not exceed natural levels by more than 10 percent.

The discharge of waste to groundwater shall not cause, or contribute to, a violation of the following water quality objectives for waters of the Fremont Valley Groundwater Basin.

a. Bacteria, Coliform

In groundwater designated as MUN (a beneficial use of groundwater of the Fremont Valley Ground Water Basin), the median concentration of coliform organisms over any seven-day period shall be less than 1.1/100 milliliters.

b. Chemical Constituents

i. Groundwater designated as MUN shall not contain concentrations of chemical constituents in excess of the maximum contaminant level (MCL) or secondary MCL based upon drinking water standards specified in provisions of the CCR, Title 22, Division 4, Chapter 15, hereby incorporated by reference into these requirements. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

ii. Groundwater shall not contain concentrations of chemical constituents in amounts that adversely affect the water for beneficial uses.

c. Radioactivity

Groundwater designated as MUN shall not contain concentrations of radionuclides in excess of the limits specified by the more restrictive of the CCR Title 22 Division 4, Article 5 sections 64441 et seq. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

d. Taste and Odor

Waters shall not contain taste or odor-producing substances in concentrations that cause nuisance or that adversely affect beneficial uses. For groundwater designated MUN, at a minimum, concentrations shall not exceed adopted secondary MCLs based upon drinking water standards specified in provisions of the CCR, Title 22, Division 4, Chapter 15, hereby incorporated by reference

into these requirements. This incorporation-by-reference is prospective including future changes to the incorporated provisions as the changes take effect.

II. PROHIBITIONS AND REQUIREMENTS

The discharge of wastes and fill associated with the Facility must not violate the following waste discharge prohibitions. These waste discharge prohibitions do not apply to discharges of storm water when wastes in the discharge are controlled through the application of management practices or other means and the discharge does not cause a violation of water quality objectives. The California Energy Commission expects that control measures will be implemented in an iterative manner as needed to meet applicable receiving water quality objectives.

A. REGIONWIDE PROHIBITIONS

1. The discharge of waste[(i)] which causes violation of any narrative water quality objective contained in the Basin Plan, including the Nondegradation Objective, is prohibited.

2. The discharge of waste which causes a violation of any numeric water quality objective contained in the Basin Plan is prohibited.

3. Where any numeric or narrative water quality objective contained in the Basin Plan is already being violated, the discharge of waste which causes further degradation or pollution is prohibited.

4. The discharge of untreated sewage, garbage, or other solid wastes into surface waters of the Region is prohibited. (For the purposes of this prohibition, "untreated sewage" is that which exceeds secondary treatment standards of the Federal Water Pollution Control Act, which are incorporated in the Basin Plan in Section 4.4 under "Surface Water Disposal of Sewage Effluent.")

5. For municipal[(ii)] and industrial[(iii)] discharges:

   a. The discharge, bypass, or diversion of raw or partially treated sewage, sludge, grease, or oils to surface waters is prohibited.

   b. The discharge of wastewater except to the designated disposal site (as designated in waste discharge requirements) is prohibited.

   c. The discharge of industrial process wastes[(iv)] to surface waters designated for the Municipal and Domestic Supply (MUN) beneficial use is prohibited.

Definitions:

(i) "Waste" is defined to include any waste or deleterious material including, but not limited to, waste earthen materials (such as soil, silt, sand, clay, rock, or other organic or mineral material) and any other waste as defined in the California Water Code § 13050(d).

(ii) "Municipal waste" is defined in Section 4.4 of the Basin Plan.

(iii) "Industry" is defined in Section 4.7 of the Basin Plan.

(iv) "Industrial process wastes" are wastes produced by industrial activities that result from one or more actions, operations, or treatments which modify raw material(s) and that may (1) add to or create within the effluent, waste, or receiving water a constituent or constituents not present prior to processing, or (2) alter water temperature and/or the concentration(s) of one or

The discharge of industrial process wastes to surface waters not designated for the MUN use may be permitted if such discharges comply with the General Discharge Limitations in Section 4.7 of the Basin Plan and if appropriate findings under state and federal anti-degradation regulations can be made.

Prohibitions 5(b) and 5(c) do not apply to industrial storm water. For control measures applicable to industrial storm water, see Section 4.3 of this Basin Plan, entitled "Stormwater Runoff, Erosion, and Sedimentation."

Prohibitions 5(b) and 5(c) do not apply to surface water disposal of treated ground water. For control measures applicable to surface water disposal of treated ground water, see Lahontan Regional Board Order No. 6-93-104, adopted November 19, 1993 (Basin Plan Appendix B).

B. acility Discharge Prohibitions

1. Activities and waste discharges associated with the Facility must not cause or threaten to cause a nuisance or pollution as defined in Water Code section 13050.

2. The discharge, including discharges of fill material, must be limited to that described in the applicant's *Project Design Refinements*, dated June 2009.

3. The discharge or deposition of any wastes into channels, surface water, or any place where it would be discharged or deposited where it would be eventually transported to surface waters, including the 100-year floodplain, must not contain or consist of any substance in concentrations toxic to animal or plant life.

4. The discharge or deposition of any wastes into channels, surface water, or any place where it would be discharged or deposited where it would be eventually transported to surface waters, including the 100-year floodplain, must not contain or consist of oil or other floating materials from any activity in quantities sufficient to cause deleterious bottom deposits, turbidity, or discoloration in surface waters.

5. The discharge of waste, as defined in the Water Code, that causes violation of any narrative water quality objective contained in the Basin Plan is prohibited.

6. The discharge of waste that causes violation of any numeric water quality objective contained in the Basin Plan is prohibited.

7. Where any numeric or narrative water quality objective contained in the Basin Plan is already being violated, the discharge of waste that causes further

more naturally occurring constituents within the effluent, waste or receiving water. Certain non-storm water discharges may occur at industrial facilities that are not considered to be industrial process wastes for the purposes of Prohibition 5(c). Examples include: fire hydrant flushing, atmospheric condensates from refrigeration and air conditioning systems, and landscape watering.

degradation or pollution (as defined in Water Code Section 13050) is prohibited.

8. The discharge of septic tank pumpings (septage) or chemical toilet wastes to other than a sewage treatment plant or a waste hauler is prohibited.

C. Requirements

1. The applicant shall develop a final Storm Water Pollution Prevention Program (SWPPP) in accordance with the State Water Board's *General Permit No. CAS00001* and *General Permit No. CAS00002*. This SWPPP, or any future revision to this SWPPP, shall be implemented after approval by the Compliance Project Manager (CPM)

2. The applicant must, at all times, maintain appropriate types and sufficient quantities of material on site to contain any spill or inadvertent release of materials that may cause a condition of pollution or nuisance if the materials reach waters of the State.

3. Discharges of wastewater generated by the Facility's operations, including cooling water, are not allowed to be released to the offsite environment.

4. The applicant must permit California Energy Commission staff or their authorized representative upon presentation of credentials:

   a. Entry onto Facility premises.

   b. Access to copy any record required to be kept under the terms and conditions of the Commission's Decision.

   c. Inspection of any treatment equipment, monitoring equipment, or monitoring method required by the Commission's Decision .

   d. Sampling of any discharge or surface water covered by the Commission's Decision.

5. The applicant must immediately notify the California Energy Commission and SWRCB by telephone whenever an adverse condition occurs as a result of this discharge. Such a condition includes, but is not limited to, a violation of the conditions of the Commission's Decision, a significant spill of petroleum products or toxic chemicals, or damage to control facilities that would cause noncompliance. A written notification of the adverse condition must be provided to the California Energy Commission within two weeks of occurrence. The written notification must identify the adverse condition, describe the actions necessary to remedy the condition, and specify a timetable, subject to any modifications by California Energy Commission staff, for the remedial actions.

6. The applicant must comply with the Monitoring and Report Program for Surface Water and Monitoring and Report Program Groundwater, included in these requirements.

III PROVISIONS

A. Special Provisions for Fill Impacts to State Waters

1. Detailed final grading plans must be provided to the CPM a minimum of 60 days prior to commencement of construction activities.

2. Construction equipment must be clean and free from oil, grease, and loose metal material and must be removed from service if necessary to protect water quality.

3. No debris, cement, concrete (or wash water therefrom), oil or petroleum products must be allowed to enter into or be placed where it may be washed from the Facility site by rainfall or runoff into waters of the State. When operations are completed, any excess material must be removed from the Facility work area and any areas adjacent to the work area where such material may be transported into waters of the State as defined in Water Code section 13050.

4. No equipment may be operated in areas of flowing or standing water; no fueling, cleaning, or maintenance of vehicles or equipment must take place within any areas where an accidental discharge to waters of the State may occur; construction materials and heavy equipment must be stored outside of the flow of the waters of the State. When work within the boundaries of waters of the State is necessary, the entire streamflow must be diverted around the work area, temporarily, as needed to control waste discharge.

B. Special Provisions for Storm Water

1. The applicant must ensure that storm water discharges and non-storm water discharges do not cause or contribute to an exceedance of any applicable water quality standards.

2. At least 60 days prior to commencement of construction activities, the applicant must develop and implement a Construction Area Monitoring Program (CAMP) in accordance with the Monitoring Program and Reporting Requirements for Surface Water.

3. Post-construction storm water flows emanating from the Facility site must not exceed predevelopment levels. Runoff from newly constructed impervious areas that is greater than background levels must be treated and detained to predevelopment runoff levels. Methods such as *low impact development* may be used to achieve this requirement (see State Board Resolution No. 2008-0030). Detention and/or infiltration facilities for a 10-year, one-hour storm event fulfills this requirement for the purposes of these requirements.

4. The applicant must implement Best Management Practices (BMPs) to prevent or reduce the discharge of wastes associated with water contacting construction materials or equipment.

5. The applicant must provide effective cover, mulch, fiber blankets, or other erosion control for soils disturbed by construction activities.

6. The applicant must provide BMPs for erosion stabilization for all areas of disturbed soil regardless of time of year, including erosion from rainfall, non-storm water runoff, and wind.

7. The applicant must stabilize from erosion all finished slopes, open space, utility backfill, and graded or filled lots within two weeks from when excavation or grading activity has been completed.

8. The applicant must control runon from offsite areas, route flows away from disturbed areas in a manner that does not cause onsite or offsite erosion, and provide controls to minimize runon and problems from storm water flows into active or disturbed Facility areas from offsite areas.

9. The applicant must, at all times, maintain effective perimeter controls and stabilize all construction entrances/exits sufficiently to control erosion and soil or sediment discharges from the site.

10. The applicant must properly install and effectively maintain all BMPs for storm drain inlets and perimeter controls, runoff control BMPs, and stabilized entrances/exits.

11. The applicant must ensure that construction activity traffic to and from the Facility is limited to entrances and exits that employ effective controls to prevent offsite tracking of soil.

12. The applicant must ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant control at entrances/exits are maintained and protected from activities that could reduce their effectiveness.

13. The applicant must comply with the following source control requirements:

    a. Maintain vegetative cover to the extent possible by developing the Facility in a way that reduces the amount of soil exposed to erosion at any time.

    b. Inspect and remove accumulated deposits of soil at all inlets to the storm drain system at frequent intervals during rainy periods.

    c. Provide buffer strips and/or vegetation protection fencing between the active construction area and any water bodies.

    d. Provide “good housekeeping” measures for construction materials, waste management, vehicle storage and maintenance, and landscape materials at all times including, but not limited to, the list of required measures in

Attachment B of the Monitoring and Reporting Program for Surface Water, which is made a part of these requirements.

14. The applicant must maintain, in perpetuity, post-construction control and treatment measures for storm water, or must identify in writing to the California Energy Commission, the entity that is legally responsible for maintaining the post-construction controls at the Facility site.

15. The applicant shall have in place adequate emergency response plans in order to clean up any spill or release of any waste at the Facility.

C. Special Provisions for the Waste Management Units (Surface Impoundments and Land Treatment Unit)

1. There shall be no discharge, bypass, or diversion of wastewater from the collection, conveyance, or disposal facilities to adjacent land areas or surface waters.

2. All facilities used for the collection, conveyance, or disposal of waste shall be adequately protected against overflow, washout, inundation, structural damage, or a significant reduction in efficiency resulting from a storm or flood having a recurrence interval of once in 100 years. The surface impoundments and land treatment unit (LTU) shall be designed and maintained with the capacity to capture the 1,000-year, 24-hour storm.

3. The release of wastewater shall not cause the presence of the groundwater monitoring parameters listed in the Monitoring and Reporting Programs to be in excess of background levels as described in the June 2009 Report of Waste Discharge (ROWD).

4. The discharge, storage or evaporative accumulation of hazardous waste to waste management units at the Facility is prohibited.

<u>Special Provisions for Surface Impoundments</u>

1. Only wastewater from the brine concentrator or storm water that may accumulate in the LTU shall be discharged to the surface impoundments.

2. The flow of wastewater to the surface impoundments shall not exceed a total of 0.066 million gallons per day for any consecutive 12 month period.

3. The maximum average daily flow rate of wastewater to the surface impoundments shall not exceed 0.081 million gallons per day.

4. The discharge of wastewater at the facility except to the authorized disposal sites (i.e., the surface impoundments) of these requirements is prohibited.

5. All lined facilities shall be effectively sealed to prevent the exfiltration of liquids.

For this project, "effectively sealed" facilities are the surface impoundments that are designed and constructed in accordance with the requirements of CCR, title 27.

6. The vertical distance between the liquid surface elevation and the highest part of a surface impoundment dike (i.e. the freeboard), or the invert of an overflow structure, shall not be less than two feet.

Special Provisions for the Leachate Collection and Removal System

1. If liquids are detected in the leachate collection and removal system (LCRS) sumps at a rate equal to or greater than the “Action Leakage Rate” of 2,750 gallons per acre per day as described in the June 2009 ROWD, then the applicant shall comply with the notice of evidence of response to exceeding the action leakage rate requirements presented in the appropriate section of the Monitoring and Reporting Program for Groundwater included with these requirements.

2. If liquids are detected in the LCRS sumps at rates greater than the “Rapid and Large Leakage Rate” of 9,500 gallons per acre per day as described in the June 2009 ROWD, the applicant shall immediately notify the CPM and cease the discharge of waste to the affected impoundment. Discharges of waste to the affected impoundment shall be prohibited until the appropriate repairs are made.

3. The depth of leachate in the leachate collection sump shall be kept at the minimum needed to ensure efficient sump dewatering pump operation.

4. The LCRS shall be operated to function without clogging throughout the life of the project including closure and post closure maintenance periods.

5. The LCRS shall be tested at least once annually to demonstrate proper operation.

6. The LCRS shall be capable of removing twice the maximum anticipated daily volume of leachate from the surface impoundments.

7. Any leachate collected in any LCRS shall be returned to the surface impoundments.

Special Provisions for the Land Treatment Unit

1. Only soil contaminated with Therminol or similarly approved HTF and originating at this Facility shall be accepted for treatment at the Land Treatment Unit.

2. Soil treated at the Land Treatment Unit may be used as fill material, road base or as a cover at the Facility (excluding any area within the 100-year floodplain) if the following concentration limit is not exceeded:

Parameter	**Maximum Concentration of the Composite Sample**
Heat Transfer Fluid - Therminol,(Biphenyl, and diphenyl oxide) or related HTF that has similar environmental fate and transport characteristics as Therminol.	100 milligram per kilogram (mg/kg) or 1/100 of the hazardous waste level, whichever is less (i.e., more conservative) (The hazardous waste level for heat transfer fluid is to be determined.)

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SOIL AND WATER RESOURCES - APPENDIX G

MONITORING AND REPORTING PROGRAM FOR SURFACE WATER

I. MONITORING

A. General Requirements

1. **The applicant must comply with the "General Provisions for Monitoring and Reporting," which is attached to and made part of this Monitoring and Reporting Program (Attachment A).**

2. **The applicant must comply with the "Good Housekeeping Best Management Practices," which is attached to and made part of this Monitoring and Reporting Program (Attachment B).**

B. Construction Site Storm Event Water Monitoring

The applicant must monitor site precipitation continuously and keep a record of storm events that produce more than 0.5 inch of precipitation at the site.

During storms and/or within one business day after each 0.5 inch of precipitation from a storm event, the applicant must visually observe and document observations of storm water discharges from the site to both the unnamed wash and to Pine Tree Creek.

For visual observations, the applicant must look for and document the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

The applicant must visually observe and document observations of the discharge of stored or contained storm water that is discharged subsequent to a storm event. The applicant is only required to visually observe such discharges if they occur under daylight conditions. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation must be observed prior to the discharge to determine whether controls and BMPs are in place and functioning as required.

For the purposes of these requirements, a "potential storm event" is defined as any storm event with a 30 percent or greater chance of precipitation as predicted by the National Weather Service's nearest weather station for the local climate zone. Forty-eight (48) hours prior to each potential storm event, the applicant must visually observe and implement appropriate corrective action for (1) all storm water drainage areas, to identify any spills, leaks, or uncontrolled pollutant sources, (2) all Best Management Practices (BMPs; see Attachment B), to identify whether they have been properly installed and maintained, and (3) any storm water storage and containment areas, to detect leaks and ensure maintenance of adequate freeboard.

Within one business day after each storm event that produces precipitation of 0.5 inch or more, the applicant must conduct a post-storm event inspection to:

1. identify whether BMPs were adequately designed, implemented, and effective,

2. identify if and where additional BMPs are needed, where BMPs are in need of maintenance, and

3. photograph each discharge location and the associated BMPs.

Within one business day after the initial 0.5 inch of precipitation from a storm event, and every 1 inch thereafter, the applicant must collect and analyze samples of storm water discharged from each detention basin.

If no discharge occurs from a basin, no sample is required, but the absence of discharge must be documented.

Storm water sampling and analyses must be performed in accordance with the following requirements:

1. The applicant must analyze the samples for pH and turbidity.

2. The applicant is not required to physically collect samples or conduct visual observations during dangerous weather conditions or outside of scheduled site operation hours.

The applicant must perform sampling of storm water discharges from all drainage areas associated with construction activity. The storm water discharge collected and observed must represent the worst quality storm water discharge in each drainage area based on visual observation of the water and upstream conditions. For example, if there has been concrete work recently in an area, or drywall scrap is exposed to the rain, a pH sample must be taken of drainage from the relevant work area. Similarly, if muddy water is flowing through some parts of a silt fence, samples must be taken of the muddy water even if most water flowing through the fence is clear.

C. Construction Site Monitoring

1. On a daily basis, the applicant must inspect all public and private paved roads serving the Facility and daily remove, by vacuuming or sweeping, visible accumulations of sediment or other construction activity-related materials that are deposited on the roads. All inspections under this provision must be documented in writing.

2. The applicant must ensure that inspections and observations at locations where runoff may discharge from the Facility site are performed weekly, and at least once each 24-hour period during extended storm events, to identify any problems and/or BMPs that:

   a. need maintenance to operate effectively,

b. have failed, or

c. are inadequate to achieve effective control.

3. The applicant must visually observe construction areas and each drainage area for the presence of (or indication of prior) non-storm water discharges and their sources to ensure that all BMPs are in place and effective.

   a. One visual observation must be conducted quarterly in each of the following periods: January – March, April – June, July – September, and October – December. Visual observations are only required during daylight hours (sunrise to sunset).

   b. Visual observations must document the presence of evidence of any non-storm water discharge, pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. The applicant must maintain on-site records indicating the personnel performing the visual observation, the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

4. The applicant must monitor and report run-on from surrounding areas that may contribute to exceedances or excursions from requirements (violations).

D. Post-Construction Monitoring

On a semi-annual basis, the applicant must inspect and document inspections of post-construction treatment controls at the Facility site. Maintenance must be provided to address any controls that are not in compliance with requirements.

E. Receiving Water Monitoring

1. Receiving water sampling must occur at the following locations in Pine Tree Creek and the unnamed wash:

   a. 200 feet upstream of the Facility site in the natural watercourse.

   b. 200 feet downstream of the Facility site in the natural watercourse.

   c. Midpoint between the upstream and downstream samples.

   d. 50 feet downstream of each outfall into the above creeks.

2. Twice monthly and at no less than 10-day intervals from November through May of each year, the applicant must sample the Facility's receiving waters, Pine Tree Creek and the unnamed wash, with grab samples for the following constituents:

   a) Turbidity,

   b) Temperature,

c) Dissolved Oxygen,

d) Suspended Solids,

e) Total Dissolved Solids, and

f) pH.

If no water is present (documented by photographs), no sampling is required.

3. The applicant must also sample the receiving waters for the above parameter(s) when discharge from any detention basin occurs.

II. REPORTING

A. Required Program Reports

1. The applicant must develop and implement a Construction Area Monitoring Program (CAMP), as described in II.C, below, and provide the CAMP to the CPM 60 days prior to commencement of construction activities. The CAMP must include receiving water monitoring locations as required above.

2. The applicant must provide a Sampling and Analysis Plan (SAP) as referenced in I.A, above, to the California Energy Commission 60 days prior to commencement of construction activities.

B. Construction Area Management Plan

1. The CAMP must be developed and implemented to address the following objectives:

   a. To demonstrate that the site is in compliance with these requirements;

   b. To determine whether immediate corrective actions, additional BMP implementation, or Storm Water Pollution Prevention Plan (SWPPP) revisions are necessary to reduce pollutants and wastes in storm water discharges and non-storm water discharges; and

   c. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges.

2. The applicant must develop a written site-specific CAMP that includes all monitoring procedures and instruction, location maps, forms, and checklists as required in these requirements and this MRP. This CAMP must be made a part of a revised SWPPP that is to be kept and used on the Facility site.

C. Storm Water Pollution Prevention Plan Annual Report

1. The applicant must prepare and provide an annual report no later than January 30 of each year.

2. The Annual Report must include a summary and evaluation of all sampling and analysis results, original laboratory reports, a summary of all corrective actions taken during the compliance year, identification of any recommended compliance activities or corrective actions that were not implemented.

3. The Annual Report must include all records and reports of visual observations and sample collection exceptions, the analytical method, method reporting unit, and method detection limit of each analytical parameter. Analytical results that are less than the method detection limit must be reported as “less than the method detection limit.”

D. Records

1. The applicant must maintain records on-site of all visual observations, personnel performing the observations, observation dates, weather condition, locations observed, and corrective actions taken in response to the observations.

2. All inspections and observations pursuant to Section I.C. above must be documented in writing and must include:

   a. Inspector’s name, title, and signature.

   b. Inspection date and date the inspection report was written.

   c. Weather information: estimate of beginning of storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall (inches).

   d. A list and description of BMPs evaluated and any deficiencies noted. If there are no deficiencies, the report must indicate (under penalty of perjury) that the Facility is in compliance with these discharge requirements.

   e. Report the presence of noticeable odors or any visible sheen on the surface of any discharges.

   f. Corrective actions required, including any changes necessary to comply with requirements, and implementation dates for completing corrective actions.

   g. Photographs taken during the inspection.

3. Records of all storm water monitoring information and copies of all reports (including Annual Reports) required by these requirements must be retained for a period of at least five years from the date of the sample, measurement, report, or application. This period may be extended when requested by the CPM. Records must be retained on-site while construction is ongoing. The records must include:

   a. The date, place, time of facility inspections, sampling, visual observation, and/or measurement, including precipitation;

   b. The individual(s) who performed the facility inspections, sampling, visual observations, and or measurement;

c. The date and approximate time of analyses;

d. The individual(s) and company who performed the analysis;

e. A summary of all analytical results from the last five years, the method detection limits and reporting units, and the analytical techniques or methods used;

f. Quality assurance/quality control records and results;

g. Non-storm water discharge inspections and visual observations and storm water discharge visual observation records; and

h. Visual observation and sample collection exception records.

TTACHMENT A

GENERAL PROVISIONS
FOR MONITORING AND REPORTING

1. SAMPLING AND ANALYSIS

   a. All analyses shall be performed in accordance with the current edition(s) of the following documents:

      i. Standard Methods for the Examination of Water and Wastewater
      ii. Methods for Chemical Analysis of Water and Wastes, EPA

   b. All analyses shall be performed in a laboratory certified to perform such analyses by the California State Department of Health Services or a laboratory approved by the Compliance Project Manager (CPM). Specific methods of analysis must be identified on each laboratory report.

   c. Any modifications to the above methods to eliminate known interferences shall be reported with the sample results. The methods used shall also be reported. If methods other than EPA-approved methods or Standard Methods are used, the exact methodology must be submitted for review and must be approved by the CPM prior to use.

   d. The applicant shall establish chain-of-custody procedures to insure that specific individuals are responsible for sample integrity from commencement of sample collection through delivery to an approved laboratory. Sample collection, storage, and analysis shall be conducted in accordance with an approved Sampling and Analysis Plan (SAP). The most recent version of the approved SAP shall be kept at the facility.

   e. The applicant shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to ensure accuracy of measurements, or shall insure that both activities will be conducted. The calibration of any wastewater flow measuring device shall be recorded and maintained in the permanent log book described in 2.b, below.

   f. A grab sample is defined as an individual sample collected in fewer than 15 minutes.

   g. A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period at equal intervals. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

2. OPERATIONAL REQUIREMENTS

   h. Sample Results

The applicant shall maintain all sampling and analytical results including: strip charts; date, exact place, and time of sampling; date analyses were performed; sample collector's name; analyst's name; analytical techniques used; and results of all analyses. Such records shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the California Energy Commission.

i. Operational Log

An operation and maintenance log shall be maintained at the facility. All monitoring and reporting data shall be recorded in a permanent log book.

3. REPORTING

j. For every item where the requirements are not met, the applicant shall submit a statement of the actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time, and shall submit a timetable for correction.

k. All sampling and analytical results shall be made available to the CPM upon request. Results shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the CPM .

l. The applicant shall provide a brief summary of any operational problems and maintenance activities to the California Energy Commission with each monitoring report. Any modifications or additions to, or any major maintenance conducted on, or any major problems occurring to the wastewater conveyance system, treatment facilities, or disposal facilities shall be included in this summary.

m. Monitoring reports shall be signed by:

iii. In the case of a corporation, by a principal executive officer at least of the level of vice-president or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge originates;
iv. In the case of a partnership, by a general partner;
v. In the case of a sole proprietorship, by the proprietor; or
vi. In the case of a municipal, state or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

n. Monitoring reports are to include the name and telephone number of an individual who can answer questions about the report.

ATTACHMENT B

GOOD HOUSEKEEPING BEST MANAGEMENT PRACTICES

1. Good housekeeping measures for construction materials include:
   a. Maintaining an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced.
   b. Covering and berming loose stockpiled construction materials (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).
   c. Storing chemicals in watertight containers or in a bermed storage shed (completely enclosed), with appropriate secondary containment.
   d. Minimizing contact of construction materials with precipitation.
   e. Implementing BMPs to reduce or prevent the offsite tracking of loose construction and landscape materials.

2. Good housekeeping measures for waste management include:
   a. Preventing disposal of any rinse/wash waters or materials into the storm drain system.
   b. Berming sanitation facilities (e.g. Porta Potties) and preventing them from being kept within the curb and gutter or on sidewalks or adjacent to a storm drain.
   c. Cleaning or replacing sanitation facilities and inspecting them regularly for leaks and spills.
   d. Covering waste disposal containers when they are not in use and preventing them from overflowing.
   e. Berming and securely protecting stockpiled waste material from wind and rain at all times unless actively being used where spill would enter surface drainage systems.
   f. Addressing procedures to deal with hazardous and non-hazardous spills.
   g. Preparing and implementing a spill response and implementation plan prior to commencement of construction activities, including:
      i. Locations of on-site equipment and materials for cleanup of spills and leaks.
      ii. Procedures to follow in the event of spill or leak that includes immediate cleanup.
      iii. Locations and procedures of disposing of waste materials.
      iv. Identification of and training for spill response personnel.
   h. Lining and berming of concrete washout areas so there is no leakage or overflow into the underlying soil and onto the surrounding areas. Washout areas must be positioned away from drain inlets and waterways and be clearly labeled.

3. Good housekeeping measures for vehicle storage and maintenance include:
   a. Not allowing oil, grease, or fuel to leak in to the soil.
   b. Placing all equipment or vehicles to be fueled, maintained and/or stored in a designated area fitted with appropriate BMPs.
   c. Cleaning leaks immediately and disposing of leaked materials and sorbents properly.
   d. Fix leaks immediately or remove equipment for service.

4. To assess the potential pollutant sources and identify all areas of the site where good housekeeping or additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and non-storm water discharges, the applicant must assess and report on the following:
   a. The quantity, physical characteristic (liquid, powder, solid, etc.), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.
   b. The degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.
   c. The direct and indirect pathways that pollutants may be exposed to storm water discharges and non-storm water discharges. This must include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.
   d. Sampling, visual observation, and inspection records.
   e. Effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and non-storm water discharges.

Soil and Water Resources - APPENDIX H

MONITORING AND REPORTING PROGRAM FOR GROUNDWATER (THREE SURFACE IMPOUNDMENTS AND A LAND TREATMENT UNIT)

I. WATER QUALITY PROTECTION STANDARD

Water Quality Protection Standard is required by Title 27 of the California Code of Regulations (CCR, title 27) to assure the earliest possible detection of a release from the Beacon Solar Energy Project (Beacon) to underlying soil and/or groundwater. The Water Quality Protection Standard shall consist of the list of constituents of concern, the concentration limits, the Point of Compliance and all Monitoring Points. This Water Quality Protection Standard shall apply during the operation, closure, post-closure maintenance period, and during any compliance period. Beacon will initially undergo construction and then will be under a Detection Monitoring Program as documented in the March and June 2009 Report of Waste Discharge (ROWD).

II. MONITORING

A. Flow Monitoring of Discharges to the Surface Impoundments (the three evaporation ponds)

The Groundwater Mitigation Plan (June 2009 ROWD) states that discharge to the surface impoundments is derived from two primary sources (blow down of circulating water from the cooling tower and wastewater from the ion exchange regeneration stream) and one occasional source (storm water that may accumulate in the Land Treatment Unit). Wastewater from these sources will be routed to a brine concentrator, where the dissolved solids are concentrated into a brine liquid and discharged to the surface impoundments.

The applicant shall monitor the following:

1. The volume, in million gallons per day (mgd), of wastewater delivered to the surface impoundments;
2. The cumulative total of wastewater flow delivered to the surface impoundments, in million gallons per month; and
3. The maximum daily flow rate, in mgd, delivered to the surface impoundments each month.

B. Monitoring of Wastewater Discharges to the Surface Impoundments

Semi-annually, the applicant shall record the following:

1. The sources of wastewater delivered to the surface impoundments;

2. The amount and types of chemical additives added to the cooling system water that may be discharged to the surface impoundments; and

3. The analytical results of a composite wastewater grab sample that shall be collected and analyzed for the parameters in Table II-1.

Wastewater Sampling Parameters
Table II-1

Parameter	U.S. EPA or Standard Method	Reporting Limit Goal	Units
Ammonia (as N)	350.1	100	µg/L
Aluminum	200.7	20	µg/L
Arsenic	6020	2	µg/L
Antimony	6020	10	µg/L
Barium	6020	5	µg/L
Beryllium	6020	2	µg/L
Boron	200.7	140	µg/L
Cadmium	6020	5	µg/L
Calcium	200.7	40,000	µg/L
Chloride	300.0	14,000	µg/L
Chromium (total)	6020	5	µg/L
Cobalt	6020	5	µg/L
Copper	6020	5	µg/L
Cyanide (total)	SM 4500	10	µg/L
Fluoride	300.0	500	µg/L
Iron	200.7	20	µg/L
Lead	6020	3	µg/L
Magnesium	200.7	10,000	µg/L
Manganese	200.7	15	µg/L
Mercury	7470A	0.2	µg/L
Molybdenum	6020	10	µg/L
Nickel	6020	5	µg/L
Nitrate as nitrogen	300.0	1,000	µg/L
Nitrite as nitrogen	SM 4500	4	µg/L
Phosphate (total)	365.3	100	µg/L
Potassium	200.7	3,000	µg/L
Selenium	6020	10	µg/L
Silver	6020	5	µg/L
Sodium	200.7	10,000	µg/L
Strontium	200.7	500	µg/L
Sulfate	300.0	100.000	µg/L
Thallium	6020	10	µg/L
Total dissolved solids	SM 2540C	10,000	µg/L
Total alkalinity(as CaCO3)	SM 2320B	100,000	µg/L
Vanadium	6020	5	µg/L
Zinc	6020	10	µg/L
Biphenyl	8015M	500	µg/L
Diphenyl oxide	8015M	500	µg/L
Cyclohexamine (20-	8015M	500	µg/L

40%)			
Morpholine (1-10%)	8015M	500	µg/L
pH	Field	+/- 0.1	pH units
Temperature	Field	+/- 0.1	° F or °C

µg/L = micrograms per liter

C. Surface Impoundment Monitoring

1. Dikes and Liners

   a. Daily, the freeboard shall be measured from the top of the lowest part of the dike to the wastewater surface. If the surface impoundment is dry, indicate that it is empty of wastewater.

   b. Monthly, the integrity of the dikes and liners shall be inspected. Should the inspection indicate any damage to the dikes or liners or if an unauthorized discharge has occurred, or is likely to occur, the California Energy Commission shall be notified within 48 hours, followed by confirmation in writing.

2. Leachate Collection and Removal System (LCRS)

   a. Weekly, visual inspection for liquid in the leachate collection detection sumps for each surface impoundment shall be conducted. The results of those inspections shall be recorded in a permanent log book.

   b. All volume of liquid pumped out of the leakage detection sumps for each surface impoundment shall be recorded along with date, time and discharge location, in a permanent log book kept on-site.

3. Surface Impoundment Wastewater Monitoring

   Semi-annually, at each surface impoundment, liquid grab samples shall be collected at three (3) sample locations in the surface impoundments spaced approximately equidistant. The collected samples shall be composited into one sample by the laboratory and analyzed to determine the quantification of the parameters in Table II-1.

4. Surface Impoundment Sludge Monitoring

   Annually, in the last quarter of each year, three (3) representative grab samples of the bottom sludge in each surface impoundment, if present, shall be collected, composited and analyzed for the parameters in Table II-2.

Surface Impoundment Sludge Monitoring

Table II-2

Parameters	Unit
CCR title 22 metals (CAM 17)- Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc	Milligrams per kilogram (mg/kg)
Biphenyl, diphenyl oxide (Therminol or similar)	mg/kg

D. Detection Monitoring

Using approved statistical or non-statistical data analysis methods approved in these requirements, and in compliance with CCR, title 27, the applicant shall, for each monitoring event, compare the concentration of each monitoring parameter with its respective concentration limit to determine if there has been a release from the surface impoundments. Monitoring shall be completed in compliance with this Section D as further described below.

1. Unsaturated Zone Monitoring - Neutron Probe

   a. Quarterly, the applicant shall check for moisture below the surface impoundment liners using a neutron moisture probe calibrated for use at the site. If moisture content is detected above 30 percent by volume, field verification testing shall be performed and the applicant shall notify the California Energy Commission and report physical evidence of a release (see notification procedures below). Field verification testing may include a combination of additional neutron analysis, laboratory analysis of liquids drawn from the neutron probe casing and visual observation to verify existence of a release.

   b. Annually, the applicant shall submit documentation of instrument calibration and performance checks. Performance checks shall be a comparison of quarterly results of neutron moisture. Pre testing with earlier tests made under comparable conditions to verify proper operation of equipment must be documented.

2. Groundwater Monitoring

   The June 2009 ROWD proposes Groundwater Monitoring Network (GMN) for two scenarios: an on-site industrial water supply scenario, and, an off-site industrial water supply scenario. Both proposed GMN layouts include three categories of monitoring wells: (1) background wells (located upgradient of the surface impoundments and land treatment unit); (2) detection wells (located adjacent to the surface impoundments and land treatment unit); and (3) compliance wells. For both onsite and offsite water supply scenarios, the detection wells are comprised of three proposed

wells (MW-1 through MW-3) located immediately adjacent to the surface impoundments. The Point of Compliance as defined in CCR, title 27, section 20405 is "a vertical surface located at the hydraulically down gradient limit of the Unit that extends through the uppermost aquifer underlying the Unit."

The GMN layouts for the two water supply scenarios are:

Onsite Water Supply Scenario (Figure 4-1A of the June 2009 ROWD):

Background Wells – Well 47, Domestic Well, Well 50 and USGS Well. As shown in Figure 4-1A in the June 2009 ROWD, a cone of depression will develop under the surface impoundments due to the location of primary pumping Wells 49 and Well 63 and backup Well 41 and Well 42. Under pumping conditions, groundwater is predicted to move toward the primary pumping well(s) from all points of the compass. Thus, all wells, except the pumping well(s), become background wells.

Detection Wells – MW-1, MW-2 and MW-3

Compliance Well(s) – The compliance well(s) will be the primary pumping well(s) that is/are active, either Well 49, Well 63, Well 41 or Well 42.

Offsite Water Supply Scenario (Figure 4-1B of the June 2009 ROWD):

Wells – Well 47, Domestic Well and Well 41

Detection Wells – MW-1, MW-2 and MW-3

Compliance Wells – Well 50, Well 51 and USGS Well

a. Semi-annually, samples shall be collected in the groundwater monitoring network as proposed in the June 2009 ROWD and analyzed for the parameters listed in Table II-3.

The results of the analysis shall be reported in the semi-annual report in tabular and graphical form. Each such graph shall be plotted with raw data at a scale appropriate to show trends or variations in water quality. For graphs showing the trends of similar constituents, the scale shall be the same. The data shall also be used to construct an Upper Tolerance Limit to determine evidence of a release and shall be used to evaluate data from the previous three quarters for evidence of a release.

Monitoring Well Sampling Parameters
Table II-3

Parameter	U.S. EPA or Standard Method	Reporting Limit Goal	Units
Ammonia (as N)	350.1	100	µg/L
Aluminum	200.7	20	µg/L
Arsenic	6020	2	µg/L
Antimony	6020	10	µg/L
Barium	6020	5	µg/L
Beryllium	6020	2	µg/L
Boron	200.7	140	µg/L
Cadmium	6020	5	µg/L
Calcium	200.7	40,000	µg/L
Chloride	300.0	14,000	µg/L
Chromium (total)	6020	5	µg/L
Cobalt	6020	5	µg/L
Copper	6020	5	µg/L
Cyanide (total)	SM 4500	10	µg/L
Fluoride	300.0	500	µg/L
Iron	200.7	20	µg/L
Lead	6020	3	µg/L
Magnesium	200.7	10,000	µg/L
Manganese	200.7	15	µg/L
Mercury	7470A	0.2	µg/L
Molybdenum	6020	10	µg/L
Nickel	6020	5	µg/L
Nitrate as nitrogen	300.0	1,000	µg/L
Nitrite as nitrogen	SM 4500	4	µg/L
Phosphate (total)	365.3	100	µg/L
Potassium	200.7	3,000	µg/L
Selenium	6020	10	µg/L
Silver	6020	5	µg/L
Sodium	200.7	10,000	µg/L
Strontium	200.7	500	µg/L
Sulfate	300.0	100.000	µg/L
Thallium	6020	10	µg/L
Total dissolved solids	SM 2540C	10,000	µg/L
Total alkalinity(as CaCO3)	SM 2320B	100,000	µg/L
Vanadium	6020	5	µg/L
Zinc	6020	10	µg/L
pH	Field	+/- 0.1	pH units
Temperature	Field	+/- 0.1	° F or °C

b. Semi-annually, the groundwater potentiometric surface shall be illustrated on a 8.5" x 11" copy of a site plan showing the static water level, in feet below ground surface; the monitoring well locations; the location of the surface impoundments; and the groundwater gradient under each surface impoundment.

c. Prior to sampling, each monitoring well shall be sufficiently purged in accordance with generally accepted sampling practices in order to obtain a representative ground water sample. If any monitoring well is dry for more than a year, a new or modified monitoring well shall be installed.

Groundwater samples must be collected after the wells have been purged in accordance with California Environmental Protection Agency guidance document, *Representative Sampling of Groundwater for Hazardous Substances*, revised February 2008 (see: http://www.dtsc.ca.gov/SiteCleanup/upload/SMP_ Representative_Sampling_GroundWater.pdf*)*. The required stability parameters and criteria from this guidance are summarized in Table II-4.

Table II-4
Stabilization Parameters and Criteria

Parameter	Criteria
temperature	± 3% of reading (minimum of ± 0.2 C)
pH	+/- 0.1
specific electrical conductance	+/- 3%
Oxidation-reduction potential	+/- 10 millivolts
dissolved oxygen	+/- 0.3 milligrams per liter

E. Heat Transfer Fluid Contaminated Soil - Spills

1. All spills of heat transfer fluid (HTF) shall be cleaned up within 48 hours. Spills of 20 gallons or more of HTF must be reported to the California Energy Commission within 48 hours. The cleanup shall be performed according to the approved Spill Management Plan. The June 2009 ROWD outlines the procedure for removing contaminated soils from the Facility and temporarily staging the soils within the Land Treatment Unit for hazardous waste testing. Representative soil samples shall be analyzed by a California certified laboratory accredited to conduct the specific analytical method. Disposal of contaminated soil resulting from HTF spills that exceed hazardous waste levels shall be accomplished in accordance with applicable waste disposal regulations.

2. HTF-contaminated soil that does not exceed the hazardous waste levels may be discharged into the Land Treatment Unit. A report for every batch of HTF-contaminated soil discharged into the Land Treatment Unit must include the volume of cubic yards discharged, the sampling method and laboratory analytical reports.

3. Semi-annually, the applicant shall provide to the CPM a report thatsummarizes onsite HTF spills. The report shall include (1) HTF spill volumes of 20 gallons or greater, (2) locations of spilled HTF, and (3) the dates of spills. The report shall also include (1) the total volume of contaminated soil resulting from spills regardless of the volume of HTF spilled, (2) the disposition of the contaminated soil, (3) the total volume of contaminated soil, and (4) a breakdown of the total volume by disposition location (e.g., hauled offsite as hazardous waste, discharged to the LTU, or re-used onsite).

E. Land Treatment Unit (LTU) - Heat Transfer Fluid Contaminated Soil

1. After treatment, the HTF-contaminated soil may be reused at the Facility in accordance with “Special Provisions for the Land Treatment Unit” in Section III C. (Special Provisions for the Waste Management Units) in the Requirements for Waste Discharge. Representative soil samples shall be collected for every batch of treated HTF-contaminated soil prior to removal from the LTU. The samples shall be composited according to methods specified in the U. S. Environmental Protection Agency's current version of the manual: "Test Methods for Evaluating Solid Waste" (SW-846). The status and/or results of sample analysis shall be reported semi-annually.

2. Annually, the applicant shall verify that HTF is not migrating past the five-foot vertical treatment zone underlying the LTU. Four soil samples (one sample from each quadrant of the LTU) shall be collected at a depth of one foot below the five-foot vertical treatment zone and analyzed for the monitoring parameters listed below. If results of any sample analysis indicate that components of HTF are detected, the applicant shall, within two weeks, repeat deeper sample collection at one foot intervals. The applicant shall repeat sample collection until laboratory analytical results show that concentrations are non-detect. If components of HTF are detected beneath the five-foot treatment zone, the applicant shall, within two weeks, report the evidence of release.

   The samples shall be collected and composited according to methods specified in the U. S. Environmental Protection Agency's current version of the manual, "Test Methods for Evaluating Solid Waste" (SW-846). The samples shall be analyzed for the parameters in Table II-5 listed below using a California certified laboratory.

Land Treatment Unit Monitoring Parameters
Table II-5

Monitoring Parameter	Units
Biphenyl, a component of HTF (Therminol or similar)	mg/kg
Diphenyl oxide , a component of HTF (Therminol or similar)	mg/kg

F. Waste Management Unit Monitoring and Maintenance

1. **Quarterly** the applicant must inspect the condition of the waste management units (three surface impoundments and the land treatment unit) to ensure their integrity. The applicant must provide reports on the inspections **annually**. The quarterly inspection must consist of the following:

   a. The applicant must inspect the waste management units for integrity.

   b. The applicant must inspect the drainage features for the entire site including those which will divert water from the site.

   c. During sampling events, groundwater monitoring wells shall be inspected for damage.

   d. Any adverse conditions found in the visual inspection of the wells must be documented and promptly corrected. Documentation of the correction must be submitted with each annual report.

III. DATA ANALYSES

All data analyses methods (statistical or non-statistical) shall meet the requirements of CCR, title 27, section 20415, subdivision (e)(9).

A. General Non-statistical Methods

Evaluation of data will be conducted using non-statistical methods to determine if any new releases from the surface impoundments or land treatment unit have occurred. Non-statistical analysis shall be as follows.

1. Physical Evidence

   Physical evidence can include dike or berm(s) damage or loss, unexplained volumetric changes in the surface impoundments, groundwater mounding, or soil discoloration. Each annual report shall comment on the absence or presence of physical evidence of a release.

2. Time Series Plots

   Each annual report must include time series plot for groundwater monitoring parameters. Time series plots are not required for parameters that have never been detected above their method detection limit (as specified by the applicable USEPA Method) or if there are less than four quarters of data. Evidence of a release may include trends of increasing concentrations of one or more constituent over time.

B. General Statistical Analysis Methods

For Detection Monitoring, the applicant shall use statistical methods to analyze the constituents of concern listed in Table 11-4 of this Monitoring and Reporting Program that exhibit concentrations that equal or exceed their respective method detection limit in at least ten percent of applicable historical samples. The applicant may propose and use any statistical method that meets the requirements of CCR, title 27, section 20415, subdivision (e)(7). The report titled "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities" (USEPA, 1989) or subsequent versions may also be used to select the statistical test to use for comparing detection monitoring well data to background monitoring data. All statistical methods and programs proposed by the applicant are subject to CPM approval and must be in compliance with CCR, title 27.

IV. RECORD KEEPING AND REPORTING REQUIREMENTS

A. Scheduled Reports to be filed with the California Energy Commission

A detection monitoring report shall be submitted to the CPM of the California Energy Commission. The content of the detection monitoring report shall be as follows:

1. results of sampling analysis, including statistical limits or each monitoring point;

2. a description and graphical presentation of the velocity and direction of ground water flow under or around the Waste Management Units, based upon water level elevations taken during the collection of the water quality data submitted in the report;

3. a map or aerial photograph showing the locations of observation stations, monitoring points, and background monitoring points;

4. an evaluation of the effectiveness of the leachate collection and recovery system, and of the runoff/runon control facilities; and

5. a letter transmitting the essential points in each report, including a discussion of any requirement violations found since the last report was submitted, and describing actions taken or planned for correcting those violations. If the applicant has previously submitted a detailed time schedule for correcting

requirement violations, a reference to the correspondence transmitting this schedule will be satisfactory. If no violations have occurred since the last submittal, this shall be stated in the letter of transmittal.

B. Unscheduled Reports To Be Filed

1. Release from the Surface Impoundments

The applicant shall perform the procedures contained in this subsection whenever there is evidence of a release from the surface impoundments.

The applicant shall immediately notify the CPM verbally whenever a determination is made that there is physical or statistically significant evidence of a release (as determined in compliance with CCR, title 27, section 20164) from a surface impoundment. This verbal notification shall be followed by written notification via certified mail within seven days of such determination. Upon such notification, the applicant may initiate verification procedures or demonstrate that another source other than the Impoundment caused evidence of a release (see below). The notification shall include the following information:

a. the surface impoundment that may have released or be releasing wastewater;

b. general information including the date, time, location, and cause of the release;

c. an estimate of the flow rate and volume of waste involved;

d. a procedure for collecting samples and description of laboratory test to be conducted;

e. identification of any subsurface water bearing zone affected or threatened;

f. a summary of proposed corrective actions; and

For statistically significant evidence of a release (as determined in compliance with CCR, title 27, section 20164) - monitoring parameters and/or constituents of concern that have indicated statistically significant evidence of a release from the surface impoundments; or

For physical evidence of a release - physical factors that indicate physical evidence of a release.

2. Exceeding the Action Leakage Rate

The applicant shall immediately notify the CPM verbally within twenty-four hours whenever a determination is made that there is a fluid volume in the LCRS

sumps in excess of the Action Leakage Rates. This verbal notification shall be followed by written notification via certified mail within seven days of such determination. This written notification shall be followed by a technical report via certified mail within thirty days of such determination. The technical report shall describe the actions taken to abate the adverse condition, and shall describe any proposed future actions to abate the adverse condition.

3. Evaluation Monitoring

Pursuant to California Water Code section 13267, subdivision (b), the applicant shall, within 90 days of verifying a release, submit to the CPM an amended Report of Waste Discharge proposing an evaluation monitoring program (CCR, title 27, sections 20420, subdivision (k)(5) and 20425). If applicant decides not to conduct verification procedures, or decides not to make a demonstration that a source other than the surface impoundments or land treatment unit are responsible for the release, the release will be considered verified.

4. Preliminary Engineering Feasibility Study Report

The applicant shall, within 180 days of verification of a release or detection, submit to the CPM a Preliminary Engineering Feasibility Study pursuant to CCR, title 27, section 20420, subdivision (k)(6), that shall contain either corrective action measures that could be taken to achieve background concentration or demonstrate that the waste management units are not the cause of the detection.

V. REPORTING REQUIREMENTS

O. General Provisions

The applicant shall comply with the “General Provisions for Monitoring and Reporting” which is attached to and made part of this Monitoring and Reporting Program.

B. Semi-Annual Report

Beginning on June 30, 2010, a Semi-annual Monitoring Report, including the preceding monitoring information, shall be submitted to the CPM. Subsequent semi-annual monitoring reports shall be submitted to the CPM by January 30 and June 30 of each year.

C. Annual Report

Beginning on January 30, 2011, and by January 30 of each year, the applicant shall submit an Annual Report to the CPM including the preceding information and with the following information:

a. Evidence that adequate financial assurance for closure, post-closure, and reasonably foreseeable releases is still in effect and may include a copy of the renewed financial instrument or a copy of the receipt for payment of the financial instrument;

b. evidence that the amount is still adequate or increase the amount of financial assurance by the appropriate amount if necessary, due to inflation, a change in the approved closure plan, or other unforeseen events; and

c. a review of the closure plan and a statement that the closure activities described are still accurate or an updated closure plan.

D. Data Analysis Report

The applicant shall, by **January 30 of every year**, submit to the CPM a Data Analysis Report as specified in Section III (Data Analysis) of this Monitoring and Reporting Program.

E. Electronic Submittal of Information

Pursuant to CCT title 23, section 3890, the applicant shall submit reports, including soil, vapor and water data, prepared for the purpose of subsurface investigation or remediation of a discharge of waste to land subject to Division 2 of Title 27 electronically over the internet to the State Water Resources Control Board's Geotracker system. This requirement is in addition to, and not superceded by, any other applicable reporting requirement.

GENERAL PROVISIONS
FOR MONITORING AND REPORTING

4. SAMPLING AND ANALYSIS

p. All analyses shall be performed in accordance with the current edition(s) of the following documents:

vii. Standard Methods for the Examination of Water and Wastewater
viii. Methods for Chemical Analysis of Water and Wastes, EPA

q. All analyses shall be performed in a laboratory certified to perform such analyses by the California State Department of Health Services or a laboratory approved by the CPM. Specific methods of analysis must be identified on each laboratory report.

r. Any modifications to the above methods to eliminate known interferences shall be reported with the sample results. The methods used shall also be reported. If methods other than EPA-approved methods or Standard Methods are used, the exact methodology must be submitted for review and must be approved by the CPM.

s. The applicant shall establish chain-of-custody procedures to insure that specific individuals are responsible for sample integrity from commencement of sample collection through delivery to an approved laboratory. Sample collection, storage, and analysis shall be conducted in accordance with an approved Sampling and Analysis Plan (SAP). The most recent version of the approved SAP shall be kept at the facility.

t. The applicant shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to ensure accuracy of measurements, or shall insure that both activities will be conducted. The calibration of any wastewater flow measuring device shall be recorded and maintained in the permanent log book described in 2.b, below.

u. A grab sample is defined as an individual sample collected in fewer than 15 minutes.

v. A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period at equal intervals. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

5. OPERATIONAL REQUIREMENTS

w. Sample Results

The applicant shall maintain all sampling and analytical results including: strip charts; date, exact place, and time of sampling; date analyses were performed; sample collector's name; analyst's name; analytical techniques used; and results of all analyses. Such records shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the CPM.

x. Operational Log

An operation and maintenance log shall be maintained at the facility. All monitoring and reporting data shall be recorded in a permanent log book.

6. REPORTING

y. For every item where the requirements are not met, the applicant shall submit a statement of the actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time, and shall submit a timetable for correction.

z. All sampling and analytical results shall be made available to the CPM upon request. Results shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the CPM.

aa. The applicant shall provide a brief summary of any operational problems and maintenance activities to the CPM with each monitoring report. Any modifications or additions to, or any major maintenance conducted on, or any major problems occurring to the wastewater conveyance system, treatment facilities, or disposal facilities shall be included in this summary.

bb. Monitoring reports shall be signed by:

ix. In the case of a corporation, by a principal executive officer at least of the level of vice-president or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge originates;
x. In the case of a partnership, by a general partner;
xi. In the case of a sole proprietorship, by the proprietor; or
xii. In the case of a municipal, state or other public facility, by either a principal executive officer, ranking elected official, or other duly authorized employee.

cc. Monitoring reports are to include the name and telephone number of an individual who can answer questions about the report.

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Soil and Water - APPENDIX I

GROUNDWATER MITIGATION PLAN

Groundwater Monitoring

This groundwater monitoring program was provided in Attachment 5 of the Project Design Refinements (DB2009r) submitted to the CEC by the applicant in June 2009. As proposed by the applicant, the following describes the groundwater mitigation plan to be incorporated if the use of site groundwater is approved by CEC for power plant operation.

Proposed Groundwater Monitoring Program

To provide for land owner protection and participation in evaluation of project impacts, a Fremont Valley Groundwater Monitoring Committee will be formed. The committee will include a representative from the following:

- California City
- Community of Cantil
- Rancho Seco
- Honda
- Beacon Solar LLC

The monitoring committee's function will be to implement and oversee the groundwater monitoring program and to verify that there are no unacceptable impacts to groundwater levels or quality in water supply wells adjacent to the BSEP.

<u>Gather Historic Water Level and Water Quality Data</u>

- Secure access, if authorized by the land owner, for the purpose of monitoring of water levels and water quality for those water supply wells predicted by the numerical groundwater model to experience water level decline over the term of the project (30 years).
- Through the access agreement, obtain all historic water level and water quality data for each water supply well. Additionally, obtain well completion information, historic well performance data, including pumping and non-pumping water levels and pump specifications for each well to be monitored.
- Update the application for certification (AFC) water level and geochemical and water level database with all new information.
- Prepare time series graphs (i.e., trend plots) for water level and total dissolved solids (TDS) data, as information is available for each well.
- Perform statistical trend analysis using Mann-Kendall Trend Test and Sen's Slope Estimator for water levels and the TDS data. The Mann-Kendall Trend Test and the

Sen's Slope Estimator are proposed to statistically analyze the data because they are the accepted non-parametric trend analysis methods for data that are not normally distributed. Use trend analysis to determine the significance of an apparent trend and to estimate the magnitude of that trend. Further, use adjacent well data to evaluate local affects from pumping in water level trends.

Establish Pre-Project Baseline Water Quality and Water Level Database

- To the extent possible, prior project construction collect groundwater levels from the off-site and on-site wells. Additionally, collect groundwater samples to provide baseline TDS data for both on-site and off-site wells. Analyze TDS samples using Standard Methods 2540C by a California Certified Analytical Laboratory.
- Map TDS data and groundwater levels within the Koehn Sub-basin from the groundwater data collected prior to construction. Update trend plots and statistical analyses, as data is available.

Groundwater Monitoring During Construction

- During construction, collect water levels on a quarterly basis for a period of one year or on a quarterly basis through the construction period, and collect TDS data at the end of the construction period and prior to site operations.

Groundwater Monitoring During Operation

- On a quarterly basis for the first five years, collect water level measurements from the wells and collect TDS data to evaluate operational influence from the project. Additionally, monitor quarterly operational parameters (i.e., pumping rate) of the water supply wells.
- After a period of five years, evaluate the data and determine if the sampling frequency and TDS sampling should be revised or eliminated.
- Subsequently, evaluate the data set every five years and determine if the sampling frequency and TDS sampling should be revised or eliminated.

Proposed Mitigation Options

Water Level Offset Mitigation Options

Based on the results of the statistical trend analyses, determine if the project pumping has induced a drawdown in the water supply at a level of five feet or more below the baseline trend. If water levels have been lowered below pre-site operational trends, then implement any of the following options, as appropriate and considering the cost effectiveness of each option.

- Electrical cost reimbursement – If the pumping water level falls below a depth of 5 feet from an average of the baseline measurements, the well owner will be

compensated for the additional electrical costs commensurate with the additional lift required to pump. The water level in the well will be assessed relative to the pumping rate during pre-site operational period.

- Pump lowering – In the event that groundwater is lowered and existing pumps are day lighted, pumps can be lowered to maintain production in the well.
- Deepening of wells – If the groundwater is lowered enough that there is insufficient water in the well and pump lowering is not an option, then wells can be deepened.

Groundwater Storage Mitigation Options

Expected groundwater usage during BSEP operation is estimated to be 1,388 acre feet per year (AFY). Options to offset that water consumption include implementation of a partial ZLD and tamarisk removal program, which are described in the Project Design Refinements (DB 2009r).

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SOIL AND WATER RESOURCES - APPENDIX J

GUIDANCE FOR BSEP MAINTENANCE DISTRICT'S CHANNEL MAINTENANCE PROGRAM DEVELOPMENT

Channel Maintenance Program

Purpose and Objectives

This Appendix describes the purpose, objectives and applicability of Staff's requirements for the BSEP Maintenance District's Channel Maintenance Program (Program). Staff is requiring as part of Condition of Certification **SOIL&WATER-8** that the Channel Maintenance Program provide long-term guidance to the applicant to implement routine channel maintenance projects and comply with BSEP's related biological (**BIO-18**) and flood protection (**SOIL&WATER -5 and -6**) Conditions of Certification in a feasible and environmentally-sensitive manner. The main goals of the Program would be to maintain the diversion channel to meet its original design to provide flood protection, maintain native plant communities, provide wildlife habitat and a wildlife movement corridor, and maintain groundwater recharge. In this appendix, staff provides a summary of related programmatic documentation required for implementation of the Channel Maintenance Program.

The Channel Maintenance Program would be used by the applicant and the CPM to ensure that routine channel maintenance practices would be conducted in an efficient, consistent, and environmentally-sensitive manner. Staff's objectives for the Channel Maintenance Program are as follows:

1. Develop standardized practices and protocols for routine sediment removal, vegetation management, channel maintenance, and structural repair.

2. Ensure routine channel maintenance activities reflect the Energy Commission's Conditions of Certification for BSEP.

3. Avoid or minimize adverse environmental impacts and encourage preservation and restoration of the diversion channel and its revegetated areas.

Applicability and Use of the Channel Maintenance Program

The Channel Maintenance Program applies to routine channel maintenance activities, including three major types of activities: sediment removal, vegetation management, and bank protection and grade control maintenance/repairs. These activities would be undertaken to ensure flood conveyance capacity is maintained in the channel. Additional minor maintenance activities would also be included in routine channel maintenance.

The channel maintenance work area addressed by this Channel Maintenance Program would include the BSEP engineered channel, typically extending to the top of bank, include access roads, and any adjacent property that BSEP or the District owns or holds an easement for access and maintenance. The Program would include Pine Tree Creek

diversion channel maintenance as needed to protect the BSEP facilities. The District would not provide maintenance on private property, unless requested, or an easement was provided.

The Channel Maintenance Program would be a process and policy document prepared by BSEP, reviewed and approved by the CPM through consultation with CDFG and Kern County, and adopted by the District. Once adopted, the Channel Maintenance Program would be used by the applicant to guide the implementation of routine channel maintenance activities and projects. The Channel Maintenance Program would outline specific measures, protocols, policies, and inspection and reporting requirements to ensure that routine channel maintenance projects would be implemented in an efficient and environmentally-sensitive manner. This Channel Maintenance Program would be a living program that would change as improvements and modifications are made to reflect the best available knowledge, technology, and practices.

The Channel Maintenance Program is intended to establish an ongoing District program of indefinite length. Projections of future channel maintenance activities for the Channel Maintenance Program cannot represent the exact extent of work that would occur. Actual channel maintenance activities would vary from year to year. The Channel Maintenance Program would be reviewed annually by the CPM in the Annual Compliance Report as required in Condition of Certification **SOIL&WATER-8**. The overall program would be reviewed in ten years as part of the **BIO-18** revegetation milestone. Condition of Certification **BIO-18** specifies that within 10 years the applicant shall establish at least 15 percent of the 41.5-acre channel bottom, or 6.2 acres, with native desert shrub plant community, and that non-native weeds constitute less than 2 percent cover of the vegetated channel.

Channel Maintenance Activities

The following provides an overview and brief discussion of the major activities to be addressed by the Channel Maintenance Program. In addition, the Channel Maintenance Program applies to more minor, routine activities such as fence repair, trash removal, or other blockage clearing.

Sediment Removal

In most cases, sediment deposition is a natural process that occurs where the channel gradient flattens out or where the gradient is otherwise flat over long reaches. Some sediment is desirable in the engineered channel to support biological functions such as vegetation colonization. Unfortunately, sediment can build up to a point where it begins to compromise the design. Sediment removal is the act of mechanically removing sediment that has been deposited in the channel. Typically, sediment is removed when it: (1) reduces flood capacity, (2) prevents appurtenant hydraulic structures from functioning as intended, and (3) becomes a permanent, non-erodible barrier to instream flows. Staff recommends that sediment removal projects be implemented in the dry season. The applicant would be required to implement BMPs to ensure that sediment removal projects have the least impact possible to native plant communities and wildlife habitat.

The method of sediment removal is dependent on the channel type (earth bottom, soil concrete bed, or stilling basin), equipment, soil characteristics, and maintenance access

location. The average annual quantity of sediment to be removed would vary from year to year depending on rainfall conditions and sediment delivery from the watershed. During some or most years, no sediment would need to be removed. Aeolian processes may also cause a significant volume of sediment to accumulate from wind blown sand collecting in the low lying channel. Staff anticipates that the location of sediment removal within the channel would vary each year. The applicant and the District would develop Maintenance Guidelines (discussed below) to determine when and where sediment removal is required.

Vegetation Management

The applicant would manage vegetation in and adjacent to the diversion channel to maintain the biological functions and values described in **BIO-18**. Vegetation is not expected to adversely affect the ability of the channel to contain the design discharge owing to the relatively sparse nature of arid zone vegetation typically found in ephemeral channels. The applicant's vegetation management would include control of invasive or nonnative vegetation as described in **BIO-18**. Vegetation management can be accomplished through hand clearing or herbicide applications. A method or combination of methods could be chosen for each area depending on the maintenance needs. Staff recommends that the applicant only use herbicides according to the label directions and for uses approved by the United States Environmental Protection Agency (USEPA) and the California Department of Pesticide Regulation (DPR).

The applicant would also plant and maintain revegetation for the BSEP instream mitigation. In the first few years after initial planting, the applicant would provide weed control at mitigation areas to increase the number of native shrubs and establish a self-sustaining plant community which provides wildlife habitat as required in Condition of Certification **BIO-18**. The applicant would manage vegetation for other purposes including the protection of soil cement linings from plant roots, levees (if applicable), and maintaining access roads.

The frequency of vegetation management activities and inspections shall be as described in **BIO-18**.

Bank Protection and Grade Control Repairs

Channel erosion is a natural process, which mostly happens during major storm events. Erosion can occur because of hydraulic forces and geotechnical instabilities. Bank protection and grade control structure repairs involve any action by the applicant to repair eroded banks, incised toes, scoured channel beds, as well as preventative erosion protection. The applicant would implement instream repairs when the problem (1) causes or could cause significant damage to BSEP, adjacent property, or the structural elements of the diversion channel, (2) is a public safety concern, (3) negatively affects groundwater recharge, or (4) negatively affects the native plant communities and wildlife habitat within the channel, or poses an entrapment hazard to desert tortoise and other wildlife.

Erosion of banks can result in increased sediment deposition, which can lead to decreased flood flow capacities and potential flood hazards. Vegetation and soil loss would be zero where the channel design incorporates soil cement bank treatment. A

major failure to the soil cement bank cover or grade control structure would cause severe erosion, may cause property damage, and would create a safety hazard and threat to wildlife. Repair of soil cement bank protection and grade control structures shall occur when these structures fail and would be replaced with in-kind, in-place materials within the same footprint. Obstructions at grade control structures would be removed to maintain functions of such structures and access for desert tortoise and other wildlife.

Banks and grade control structures would be inspected after all major storms for damage and maintenance needs. The applicant would make an inspection of the channel upstream and downstream of an erosion site to determine if there is an identifiable cause of the erosion. Design of a particular facilities repair may require evaluation of other site-specific characteristics such as bank slope, shear stress, soil type, flow velocity and depth, Froude number, or the active channel's geomorphic characteristics.

Routine Channel Maintenance

Routine channel maintenance activities included in this Channel Maintenance Program would be: trash removal and associated debris to maintain channel design capacity; repair and installation of fences, gates and signs; grading and other repairs to restore the original contour of access roads and levees (if applicable); and removal of flow obstructions at BSEP storm drain (flap gate) outfalls.

Routine maintenance occurs on a year-round basis. Typically, routine maintenance that requires the operation of heavy equipment in the channel would be limited to the dry conditions.

Channel Maintenance Program - Exclusions

Routine channel maintenance would not include emergency repair. A situation is considered an "emergency" if it is a sudden, unexpected occurrence involving a clear and imminent danger that demands immediate action to prevent or mitigate loss of or damage to life, health, property, or essential public services (Public Resource Code Section 21060.3).

Large construction projects or Capital Improvement Projects (CIP) would not be considered routine channel maintenance and would not be addressed through the Channel Maintenance Program. Staff recommends that the applicant coordinate with Kern County and the CPM to develop a long-term plan that deals with CIP for the diversion channel.

Related Programmatic Documentation

Because this Channel Maintenance Program would be designed to guide the implementation of routine channel maintenance projects and activities over the long-term, it shall address channel maintenance at a general or "programmatic" level. As such, staff's Condition of Certification **SOIL&WATER-8** provides guidelines and implementation measures that characterize how channel maintenance would be conducted by the District.

The applicant would be required to comply with the Requirements of Waste Discharge provided in **Soil and Water Appendices E, F, G & H** as discussed in Condition of Certification **Soil&Water-4.** The applicant would also be required to meet CDFG requirements for channel maintenance activities and provide CDFG with a copy of the Channel Maintenance Program for review and comment. Because the diversion channel would be mapped as a SFHA, the applicant would be required to comply with NFIP regulations. The CPM would review all agency permits for routine channel maintenance activities and approve the Channel Maintenance Program.

Channel Maintenance Process Overview

This section describes Staff's recommendation for three distinct phases of the Channel Maintenance Program: program development and documentation, implementation of annual routine channel maintenance activities, and annual compliance reporting.

Program Development and Documentation

This Channel Maintenance Program would be developed to guide the long-term implementation of the District's annual routine channel maintenance work. The Channel Maintenance Program would enable the applicant to participate in a watershed-wide approach to environmental protection. Through these programmatic documents, the applicant would be committed to implementing individual maintenance projects in an environmentally-sensitive manner.

Maintenance Guidelines

Staff's Maintenance Guidelines are based on two concepts: (1) the maintenance standard and (2) the acceptable maintenance condition. The maintenance standard is defined as the design facility condition, where the engineered channel has full design capacity and freeboard. The acceptable maintenance condition is the condition to which a channel can be allowed to deteriorate before capacity is determined to be compromised and maintenance work becomes essential. The focus of BSEP's hydraulic and sediment transport analyses were related to the study of these two concepts. These analyses were prepared to investigate the *annual* accumulation of sediment and forecast the threshold of an acceptable maintenance condition. Further study is needed to understand annual sediment contribution, accumulation and capacity constraints.

The Maintenance Guidelines may also apply to other activities such as vegetation management, trash and debris collection, blockage removal, fence repairs, and access road maintenance. Vegetation in the desert channel environment does affect the channel's roughness, but increases in channel roughness would be slight because of the sparse vegetation and it is not expected to have an impact on the channel's flood capacity. By conducting these routine maintenance activities, the applicant would ensure that facilities continue to provide the level of flood protection for which they were constructed. These efforts protect channel function and help to comply with NFIP regulations and Kern County's Floodplain Management Ordinance.

Implementation

Maintenance work would be proposed either as part of a Channel Maintenance Work Plan or as other work identified later in the year through inspection. Staff recommends

specific Maintenance Guidelines be developed to ensure that the maintenance meets pre-established conditions of certification and engineering requirements. Staff recommends that field reconnaissance, inspection or survey be implemented to monitor the channel's maintenance condition and compare to specific Maintenance Guidelines. Maintenance Guidelines for BSEP's vegetation management activities are established in Condition of Certification **BIO-18**.

BSEP's Maintenance Guidelines for sediment removal would provide information on the allowable depth of sediment for the engineered channel that would continue to provide design discharge protection. Sediment should be allowed to store in the channel as minor aggradation which is part of the sediment transport and geomorphic function of the channel. Staff believe that sediment storage in the basin of the grade control structures provide an excellent source of sediment for long-term transport through the engineered channel. Staff recommends that the channel sediment be allowed to accumulate, on average, up to the sill elevation plus the depth of the active channel. Staff estimates that the depth of the active or bank full channel is roughly 1.5 to 2.5 feet, but further study is recommended. BSEP's engineer should verify that this sediment storage threshold, several feet above the sill elevation, would not affect the grade control structures ability to perform under the design discharge. Staff also recommends that BSEP verify that the channel would maintain capacity for the design discharge as part of compliance with Conditions of Certification **SOIL&WATER-7, -11,** and **-15**.

Reporting

Staff requests that a Channel Maintenance Work Plan, which would include a description of the planned "major" maintenance activity and extent of work to be accomplished, would be submitted to the CPM for approval prior to the commencement of the work. CIP would also be identified in the work plan. This work plan may be submitted annually as part of the BSEP's Annual Compliance Report.

To assess the overall progress of the mitigation program and determine the accuracy of the impact projections, annual reports would be made to the CPM for review as part of the BSEP's Annual Compliance Report. The Channel Maintenance Program Annual Report would specify which maintenance activities were completed during the year including type of work, location, and measure of the activity (e.g. cubic yards of sediment removed). Staff requires that the applicant provide a report describing "Lessons Learned" to evaluate the effectiveness of both resource protection and maintenance methods used throughout the year. The information and assessments would be used to update BMPs, Channel Maintenance Program processes, and the Maintenance Guidelines and to create a greater understanding of how to accomplish environmentally-sensitive maintenance work.

In addition to reporting on the maintenance activity completed for the year, the applicant would also provide reporting on the implementation of the mitigation program. For the first 10 years of the program, the applicant would provide photographs of the diversion channel and meet the verification requirements of Condition of Certification **BIO-18**.

Resource Protection Policies

Staff recommends the Channel Maintenance Program establish policies to ensure that resources would be protected to the furthest extent feasible during routine channel maintenance activities and are consistent with state and federal laws protecting special status species. The Channel Maintenance Program policies would be developed to guide decision-making for channel maintenance activities. The applicant would develop these policies through the routine channel maintenance planning process. BMPs would be developed to implement these policies. All routine channel maintenance activities would adhere to the policies contained in the program. Staff recommends that the applicant implement the following policies:

Policy 1*: The applicant will conduct all routine channel maintenance activities according to the process and protocols established in the Channel Maintenance Program.*

Policy 2*: Decisions regarding the necessity of routine sediment removal (to restore design discharge capacities) and vegetation management activities will be made by the applicant using the thresholds established in the Maintenance Guidelines. This information will be used to formulate in part an annual routine maintenance work plan.*

Policy 3*: The District will continue to develop, implement, and update BMPs for implementation of channel maintenance projects to ensure that maintenance activities are conducted in the most effective and environmentally-sensitive way possible and are technically feasible and economically reasonable.*

Policy 4*: The applicant will use the Channel Maintenance Program to manage its routine channel maintenance activities in a programmatic way.*

Policy 5*: The applicant will implement measures to avoid and minimize impacts to native species, especially special-status and riparian-dependent species. All management actions taken shall be consistent with state and federal laws protecting special status species (California Endangered Species Act of 1984, Fish and Game Code, sections 2050 through 2098; 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.)*

Policy 6*: Control and removal of native vegetation will be minimized to the extent practicable. Where appropriate, measures will be taken to leave the work site in a vegetated condition after routine channel maintenance activities are completed.*

Policy 7*: The applicant's use of herbicides will be consistent with environmental goals, including protection, preservation, and restoration. Herbicides will be used such that negative effects to the environment are avoided or minimized.*

Policy 8*: The applicant will implement measures to ensure that hazardous materials are properly handled and the quality of water resources is protected by all reasonable means when removing sediments from the channel.*

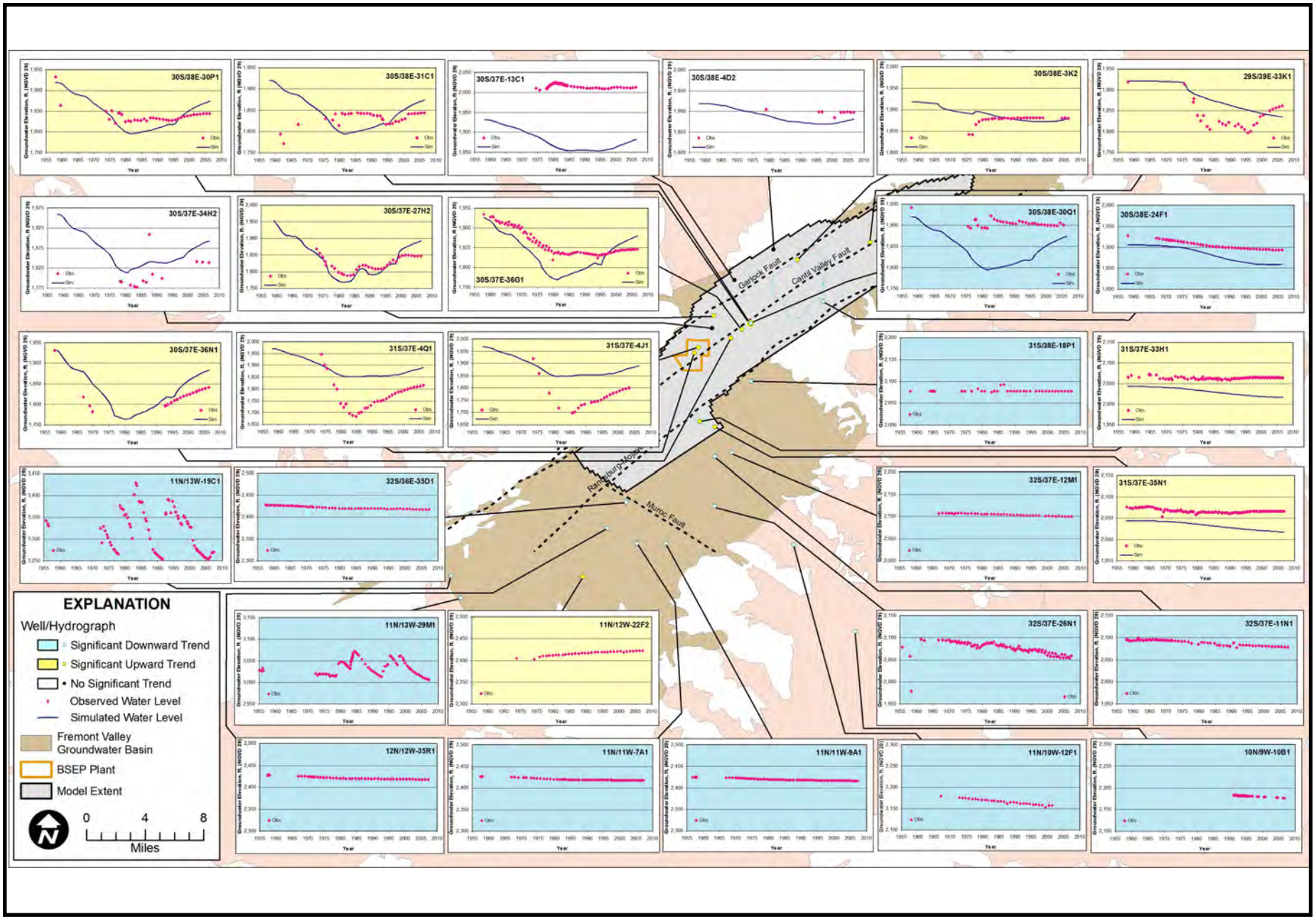
Policy 9*: The temporary stockpiling, transportation, and disposal of removed sediments from channel maintenance projects shall be implemented, avoiding or minimizing impacts to the surrounding natural environment.*

Policy 10*: Channel maintenance projects shall be implemented, avoiding or minimizing the potential for short-term noise nuisances and short-term air quality impacts to the surrounding community.*

Policy 11*: Measures shall be implemented at the work site to ensure that the potential for significant impacts to previously undiscovered cultural resources are reduced to less-than-significant levels.*

SOIL AND WATER RESOURCES - FIGURE 1

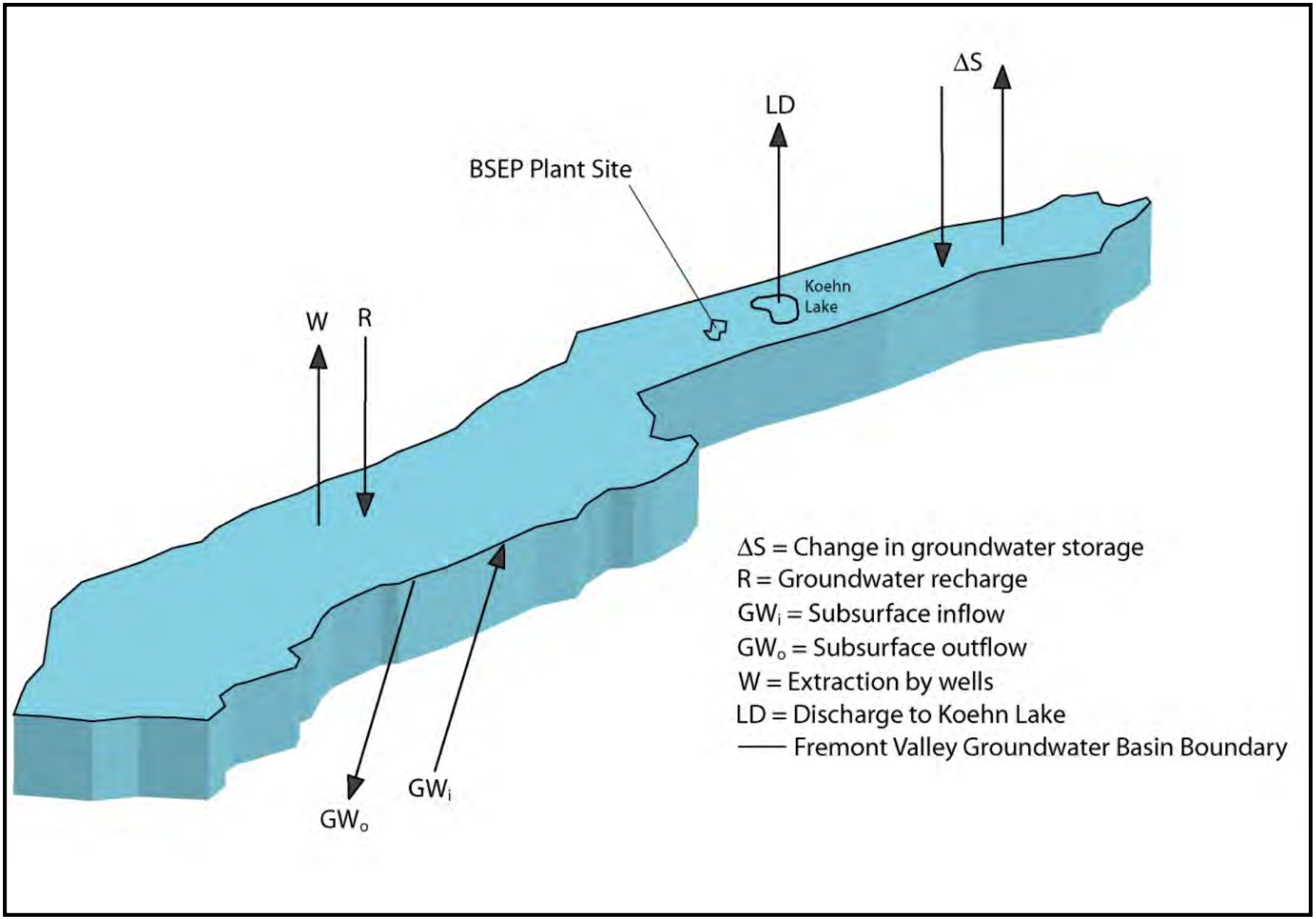
Beacon Solar Energy Project - Water Level Trends, Fremont Valley Basin



SOURCE: HydroFocus, Inc.

SOIL AND WATER RESOURCES - FIGURE 2

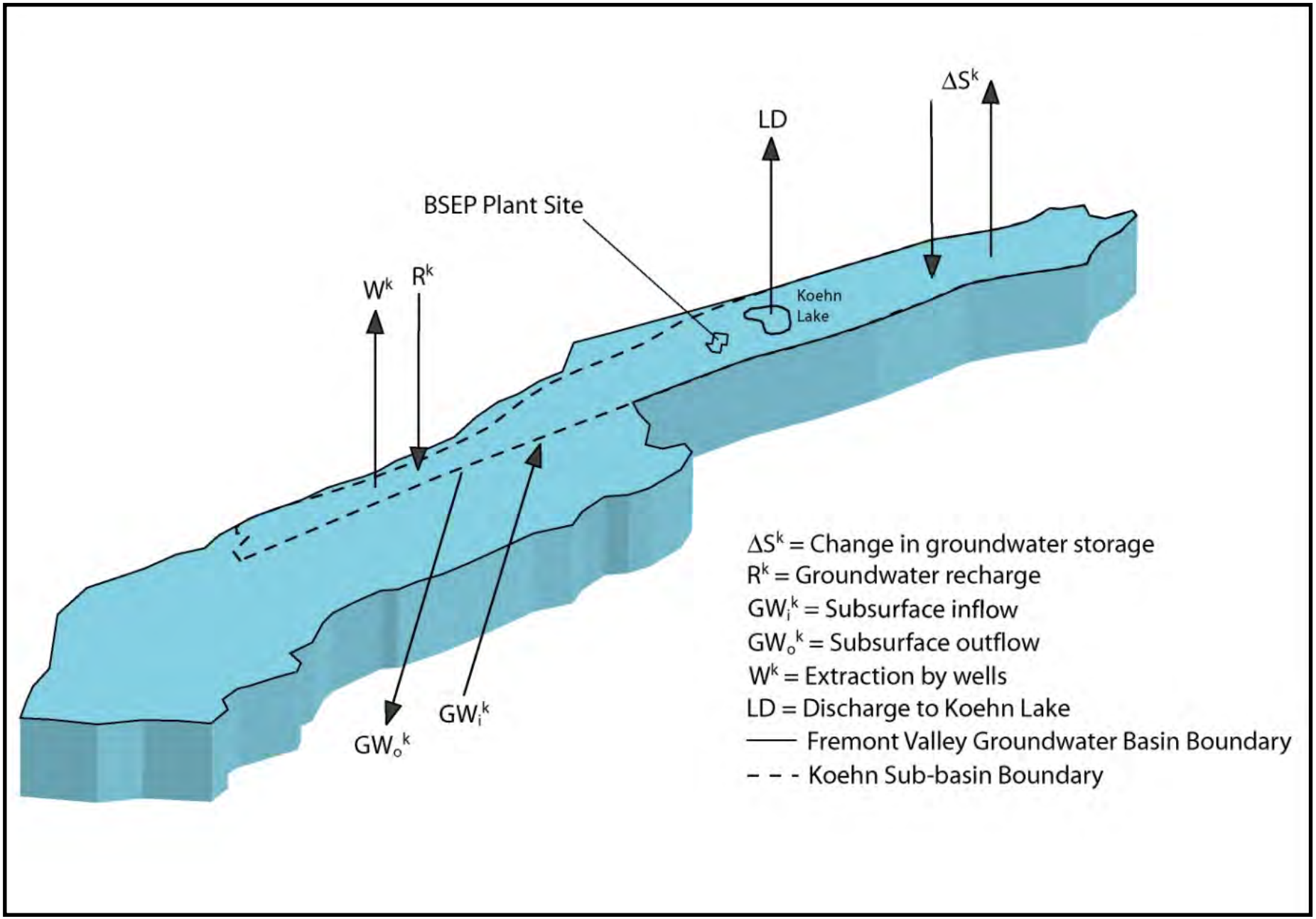
Beacon Solar Energy Project - Conceptual Fremont Valley Basin Water Budget



SOURCE: California Energy Commission

SOIL AND WATER RESOURCES - FIGURE 3

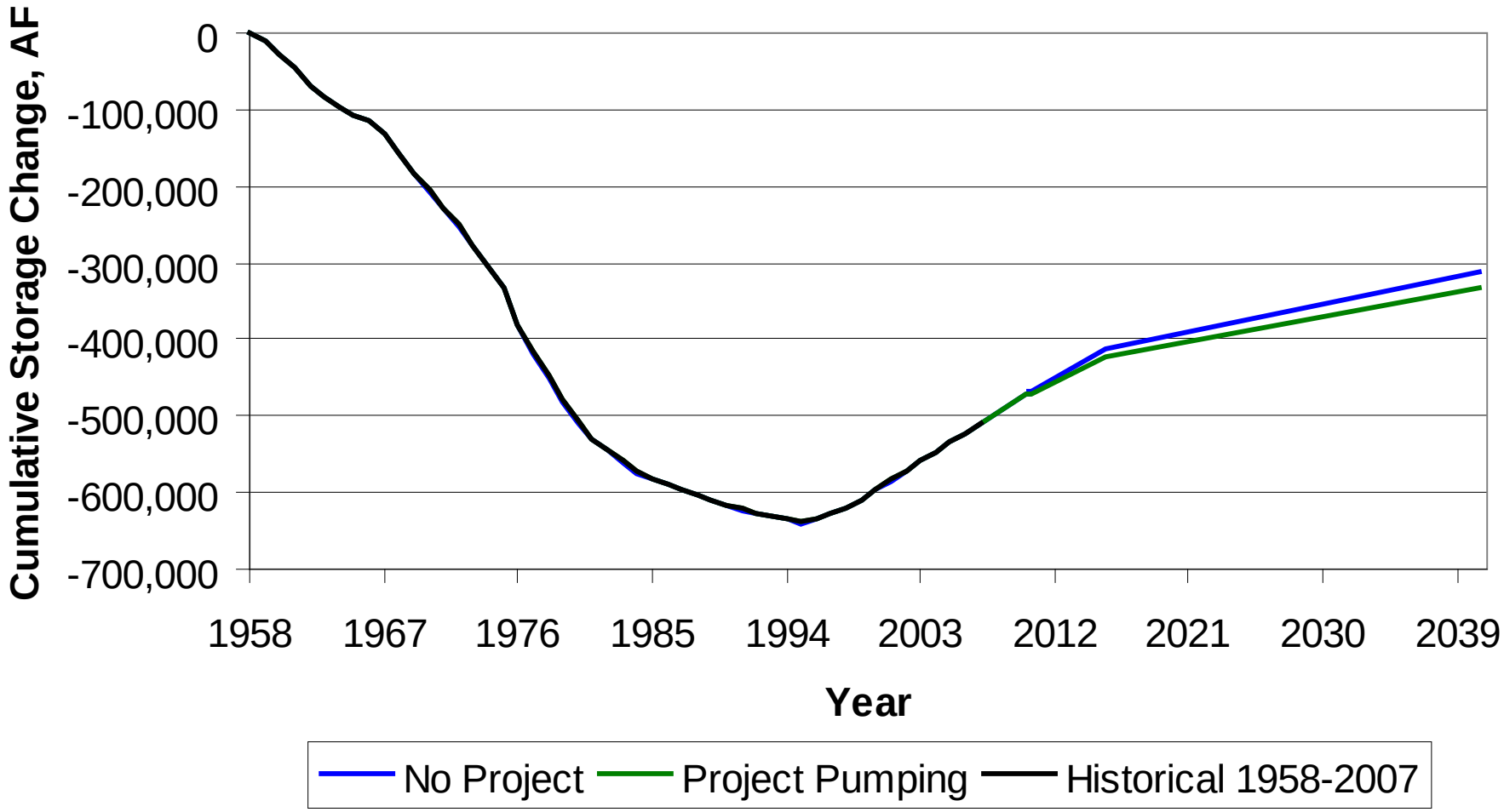
Beacon Solar Energy Project - Conceptual Koehn Sub-Basin Water Budget



SOURCE: California Energy Commission

SOIL AND WATER RESOURCES - FIGURE 4

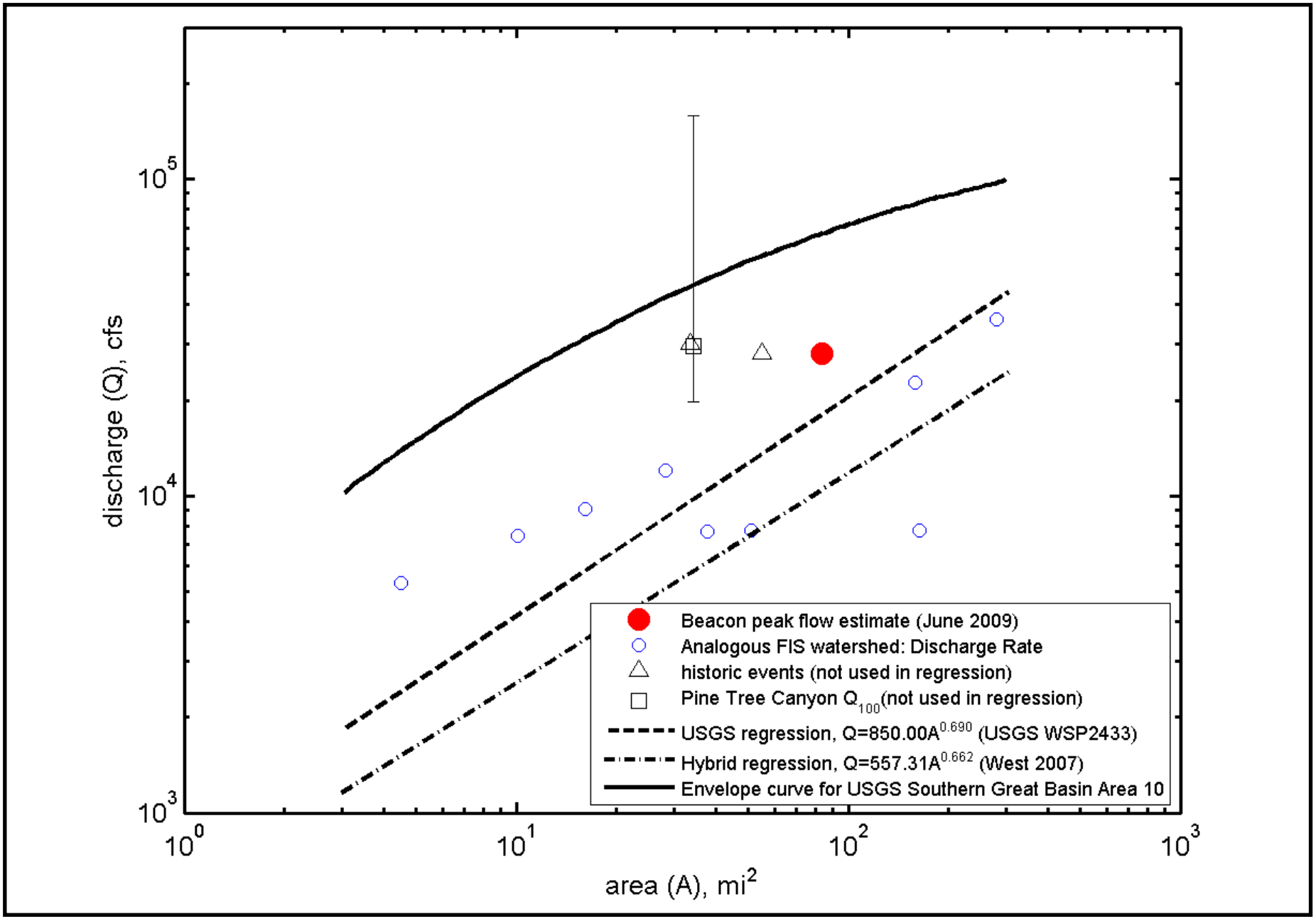
Beacon Solar Energy Project - Simulated Cumulative Groundwater Storage Change With and Without Project Pumping



SOURCE: California Energy Commission

SOIL AND WATER RESOURCES APPENDIX C - FIGURE 1

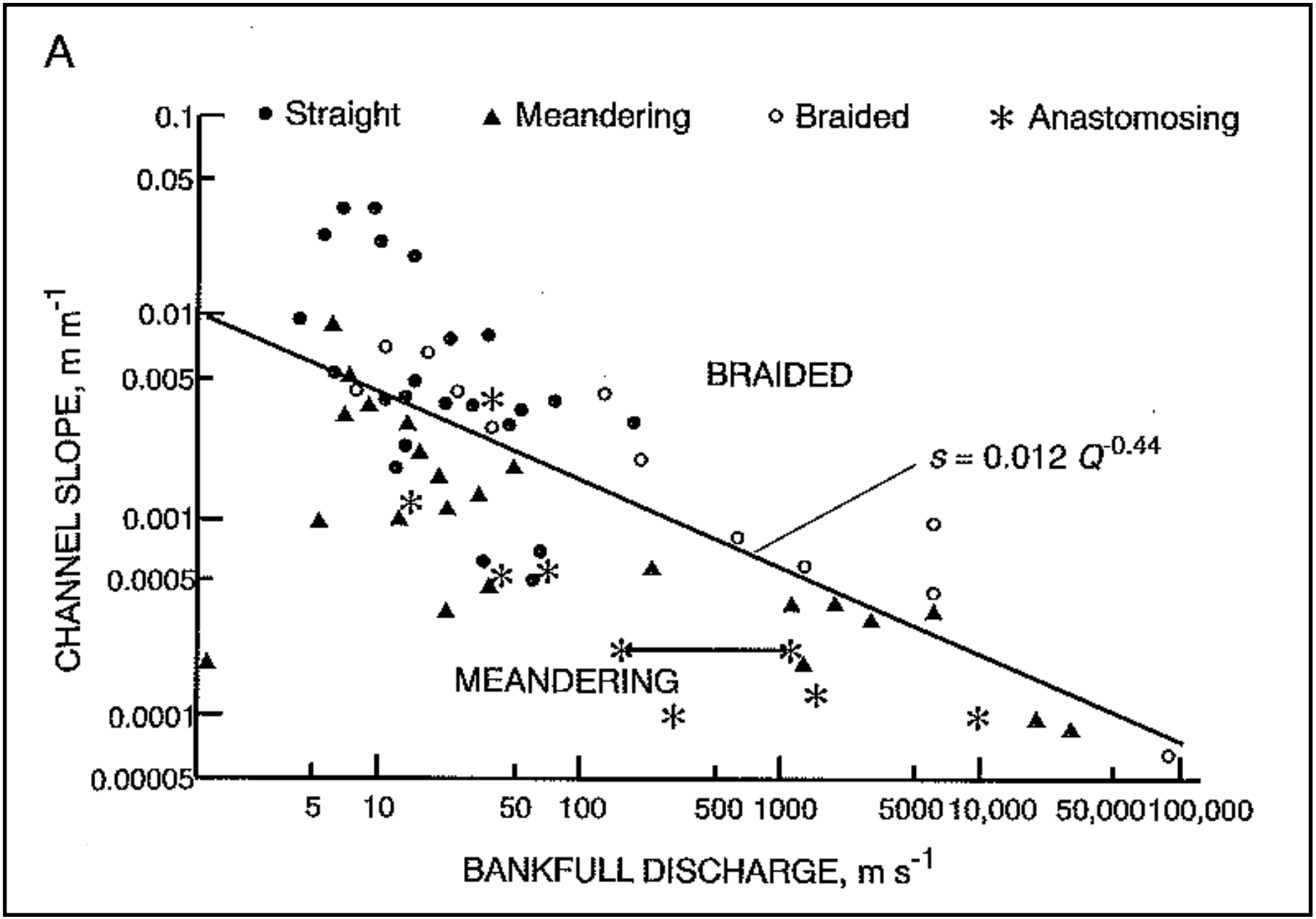
Beacon Solar Energy Project - Hydrologic Assessment of Peak Flood Flows



SOURCE: California Energy Commission

SOIL AND WATER RESOURCES APPENDIX C - FIGURE 2

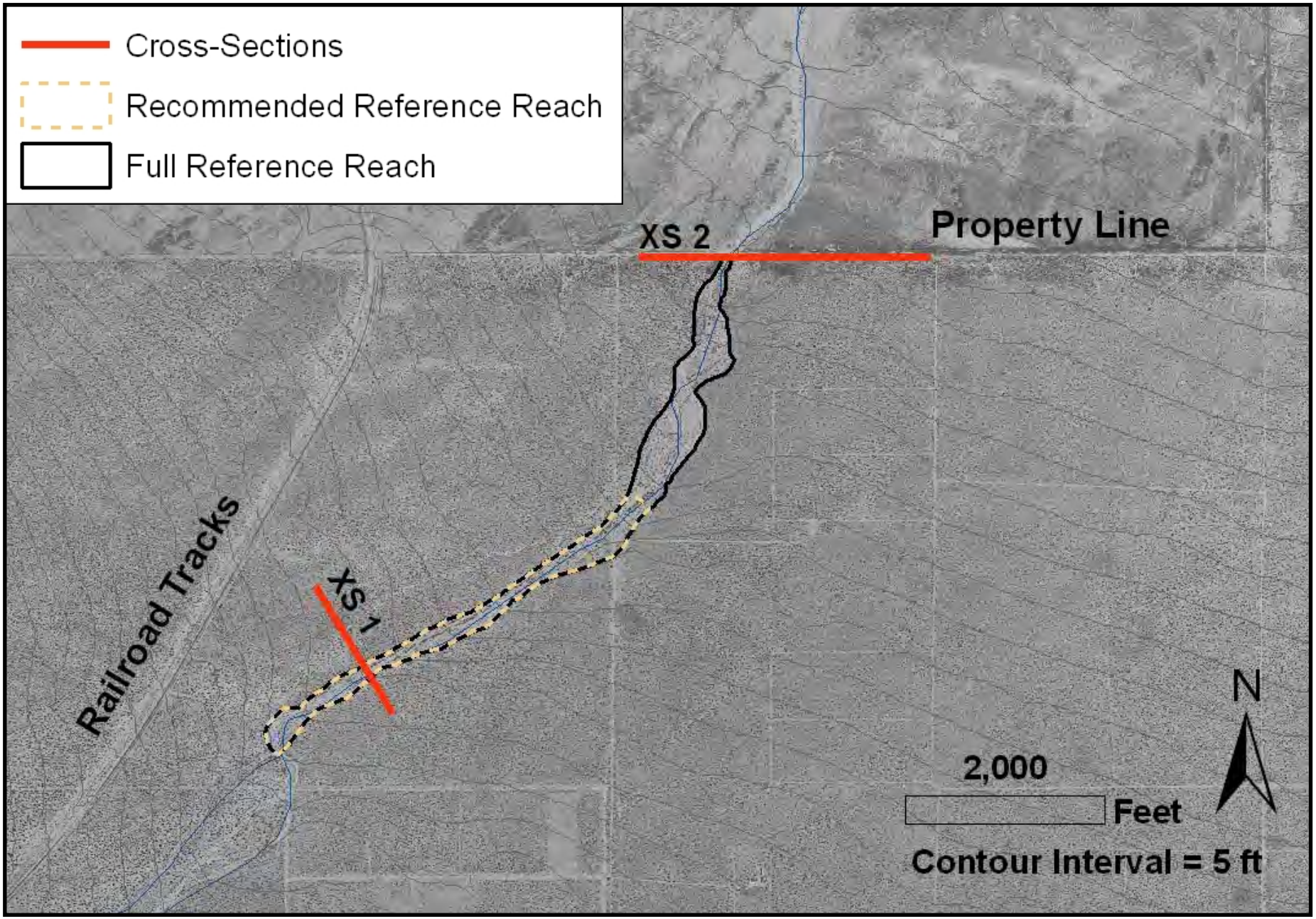
Beacon Solar Energy Project - Distinction between braided and meandering channels



SOURCE: California Energy Commission

SOIL AND WATER RESOURCES APPENDIX C - FIGURE 3

Beacon Solar Energy Project - Plan View of Staff's Reference Reach Locations of Cross-Sections 1 and 2

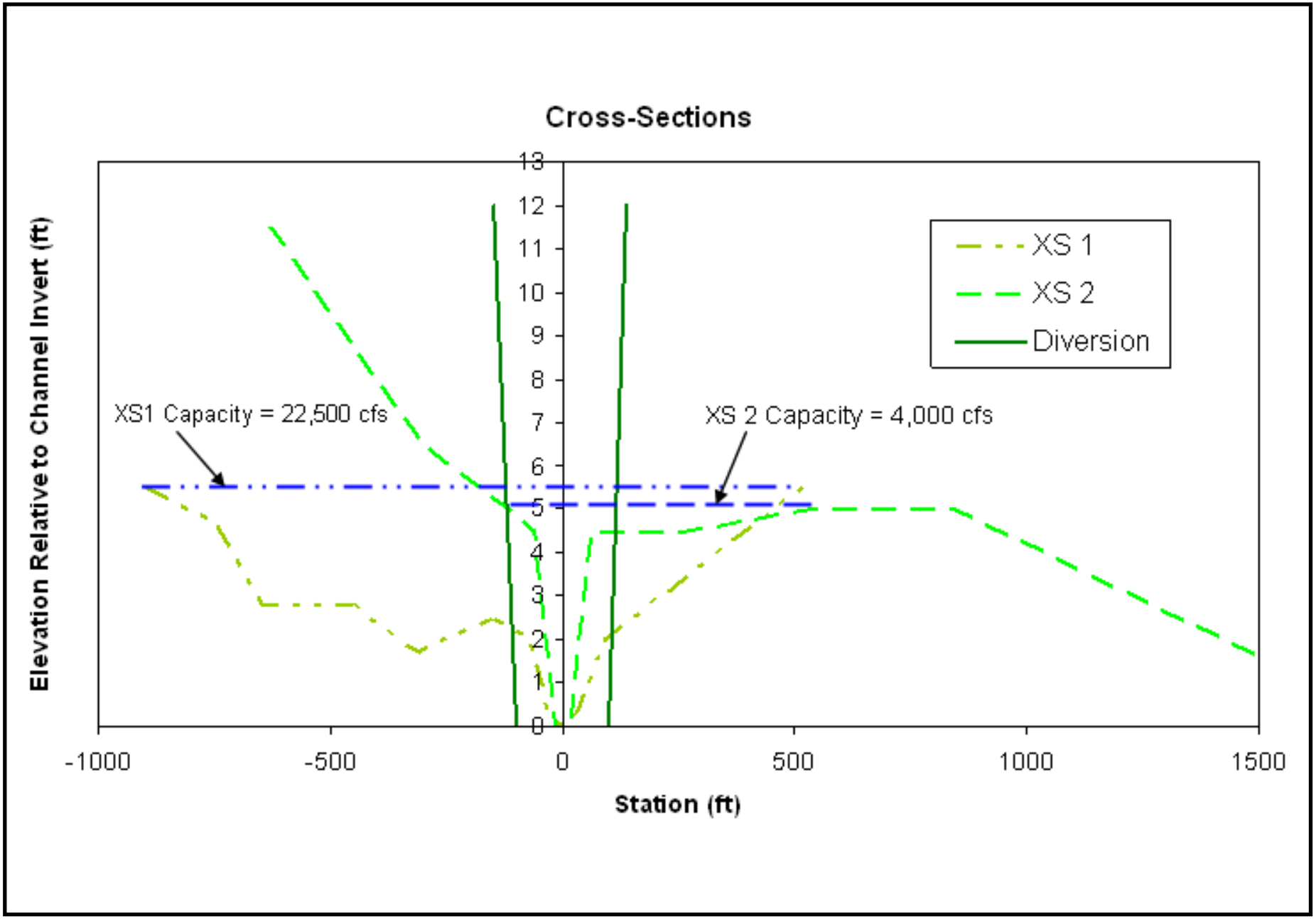


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission

SOIL AND WATER RESOURCES APPENDIX C - FIGURE 4

Beacon Solar Energy Project - Cross Section Comparison Peak Flow Capacity Estimated



SOURCE: California Energy Commission

TRAFFIC AND TRANSPORTATION

Testimony of David Flores

SUMMARY OF CONCLUSIONS

The Beacon Solar Energy Project (BSEP) would be consistent with the Circulation Element in the Kern County General Plan, local circulation plans and policies and all other applicable laws, ordinances, regulations, and standards. The project would not have a significant adverse impact on the local and regional road/highway network. During the construction and operation phases, local roadway and highway demand resulting from the daily movement of workers and materials would not increase beyond significance thresholds established by Kern County. During the operational phase, the project would not adversely affect local roads or aviation operations associated with any airport flight traffic.

INTRODUCTION

In the traffic and transportation analysis, staff addresses the extent to which the project may impact the transportation system in the local area. This analysis includes the identification of 1) the proposed roads and routings to be used for construction and operation; 2) potential traffic-related problems associated with the use of those routes by construction workers and truck deliveries; 3) the anticipated encroachment upon public rights-of-way during the construction of the proposed project and associated facilities; 4) the frequency of trips and probable routes associated with the delivery of hazardous materials; and 5) the possible effect of project operations on local airport flight traffic.

In addition to assessing potential project related impacts, staff has reviewed the applicable laws, ordinances, regulations, and standards (LORS) to determine compliance. The LORS that govern the project are listed below in **Traffic and Transportation Table 1**, followed by a discussion of the potential impacts related to traffic operations and safety hazards resulting from the construction and operation of the BSEP.

On June 22, 2009 and subsequently on July 1, 2009, energy commission staff received a project design refinement plan from the applicant. The following are a list of refinements that will affect the traffic and transportation analysis:

- Construction of a emergency access road;
- Water treatment and discharge facilities on site;
- Tertiary water line installation from Rosamond to the project site;
- Installation of a tertiary water line from California City to the project site; and
- Trucking of propane to the project site.

A discussion and evaluation of traffic impacts are discussed in the **CONSTRUCTION MITIGATIONS AND IMPACTS** section of this analysis.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Traffic and Transportation Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
Title 14, Code of Federal Regulations (CFR) Chapter 1, Part 77	Includes standards for determining obstructions in navigable airspace. Sets forth requirements for notice to the Federal Aviation Administration of certain proposed construction or alteration. Also, provides for aeronautical studies of obstructions to air navigation to determine their effect on the safe and efficient use of airspace.
Title 49, Subtitle B	Includes procedures and regulations pertaining to interstate and intrastate transport (includes hazardous materials program procedures) and provides safety measures for motor carriers and motor vehicles that operate on public highways.
State	
California Vehicle Code, Division 2, Chapter. 2.5; Div. 6, Chap. 7; Div. 13, Chap. 5; Div. 14.1, Chap. 1 & 2; Div. 14.8; Div. 15	Includes regulations pertaining to licensing, size, weight, and load of vehicles operated on highways; safe operation of vehicles; and the transportation of hazardous materials.
California Streets and Highway Code, Division 1 & 2, Chapter 3 & Chapter 5.5	Includes regulations for the care and protection of state and county highways and provisions for the issuance of written permits.
California Government Code, Sec.65352, 65940, and 65944	Requires evaluation of compatibility with military activities for any land use proposal located near a military installation or airspace.
California Public Utilities Commission General Order 75, Section 7.1	Pursuant to Public Utilities Code Section 7537, the Commission has the authority to determine the necessity for any private at-grade crossing and the place, manner, and conditions under which the at-grade crossing shall be constructed and maintained, and to fix and assess the cost and expense thereof.
Local	
Kern County General Plan Circulation Element, Sec. 2.3.2 & 2.3.3	Establishes level of service (LOS) D or better as minimum acceptable standard on County roadways, and a LOS C on State or Federal Highways.
Kern County Circulation Element	Addresses long-term planning goals and procedures for transportation infrastructure system quality: standards and procedures for air transportation: and transportation safety in Kern County.

Applicable LORS	Description
Kern County Circulation Element-Cont.	Kern County must assure protection of road right-of-way for efficient management of circulation. Goals 3: Protecting corridors for future transportation facilities is most important transportation planning activity in any high growth area. Goal 4: To reserve right–of- way to meet future road needs that result from development allowed by land use plans.

SETTING

The BSEP site is located in a remote section of Kern County, approximately 4 miles north of the northern boundary of California City. Regional access to the area is limited to State Route 14 (SR-14). A mayor portion of the roadways consist of unpaved local roadways extending east and west from SR-14. **Traffic and Transportation Figure 1, Regional Transportation System,** shows the region surrounding the project site. Transportation figures are located at the end of this analysis.

CRITICAL HIGHWAYS AND ROADS

SR-14 is a north-south route comprised of both freeway and expressway segments that run from the eastern side of the Sierra Nevada Mountain Range from the Los Angeles basin to US 395 near the community of Inyokern.

California Department of Transportation (Caltrans) records show average daily traffic volume on SR-14 in the project area (north of California City Boulevard) at 6,600 vehicles per day and 19,000 vehicles per day south of SR-58 (Caltrans 2007).

The local roadways in the area include California City Boulevard, and the Randsburg cutoff which is a east-west roadway that provides the most direct route to the proposed project site. It is classified as a major arterial and connects to the regional freeway system via an interchange with the SR-14 freeway to the north and SR-58 freeway to the south.

LEVEL OF SERVICE

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream. The term is used to describe and quantify the congestion level on a particular roadway or intersection and generally describes these conditions in terms of such factors as speed, travel time, and delay. The *Highway Capacity Manual*[1] defines six levels of service for roadways or intersections ranging from LOS A representing the best operating conditions and LOS F, the worst.

Traffic and Transportation Table 2 provides existing daily and peak traffic volume and LOS in the project area. Plant construction and operation traffic would use the existing local roadways, including SR-14 and SR-58, which are the principal highways in the area and are LOS A on a daily basis. Access into the project site will be from SR-14.

[1] National Research Council, *Highway Capacity Manual, Third Edition*, 1994.

The access point will be determined by Caltrans as they restrict the number of access points from the state highway.

Traffic and Transportation Table 2
Baseline Peak Hour Roadway Traffic Volumes Design Capacities, and Levels of Service (Without the Project)

	Existing Conditions[1]				Year 2011 Conditions[2]			
Roadway/ Segment	**Travel Lanes**	**Volume**	**Capacity[3]**	**LOS**	**Travel Lanes**	**Volume**	**Capacity[3]**	**LOS**
SR-14 north of Project site	2	345[4]	2,000	A	2	355	2,000	A
SR-14 at Project Site	4	345[4]	6,800	A	4	355	6,800	A
SR-14 south of Project Site	2	345[4]	2,000	A	2	355	2,000	A
SR-14 south of Mojave	4	2,050	6,800	A	4	2,345	6,800	A
SR-58 west of SR-14	4	1,900	6,800	A	4	2,255	6,800	A
SR-58 east of SR-14	4	1,850	6,800	A	4	2,345	6,800	A

1 Source-Caltrans,2007

2 Year 2006 traffic volumes expanded to Year 2011 (estimated construction completion) at historical rates Year 2000 to 2006 (1.28-3.76 percent/year depending on location.

3 Approximate two-way capacity in vehicles per hour.

4 Wilson Engineering Field County, February 2008.

AIRPORTS

The nearest airport facility is the California City Municipal Airport, located approximately six miles south of the proposed project site. There are three other airports in the region, including the Mojave Air and Space Port located approximately fifteen miles southwest of the project site, the Edwards Air Force Base located approximately twenty miles to the south, and the Naval Weapons Station China Lake facility located approximately forty miles northeast of the project site.

PUBLIC TRANSPORTATION

The following is a list of public transit providers in the general area around the proposed BSEP site:

- Currently there are no bike paths in the area of the project site. Bicycle and pedestrian circulation rely on the shoulders of the rural highway and county roads, but are not allowed on freeways.

- Regional transit in the area is provided by Kern Regional Transit with the Boron Mojave Route, East Kern Express, and the Mojave-Ridgecrest Route. The following are the route details:
- Boron-Mojave Route: Service is provided on Wednesday only between the communities of Boron, North Edwards, and Mojave.
- East Kern Express: Service is provided Monday through Saturday between the communities of Bakersfield, Keene, Tehachapi, Mojave, Rosamond, and Lancaster.
- Mojave-Ridgecrest Route: Service is provided between Mojave and California City Monday through Saturday. Intercity service is provided between the communities of Ridgecrest, Inyokern, and Mojave on Monday, Wednesday, and Friday.
- Dial-A-Ride service is also provided in the communities of Mojave, Tehachapi, and Rosamond. Service is available Monday, Wednesday, and Friday.

There are no school bus routes or stops within the routes that would be used by the workforce going to the project site or along the truck routes proposed for use during construction of the project.

RAILROADS

The applicant has indicated that during construction an established rail line off-loading area would be used for delivery of heavy equipment. The railroad off-loading site is located in the community of Mojave. It will be utilized during BSEP construction for the delivery of several pieces of major generation equipment, which will then be transported by truck to the project site.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

According to Appendix G of the California Environmental Quality Act (CEQA) Guidelines, a project may have a significant effect on traffic and transportation if the project would:

- cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections);
- exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways;
- result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);

- result in inadequate emergency access; or
- result in inadequate parking capacity; or conflict with adopted policies, plans, or programs.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Construction Impacts and Mitigation

When evaluating a project's potential impact on the local transportation system, staff uses LOS determinations as the foundation on which to base its analysis. The following discussion identifies potential traffic impacts associated with the construction of the BSEP and provides an explanation of the impact conclusion.

The Application for Certification (AFC) provides an analysis of projected traffic conditions with the addition of project construction traffic trips. Project construction is expected to take 25 months. All plant construction workers would park on a 6-acre parcel of land directly west of the BSEP site (BSEP 2008a, p. 5.13-11). This would also serve as a laydown area for materials and equipment (see **Traffic and Transportation Figure 2**). Staff has determined that the parking area is adequate for the number of construction workers involved in the project, based on the 6 acres that will be set aside for construction worker parking and laydown area.

Construction Workforce Traffic

To determine the amount of vehicle trips to the project site during average and peak construction, the applicant assumed that workers would commute alone during the morning and afternoon peak intervals (6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.). The average number of construction workers would be approximately 400, while the peak workforce would consist of 836 workers during month 15 of the construction period. Considering that some degree of carpooling would occur, the applicant assumed 880 one-way daily trips during peak construction. Given experience with previous projects, staff believes that the estimated construction traffic trips and assumptions about peak construction activity are reasonable. Based on regional demographics and availability of skilled laborers, the construction workers would probably come from Kern County. However, staff believes that some workers could come from San Bernardino and Los Angeles County.

Construction Truck Traffic

Construction of the generating plant would require the use and installation of heavy equipment and associated systems and structures. Heavy equipment would be used throughout the construction period, including trenching and earthmoving equipment, forklifts, cranes, cement mixers, and drilling equipment. A passenger car equivalent (PCE) factor of three cars per truck was used to determine the traffic impacts of trucks and heavy equipment deliveries (National Research Council 1994). Project construction is expected to require 15 trucks on average and 19 trucks during peak construction per day (BSEP 2008a). In-bound and out-bound truck traffic would arrive and depart the project site using the same route as construction workers.

Total Construction Traffic

The total peak construction traffic impact would be from 836 worker trips plus 20 truck and delivery trips, or 1,712 one-way vehicle trips. Staff is proposing Condition of Certification **TRANS-2** and **TRANS-3 to** repair any damage to various roadways identified in this analysis from construction traffic, particularly from heavy trucks during construction and installation of the tertiary water lines.

As reflected in **Traffic and Transportation Table 3**, the project construction related increases in traffic will be limited as project impacts would be dispersed over a number of routes, not causing a degradation of existing peak hour LOS. Roadways to the project site are forecasted to continue to operate at LOS A on the same segments as shown on **Table 2, Freeway/Roadway Segment Level of Service Existing Conditions** during the a.m. and p.m. peak hours. None of the study segment's LOS would deteriorate to a worse LOS, and would not result in a significant impact.

Traffic and Transportation Table 3
Peak Hour Roadway Volumes, Design Capacities, and Levels of Service
(With Project Related Traffic)

	Year 2011 Conditions with Project Construction Traffic[1]				Year 2011 Conditions with Project Operations Traffic[2]			
Roadway/ Freeway	**Travel Lanes**	**Traffic Volume**	**Capacity[3]**	**LOS[1]**	**Travel Lanes**	**Traffic Volume**	**Capacity[3]**	**LOS**
SR-14 - North of Project Site[2]	2	397	2,000	A	2	358	2,000	A
SR-14 - At the Project Site[2]	4	1,150	6,800	A	4	402	6,800	A
SR-14 - South of the Project Site[2]	2	1,150	2,000	A[4]	2	402	2,000	A
SR-14 - South of Mojave[2]	4	2,680	6,800	A	4	2,365	6,800	A
SR-58 - West of SR-14[2]	4	2,505	6,800	A	4	2,265	6,800	A
SR-58 - East of SR-14[2]	4	2,512	6,800	A	4	2,355	6,800	A

1 Assumes month 15 peak construction traffic levels with 836 workers

2 Assumes normal future project operations with total work force of 66 employees.

3 Two-Way capacity in vehicles per hour

4 Based on volume to capacity ratio, project operations are LOS A. Based on the most recent highway capacity manual methodology for rural two-way highways, which determines LOS based on an estimated percentage of drives having to follow another vehicle under worst case peak conditions, the two-lane segment of SR-14 at the BSEP site could be described as operating at LOS D.

Source: Caltrans, 2005

Linear Facilities

The applicant proposes that process water for the proposed project would be supplied by three groundwater wells on-site with a water storage facility to handle fire protection and domestic use; therefore, no traffic issues would exist for the installation of off-site water pipelines.

The western boundary of the 2,012-acre BSEP plant site is located approximately one mile east of the two existing LADWP transmission lines: 1) the Celilio-Sylmar 500 kV DC intertie line and 2) the Inyo-Barren Ridge 230 kV line. The applicant has proposed a new 3.5-mile transmission line route that would extend west across SR-14 and would head south and connect with the existing Barren Ridge Switching Station.

Potential impacts associated with the transmission line route include both construction and operation related impacts. Construction related impacts will result from the movement of heavy equipment, trucks, and worker vehicles along access routes during construction of transmission line towers and installation of conductors.

While this work will not directly impact traffic operations, several aspects of transmission line tower construction and conductor installation could potentially result in impacts. These include: 1) workforce related traffic; 2) access to proposed tower structure locations; 3) transmission line roadway crossings; and 4) construction equipment and materials deliveries. Condition of Certification **TRANS-5** requires that the applicant install crossing structures and netting, if required by Caltrans across SR-14 as a safety precaution and to reduce the potential for damage from falling construction materials or equipment during cable-stringing activities.

Staff’s Recommended Project Alternatives

Rosamond Water Alternative

The Rosamond Community Services District (RCSD) proposes to supply tertiary-treated wastewater for BSEP's facility operations, as an alternative to BSEP's proposal to use potable water as process water. In order to supply water from the RCSD facility to the BSEP site, an underground water pipeline would need to be constructed. Staff has worked with the RCSD to identify a proposed route that follows existing road rights-of-ways. See Alternatives section for further discussion.

California City Water Alternative

The city of California City (CA City) proposes to supply tertiary-treated wastewater for BSEP's facility operations, as an alternative to BSEP's proposal to use potable water as process water. In order to supply water from the CA City waste water treatment plant (WWTP) to the BSEP site, an underground water pipeline would need to be constructed along dedicated roadways (i.e., Mendiburu Road and Neuralia Road). CA City staff has proposed a pipeline route that follows existing road right-of-ways. See Alternatives section for further discussion.

Heavy equipment would be used throughout the construction period, for either the California City Water Alternative or the RCSD Water Alternative, including trenching and earthmoving equipment, cranes, cement mixers, and drilling equipment.

If the Energy Commissions approves either of the project alternative tertiary water supply pipelines (California City or RCSD) then the installation of the new tertiary water line(s) will require trenching within or along area roadways and dedicated and existing right-of-ways. Where installation of water pipelines would occur in the road right-of-ways, alternating partial road closure would be required. The closures together with the implementation of other mitigation measures such as signage or flagman, and staff's recommended Conditions of Certification **TRANS-2 or TRANS-3,** would be implemented in accordance with county and city requirements. With implementation of staff's recommended mitigation measures, none of the study water line segment's LOS would deteriorate to a worse LOS, and would not result in a significant impact.

Propane Fuel Alternative

The applicant has also proposed the use of propane to fuel the boilers. It is estimated that approximately 132 truck trips per year would be required based on the truck's delivery capacity of 5,000 gallons. Propane truck deliveries will increase the volume of traffic in the local area; however roadway segments in the area of the project site will remain at acceptable LOS and would not result in a significant impact.

Construction Phase Transport of Hazardous Materials and Waste

Deliveries to the BSEP site would include small quantities of hazardous materials to be used during project construction. The applicant has stated that the delivery/disposal of hazardous materials (15 deliveries per month [BSEP 2008a]) to and from the site, and materials handling on site would be conducted in accordance with all applicable federal and state statutes (see the **HAZARDOUS MATERIALS MANAGEMENT** section of this assessment for more information). The preferred transportation route for hazardous materials delivery would be via SR-14, and possibly SR-58 to access the BSEP site from the south.

School Bus Route

As noted earlier, there are no school bus routes or bus stops near the proposed project or along the proposed worker and truck routes identified in this analysis.

Railroad Crossing

Access to the laydown and parking areas that will be used during construction would require crossing the Union Pacific Lone Pine Branch rail line. Union Pacific representatives will need to be notified regarding necessary upgrades at the railroad crossing to minimize potential conflicts between construction and rail activities. To date, staff is not aware of any attempts by the applicant to contact railroad representatives. Condition of Certification **TRANS-4** requires the applicant to obtain the necessary approvals for their construction of a crossing arm, or other required mitigation requirements.

Access Road and Driveway Improvements

BSEP site access will be provided via a new driveway/access road extending easterly from SR-14 in the northeastern area of the plant site. Condition of Certification **TRANS-1** requires that the applicant work with Caltrans in securing the necessary encroachment permits and constructing the driveway access in accordance with Caltrans requirements.

The Kern County Resource Management Agency submitted a letter dated September 16, 2008 responding to the AFC and their attendance of a public workshop held on August 25, 2008. In their response letter they indicated that existing dedicated right-of-ways exist along the section lines and mid-section lines within the project area. The County's Circulation Element requires the preservation of these open corridors for future roadways.

The County indicated in their letter that to delete these reservations, would require a General Plan Amendment to the Circulation Element, requiring Planning Commission and the Board of Supervisors review and approval. It is anticipated that Planning Commission hearings for this amendment will be heard on April 21, 2009, and shortly thereafter before the Board of Supervisors for final consideration.

Energy Commission staff has indicated their preference is for the applicant to provide a right-of-way access easement along the eastern, northern, and westerly property boundary lines for continued access for maintenance of the overhead transmission lines that evidentially will be relocated from its current location within the project site to the northern edge of the project site. In addition, the right-of-way access road will provide a secondary access for fire protection equipment during an emergency response.

The construction of the emergency access road will take approximately two weeks to complete and would add approximately 10 trucks per hour to the traffic load on the roadway to and from the project site. As reflected in **Traffic and Transportation Figure Table 3,** the additional vehicle traffic required for the emergency access road construction would not adversely impact the LOS of any of the roadways.

See the **LAND USE** section of this analysis for continued discussion of public-right-of way dedications.

Operation Impacts and Mitigation

Employee and Truck Traffic

Operation of the power plant would require a labor force of 66 full-time employees that would generate 132 one-way trips to and from the BSEP site. Other project-related trips (that is, delivery trucks, visitors, and other business-related trips) are expected to be minimal and would occur during regular business hours. Staff assumes that operational workers would follow the same routes as the construction workers. These minor trip additions to surrounding local streets and highways would not significantly affect the LOS of these roads.

Transport of Hazardous Materials and Waste

The transportation and handling of hazardous substances associated with the proposed project could increase roadway hazard potential. Impacts associated with hazardous material transport to the facility could be mitigated to a level of insignificance by compliance with existing federal and state standards established to regulate the transportation of hazardous substances. The applicant intends to comply with all federal and state regulations related to the transportation of hazardous materials (BSEP 2008a, p.5.13-15).

The California Department of Motor Vehicles exclusively licenses all drivers who transport hazardous materials. Drivers are also required to check for weight limits and conduct periodic brake inspections. Commercial truck operators handling hazardous materials are also required to take instruction in first aid and procedures on handling hazardous waste spills. Drivers transporting hazardous waste are required to carry a manifest, which is available for review in the event of a spill, and is reviewed by the California Highway Patrol at inspection stations along major highways and interstates.

The California Vehicle Code and the Streets and Highways Code (sections 31600 through 34510) ensure that the transportation and handling of hazardous materials are done in a manner that protects public safety. Enforcement of these statutes is under the jurisdiction of the California Highway Patrol.

Project operation would require use of hazardous substances including sulfuric acid and cleaning and water treatment chemicals. It is estimated that there would be a maximum of six delivery/service trucks per week. A licensed hazardous waste transporter would haul any hazardous waste from the project site to one of three Class 1 hazardous waste landfills in western Kern County near the communities of Buttonwillow and Kettleman City, and in Imperial County near the community of Westmoreland. The handling and disposal of hazardous substances are also addressed in the **WASTE MANAGEMENT, WORKER SAFETY AND FIRE PROTECTION,** and **HAZARDOUS MATERIALS** sections of this assessment.

Water and Discharge Facilities

The proposed water treatment option will require approximately 30 additional two-way truck trips per month for water treatment chemical delivery to the project site. This is based on the use of Koehn Lake for water. Solids removal from the evaporative ponds will require approximately 700 truck trips per event. The frequency of clean-out as indicated by the applicant will depend on which water supply option is selected; clean out will be required once every 4.5 years for the on-site groundwater option and 3.5 years for the Koehn Lake water option. **Traffic and Transportation Figure Table 3** reflects the impacts during construction and operation of the BSEP as it was originally proposed. The solid waste removal from the evaporation ponds will use two additional truck trips per hour for up to ten hours a day which based on Table 3 would not adversely impact LOS on those roadways identified in the Table.

Airport Operations

As noted previously, the closest major airport is the California City Municipal Airport which is approximately 6 miles south of the proposed site. The existing flight pattern does not bring aircraft at low altitude over the project site. The steam turbine generator would be 55 feet high and the cooling tower would be 45 feet high (BSEP 2008a, pg.5.15-9). The transmission line support towers would average around 79 feet high, but a small number of transmission towers near the project facilities will be 110 feet. These structures would not penetrate navigable airspace for any airport.

As indicated in the AFC (BSEP 2008A, pg. 5.13-17), because of the remoteness of the project from the nearest civilian airport (six miles), the project would not conflict with civilian aircraft operations, however the applicant has filed a Federal Aviation Administration (FAA) Form 7460 to determine if any additional requirements may be required.

Ground Hugging Plumes

SACTI calculations were performed for AEP and no ground hugging plumes are predicted under the range of cooling tower operations provided by the applicant. Therefore, based on the SACTI model there would appear to be no impacts from the plumes to ground traffic in the project area.

Emergency Services Vehicle Access

The Kern County Fire Department would provide 24-hour fire protection and emergency medical services to the BSEP site. The nearest fire station is in the California City, about ten miles from the project site. Emergency service vehicles would reach the project site via the access road off SR-14 or Neuralia Road. For a more detailed discussion of emergency services concerning adequate ingress/egress serving the facility, see the **WORKER SAFETY AND FIRE PROTECTION** section of this assessment.

CUMULATIVE IMPACTS

No cumulative projects have been identified in the project vicinity that would create significant traffic impacts when considered together with the BSEP. The nearest known projects are the Pine Tree Wind Development Project, which is located approximately six miles west of the BSEP site and the LADWP Barren Ridge-Castaic Switching Station about 1.5 miles south of the plant site and extends south to Los Angeles County. Due to the distance from the BSEP site and the absence of significant traffic impacts associated with either project, cumulative impacts to existing traffic patterns and County circulation plans and policies would be less than significant. It should also be noted that Caltrans has no highway improvement proposals in this general area.

Staff has considered the minority populations (as identified in **Socioeconomics Figure 1**) and low income populations in its impact analysis. There are no significant direct or cumulative traffic and transportation impacts, and therefore, no environmental justice issues.

COMPLIANCE WITH LORS

The applicant has stated its intention to comply with all applicable LORS (BSEP 2006a, section 5.11.5). Staff has concluded that the project as proposed would comply with relevant LORS. **Traffic and Transportation Table 3** presents the project's conformance with all applicable LORS.

Traffic & Transportation Table 3
Project Compliance with Adopted Traffic and Transportation LORS

Applicable LORS	Description
Federal	
Title 14, Code of Federal Regulations (CFR) Chapter 1, Part 77	Includes standards for determining obstructions in navigable airspace. Sets forth requirements for notice to the Federal Aviation Administration of certain proposed construction or alteration. Also, provides for aeronautical studies of obstructions to air navigation to determine their effect on the safe and efficient use of airspace.
	Consistent: The nearest civilian airport is six miles away, therefore none of the project's structures would not penetrate any navigable airspace. The applicant will file a Notice of Proposed Construction or Alteration with the FAA to determine if any additional requirements are necessary.
Title 49, Subtitle B	Includes procedures and regulations pertaining to interstate and intrastate transport (includes hazardous materials program procedures) and provides safety measures for motor carriers and motor vehicles that operate on public highways.
	Consistent: Enforcement is conducted by state and local law enforcement agencies and through state agency licensing and ministerial permitting (e.g., California Department of Motor Vehicles licensing, Caltrans permits), and/or local agency permitting (e.g., Kern County Department of Public Works).
State	
California Vehicle Code, Division 2, Chapter 2.5; Div. 6, Chap. 7; Div. 13, Chap. 5; Div. 14.1, Chap. 1 & 2; Div. 14.8; Div. 15	Includes regulations pertaining to licensing, size, weight, and load of vehicles operated on highways; safe operation of vehicles; and the transportation of hazardous materials.
	Consistent: Enforcement is provided by state and local law enforcement agencies and through ministerial state agency licensing and permitting and/or local agency permitting.
California Streets and Highway Code, Division 1 & 2, Chapter 3 & Chapter 5.5	Includes regulations for the care and protection of state and county highways and provisions for the issuance of written permits.
	Consistent: Enforcement is provided by state and local law enforcement and through ministerial state agency licensing and permitting and/or local agency permitting.
California Public Utilities Commission	Pursuant to Public Utilities Code Section 7537, the Commission has the authority to determine the necessity for any private at-grade crossing

Applicable LORS	Description
General Order 75, Section 7.1	and the place, manner, and conditions under which the at-grade crossing shall be constructed and maintained, and to fix and assess the cost and expense thereof.
	Consistent: The applicant in consultation with the California Public Utilities Commission and Union Pacific Representatives will make necessary upgrades at the railroad crossing to minimize potential conflicts between construction and rail activities.
Local	
Kern County General Plan Circulation Element, Sec. 2.3.2 & 2.3.3	Establishes level of service (LOS) D or better as minimum acceptable standard on County roadways, and a LOS C on State or Federal Highways.
	Consistent: As reflected in Traffic and Transportation Table 2, the LOS along these designated roadways would remain better than the LOS D threshold requirement.
Kern County Circulation Element	Addresses long-term planning goals and procedures for transportation infrastructure system quality: standards and procedures for air transportation: and transportation safety in Kern County.
	Consistent: The applicant will work with Kern County and Caltrans in determining necessary roadway improvements needed for the entrance into the project site, and to insure traffic safety during construction and operations of the BSEP.
	Kern County must assure protection of road right-of-way for efficient management of circulation. Goals 3: Protecting corridors for future transportation facilities is most important transportation planning activity in any high growth area Goal 4: To reserve right –of- way to meet future road needs that result from development allowed by land use plans.
	Consistent: The applicant will work with Kern County to insure necessary rights-of-way are dedicated to the County for implementation in the Circulation Element of the General Plan.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Tanya A. Gulesserian, Attorney with Adams, Broadwell, Joseph & Cardozo Law Firm indicated that TRANS-2 and TRANS-3 requires the applicant to prepare and submit a mitigation plan for repair any damage to Neuralia Road and California City Boulevard during the open cutting for the installation of the natural gas line. Ms. Gulesserian indicated that this condition improperly defers mitigation to a future date in violation of CEQA, and deprives the public and decisionmakers the right to review and comment on the measure and should be prepared now and circulated for public review prior to project approval.

Staff Response: On June 22, 2009, the applicant submitted a project refinement proposing the use of propane to fuel the boilers. The construction of the natural gas pipeline is no longer part of the project. A further discussion of the use of propane is discussed in the **Construction Mitigation and Impacts** section of this analysis.

Energy Commission Staff disagrees with Ms. Gulesserian assertion that that proposed condition of certification **TRANS-2** is in violation of CEQA protocols to mitigate without first circulating the document for public comment. As discussed in detail in the Final Staff Assessment, with implementation of the Traffic Mitigation Plan, construction of the BSEP is not anticipated to result in any significant adverse project-level or cumulative impacts related to Traffic and Transportation. The purpose of the mitigation plan to repair open cut roadways due to tertiary water installations is to meet local jurisdictional requirements for backfill and asphalt requirements.

Department of Transportation, Gayle J. Rosander provided comments to the Preliminary Staff Analysis by recommending minor changes to the LORS standards for LOS threshold, encroachment requirements by Caltrans for transmission line crossing State Route-14, and security fencing requirements when working in Caltrans right-of-way.

Staff Response: The **Traffic and Transportation** section of the Final Staff Assessment been revised to address the concerns stated by Caltrans in the above statement.

*Jane E. Luckhardt, Downey Brand,LLP-attorney for the applicant requested staff to modify the language in staff's proposed condition of certification **TRANS-1**. Ms. Luckhardt cited that it would not be practical for the applicant to mobilize a separate construction crew and contract just for these road improvements prior to initiating the general site construction. She indicated that more logically, this work would be done in conjunction with site civil work.*

Staff Response: Energy Commission Staff has reviewed the revised language, and agrees to the revision of the **TRANS-1**, as it will provide a more logical approach and timing aspect to the entrance improvements onto the project site from SR-14.

CONCLUSIONS

1. The project as proposed would comply with all applicable LORS related to traffic and transportation and would not significantly degrade the level of service on SR-14 or SR-58.

2. Because of the project's distance from the nearest airport, no impact on the California City Municipal Airport Airspace would occur, and the project would not impact aviation safety.

3. Staff is proposing Condition of Certification **TRANS-2**which would require a mitigation plan to repair various roadways identified in the traffic analysis if they are damaged by installation of the CA City Alternative tertiary water pipeline proposed by staff.

4. Staff is proposing Condition of Certification **TRANS-3** which would require a mitigation plan to repair various roadways identified in the traffic analysis if they are damaged by installation of the Rosamond Alternative tertiary water pipeline proposed by staff.

5. There would be no significant direct or cumulative traffic and transportation impact and therefore no environmental justice issues.

6. Staff is proposing Condition of Certification **TRANS-4** to ensure the necessary approvals for the proposed Union Pacific railroad crossing.

PROPOSED CONDITION OF CERTIFICATION

TRANS-1 Prior to the start of construction activities, the contractor shall coordinate with Caltrans District 9 staff, prepare improvement plans and submit for an encroachment permit to complete required physical improvements at the SR-14 entrance into the project site. The project owner shall complete all physical improvements and construction conditions of encroachment permit at SR-14 entrance prior to beginning on-site activities requiring more than 150 construction workers per day.

Verification: At least 30 days prior to start of construction, the project owner shall in coordination with Caltrans, design and submit for an encroachment permit to construct the roadway improvements described above. Prior to initiating construction activities requiring a workforce of 150 persons or more, the project owner shall have completed construction of the improvements and the project owner shall notify the CPM that these roadway improvements have been completed and are ready for inspection.

TRANS-2 Prior to site mobilization activities, the project owner shall prepare a mitigation plan for Neuralia Road and Mendiburu Roaddue to open cutting of the roadways for the installation of the tertiary water pipeline. The intent of this plan is to ensure that if these roadways are disturbed by project construction, they will be repaired and reconstructed to original or as near original condition as possible. This plan shall include:

- Documentation of the pre-construction condition of the following roadways:
  1. Neuralia Road from the project site south to Mendiburu Road and then east on Mendiburu Road where it reaches the California City waste water treatment plant.
- Prior to the start of site mobilization, the project owner shall provide to the CPM photographs or videotape of water line routes discussed above.
- Documentation of any portions of Neuralia Road and Mendiburu Road that may be inadequate to accommodate oversize or large construction vehicles and identification of necessary remediation measures;

- Provision for appropriate bonding or other assurances to ensure that any damage to Neuralia Road, and Mendiburu Road due to construction activity will be remedied by the project owner; and
- Reconstruction of portions of Neuralia Road, and Mendiburu Road that are damaged by project construction due to oversize or overweight construction vehicles.

Verification: At least 90 days prior to the start of site mobilization, the project owner shall submit a mitigation plan focused on restoring Neuralia Roadand Mendiburu Road to its pre-project condition to Kern County and California City Public Works and Planning Department for review and comment and to the CPM for review and approval.

Within 90 days following the completion of construction, the project owner shall provide photo/videotape documentation to the Kern County and California City Public Works and Planning Department and the CPM that the damaged sections of Neuralia Road, and Mendiburu Road have been restored to their pre-project condition.

TRANS-3 Prior to site mobilization activities, the project owner shall prepare a mitigation plan for Rosamond Boulevard, Sierra Highway, Sopp Road, Lone Butte Road, California Avenue, and Neuralia Road, due to open cutting of the roadways for the installation of the tertiary water pipeline. The intent of this plan is to ensure that if these roadways are disturbed by project construction, they will be repaired and reconstructed to original or as near original condition as possible. This plan shall include:

- Documentation of the pre-construction condition of the following roadways:
  1. Rosamond Boulevard, Sierra Highway, Sopp Road, Lone Butte Road, California Boulevard , and Neuralia Road.
- Prior to the start of site mobilization, the project owner shall provide to the CPM photographs or videotape of water line routes discussed above.
- Documentation of any portions of Rosamond Boulevard, Sierra Highway, Sopp Road, Lone Butte Road, California Boulevard and Neuralia Road that may be inadequate to accommodate oversize or large construction vehicles and identification of necessary remediation measures;
- Provision for appropriate bonding or other assurances to ensure that any damage to Rosamond Boulevard, Sierra Highway, Sopp Road, Lone Butte Road, California Boulevard and Neuralia Road due to construction activity will be remedied by the project owner; and
- Reconstruction of portions of Rosamond Boulevard, Sierra Highway, Sopp Road, Lone Butte Road, California Boulevard , and Neuralia Road that are damaged by project construction due to oversize or overweight construction vehicles.

Verification: At least 90 days prior to the start of site mobilization, the project owner shall submit a mitigation plan focused on Rosamond Boulevard, Sierra Highway, Sopp Road, Lone Butte Road, California Boulevard , and Neuralia Road to its pre-project

condition to Kern County and California City Public Works and Planning Department for review and comment and to the CPM for review and approval.

Within 90 days following the completion of construction, the project owner shall provide photo/videotape documentation to the Kern County and California City Public Works and Planning Department and the CPM that the damaged sections of Rosamond Boulevard, Sierra Highway, Sopp Road, Lone Butte Road, California Boulevard , and Neuralia Road have been restored to their pre-project condition.

TRANS-4 Prior to start of construction, the project owner shall obtain approval from the California Public Utilities Commission (CPUC) to install railroad crossing improvements (gates and signals) to the Union Pacific /Lone Pine Branch track for access to the BSEP site. If the warning equipment is not installed prior to the start of site preparation or earth moving activities, then the project owner shall install temporary measures, including the stationing of flag persons, to the satisfaction of Union Pacific representatives and the CPUC. These temporary measures shall remain in place until the permanent equipment is installed.

Verification: The project owner shall inform Union Pacific Railroad, Kern County, California City, CPUC, and the CPM that the final grade crossing warning equipment (gates and signals) are ready for inspection.

TRANS-5 The project owner or its contractor shall install crossing structures and netting, if required by Caltrans across SR-14 as a safety precaution and to reduce the potential for damage from falling construction materials or equipment during cable-stringing activities.

Verification: Thirty days prior to wire stringing, or a lesser period of time as mutually agreed to by the project owner and the CPM, the project owner shall provide to the CPM for review and approval, a copy of its safety plan and implementation program.

REFERENCES

AECOM, Inc. Beacon Solar Energy Project- Project Design Refinements June, 2009

California City, 2008. California City Municipal Airport website- http:/www.calcityairport.com.

Caltrans. 2008. Traffic Volumes on California State Highways.

Kern County. Kern County 2004. Kern County General Plan–Transportation/ Circulation Element.

Kern County. Resource Management Agency. Kern County Planning Department Comments and Requests for Conditions Review of Beacon Solar Energy Application for Certification. September 16, 2008.

FPL Energy/M. O'Sullivan. BS 2008a. Application for Certification, Beacon Solar Energy Project (08-AFC-2).

Transportation Research Board. 2000. Highway Capacity Manual.

APPENDIX A

HIGHWAY CAPACITY MANUAL

The *Highway Capacity Manual* is prepared by the Transportation Research Board, Committee on Highway Capacity and Quality of Service. It represents a concentrated, multi-agency effort by the Transportation Research Board, the Federal Highway Administration, the American Association of Highway and Transportation Officials, and other traffic/transportation related agencies. It is the most widely used resource for traffic analysis. Several versions of the *Highway Capacity Manual* (*HCM*) have been published. The current edition was published in 2000. It contains concepts, guidelines, and procedures for computing the capacity and quality of service of various highway facilities, including freeways, signalized and unsignalized intersections, and rural highways, and the effects of transit, pedestrians, and bicycles on the performance of these systems.

LEVEL OF SERVICE

The description and procedures for calculating capacity and level of service are found in the *Highway Capacity Manual 2000*. The *Highway Capacity Manual 2000* represents the latest research on capacity and quality of service for transportation facilities.

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six levels of service are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with level of service A representing the best operating conditions and level of service F, the worst. Each level of service represents a range of operating conditions and the driver's perception of these conditions. Safety is not included in the measures that establish service levels. A general description of service levels for various types of facilities is shown in **Table A**.

Table A
Level of Service Description

Facility Type	Uninterrupted Flow	Interrupted Flow
	Freeways Multi-Lane Highways Two-Lane Highways Urban Streets	Signalized Intersections Unsignalized Intersections - Two-Way Stop Control - All-Way Stop Control
Level of Service		
A	Free-flow.	Very low delay
B	Stable flow. Presence of other users noticeable.	Low delay
C	Stable flow. Comfort and convenience starts to decline.	Acceptable delay
D	High density stable flow.	Tolerable delay
E	Unstable flow.	Limit of acceptable delay
F	Forced or breakdown flow.	Unacceptable delay

Source: *Highway Capacity Manual 2000*

Interrupted Flow

One of the more important elements limiting, and often interrupting, the flow of traffic on a highway is the intersection. Flow on an interrupted facility is usually dominated by points of fixed operation such as traffic signals and stop and yield signs. These all operate quite differently and have differing impacts on overall flow.

Signalized Intersections

The capacity of a highway is related primarily to the geometric characteristics of the facility, as well as to the composition of the traffic stream on the facility. Geometrics are a fixed, or non-varying, characteristic of a facility.

At the signalized intersection, an additional element is introduced into the concept of capacity: time allocation. A traffic signal essentially allocates time among conflicting traffic movements seeking use of the same physical space. The way in which time is allocated has a significant impact on the operation of the intersection and on the capacity of the intersection and its approaches.

Level of service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, driver frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions (that is, in the absence of traffic control, geometric delay, any incidents, and any other vehicles). Specifically, level of service criteria for traffic signals is stated in terms of average control delay per vehicle, typically for a 15-minute analysis period. Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the ratio of green time to cycle length, and the volume to capacity ratio for the lane group.

For each intersection analyzed, the average control delay per vehicle per approach is determined for the peak hour. A weighted average of control delay per vehicle is then determined for the intersection. A level of service designation is given to the control delay to better describe the level of operation. Descriptions of levels of service for signalized intersections can be found in **Table B**.

Table B
Description of Level of Service for Signalized Intersections

Level of Service	Description
A	Very low control delay, up to 10 seconds per vehicle. Movement forward (progression) is extremely favorable, and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.
B	Control delay greater than 10 and up to 20 seconds per vehicle. There is good progression or short cycle lengths or both. More vehicles stop, causing higher levels of delay.
C	Control delay greater than 20 and up to 35 seconds per vehicle. Higher delays are caused by fair progression or longer cycle lengths or both. Individual cycle failures may begin to appear. Cycle failure occurs when a given green phase does not serve a waiting line of vehicles, and overflow occurs. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.
D	Control delay greater than 35 and up to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volumes. Many vehicles stop, the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Control delay greater than 55 and up to 80 seconds per vehicle, the limit of acceptable delay. High delays usually indicate poor progression, long cycle lengths, and high volumes. Individual cycle failures are frequent.
F	Control delay in excess of 80 seconds per vehicle. Unacceptable to most drivers. Oversaturation and arrival flow rates exceed the capacity of the intersection. Many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to higher delay.

Source: *Highway Capacity Manual 2000*

The use of control delay, often referred to as signal delay, was introduced in the 1997 update to the *Highway Capacity Manual*. It represents a departure from previous updates. In the third edition of the *Highway Capacity Manual*, published in 1985 and the 1994 update to the third edition, delay only included stop delay. Thus, the level of service criteria listed in Table B differs from earlier criteria.

Unsignalized Intersections

The current procedures on unsignalized intersections were first introduced in the 1997 update to the *Highway Capacity Manual* and represent a revision of the methodology published in the 1994 update to the 1985 Highway Capacity Manual. The revised procedures use control delay as a measure of effectiveness to determine level of service. Delay is a measure of driver discomfort, driver frustration, fuel consumption,

and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions (that is, in the absence of traffic control, geometric delay, any incidents, and any other vehicles). Control delay is the increased time of travel for a vehicle approaching and passing through an unsignalized intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection.

Two-Way Stop Controlled Intersections

Two-way stop controlled intersections, in which stop signs are used to assign the right-of-way, are the most prevalent type of intersection in the United States. At two-way stop-controlled intersections, the stop-controlled approaches are referred to as the *minor street approaches* and can be either public streets or private driveways. The approaches that are not controlled by stop signs are referred to as the *major street approaches*.

The capacity of movements subject to delay is determined using the "critical gap" method of capacity analysis. Expected average control delay based on movement volume and movement capacity is calculated. A level of service designation is given to the expected control delay for each minor movement. Level of service is not defined for the intersection as a whole. Control delay is the increased time of travel for a vehicle approaching and passing through an all-way stop-controlled intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection. A description of levels of service for two-way stop-controlled intersections is found in **Table C**.

Table C
Description of Level of Service for Two-Way Stop Controlled Intersections

Level of Service	Description
A	Very low control delay: less than 10 seconds per vehicle for each movement subject to delay.
B	Low control delay: greater than 10 and up to 15 seconds per vehicle for each movement subject to delay.
C	Acceptable control delay: greater than 15 and up to 25 seconds per vehicle for each movement subject to delay.
D	Tolerable control delay: greater than 25 and up to 35 seconds per vehicle for each movement subject to delay.
E	Limit of acceptable control delay: greater than 35 and up to 50 seconds per vehicle for each movement subject to delay.
F	Unacceptable control delay: in excess of 50 seconds per vehicle for each movement subject to delay.

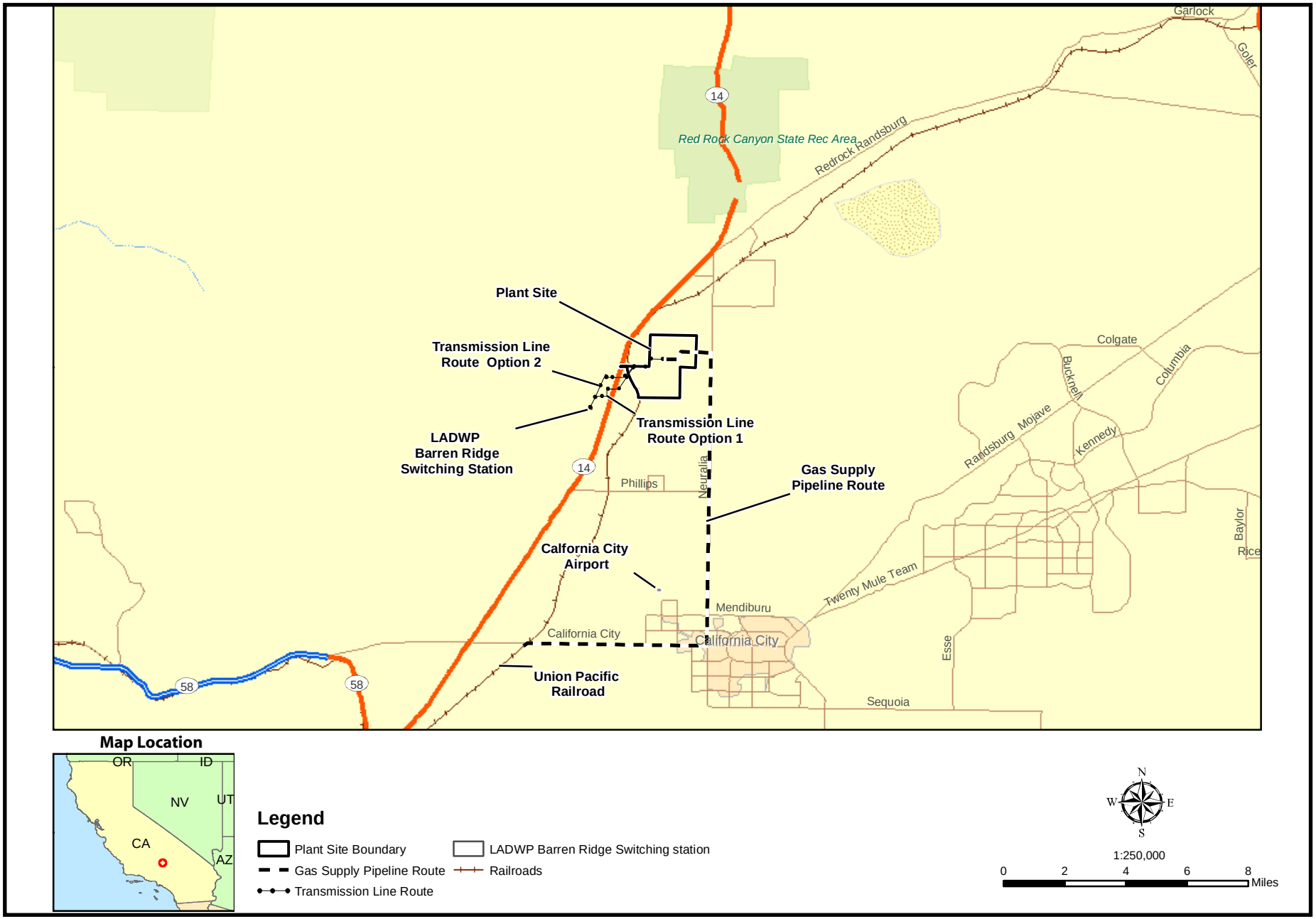
Source: *Highway Capacity Manual 2000*

REFERENCE

Transportation Research Board. *Highway Capacity Manual 2000*. Washington, D.C.

TRAFFIC AND TRANSPORTATION - FIGURE 1

Beacon Solar Energy Project - Regional Transportation Facilities

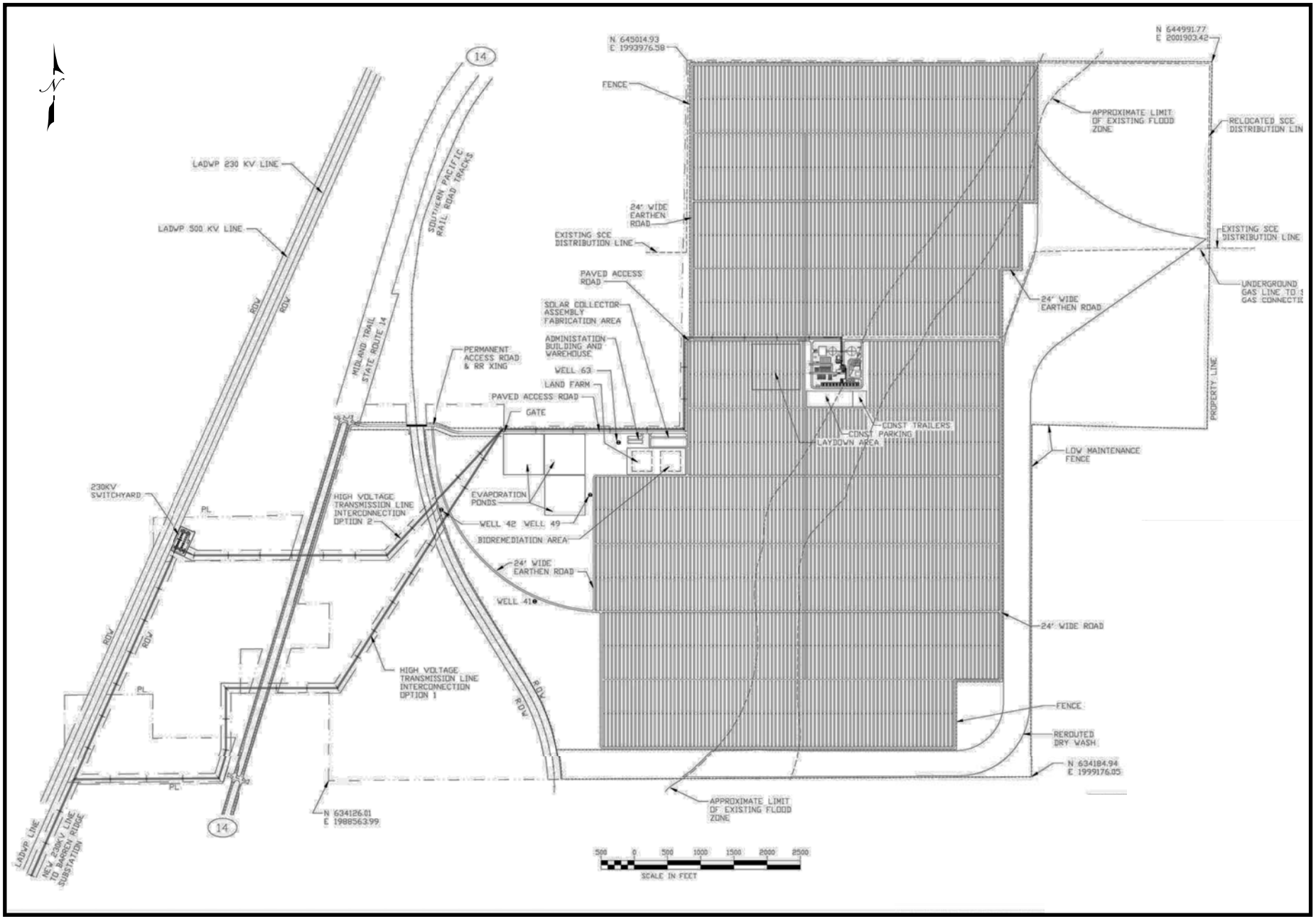


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: 08-AFC-2 Figure 5.13-1

TRAFFIC AND TRANSPORTATION - FIGURE 2

Beacon Solar Energy Project - General Arrangement Site Plan



SOURCE: 08-AFC-2 Figure 2-4

TRANSMISSION LINE SAFETY AND NUISANCE

Testimony of Obed Odoemelam, Ph.D.

SUMMARY OF CONCLUSIONS

The applicant, Beacon Solar, LLC (Beacon Solar) , proposes to transmit the power from the proposed Beacon Solar Energy Project (BSEP) to the Los Angeles Department of Water and Power's (LADWP's) transmission grid through LADWP's existing 230-kV Barren Ridge Switching Station approximately 1.5 miles southwest of the project site. The applicant proposes to use of a line of approximately 3.5 miles running from the project site to the interconnection points within the Barren Ridge Switching Station. The line would (a) be constructed according to LADWP's design guidelines for line safety and field management, (b) traverse undisturbed desert land with no nearby residents, thereby eliminating the potential for residential electric and magnetic field exposures and (c) be owned and operated by LADWP so its proposed design, erection, and maintenance plan would be according to standard LADWP practices, which conform to applicable laws, ordinances, regulations and standards (LORS). With the five proposed conditions of certification, any safety and nuisance impacts from the proposed line would be less than significant.

INTRODUCTION

The purpose of this analysis is to assess the line design and operational plan for the proposed Beacon Solar Energy Project's overhead transmission line to determine whether its related field and non-field impacts would constitute a significant environmental hazard in the area around the proposed route. All related health and safety LORS are currently aimed at minimizing such hazards. Staff's analysis focuses on the following issues taking into account both the physical presence of the line and the physical interactions of its electric and magnetic fields:

- aviation safety;
- interference with radio-frequency communication;
- audible noise;
- fire hazards;
- hazardous shocks;
- nuisance shocks; and
- electric and magnetic field (EMF) exposure.

The following federal, state, and local laws and policies apply to the control of the field and non-field impacts of electric power lines. Staff's analysis examines the project's compliance with these requirements.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

TRANSMISSION LINE SAFETY AND NUISANCE (TLSN) TABLE 1
Laws, Ordinances, Regulations and Standards (LORS)

Applicable LORS	Description
Aviation Safety	
Federal	
Title 14, Part 77 of the Code of Federal Regulations (CFR),"Objects Affecting the Navigable Air Space"	Describes the criteria used to determine the need for a Federal Aviation Administration (FAA) "Notice of Proposed Construction or Alteration" in cases of potential obstruction hazards.
FAA Advisory Circular No. 70/7460-1G, " Proposed Construction and/or Alteration of Objects that May Affect the Navigation Space"	Addresses the need to file the "Notice of Proposed Construction or Alteration" (Form 7640) with the FAA in cases of potential for an obstruction hazard.
FAA Advisory Circular 70/460-1G, "Obstruction Marking and Lighting"	Describes the FAA standards for marking and lighting objects that may pose a navigation hazard as established using the criteria in Title 14, Part 77 of the CFR.
Interference with Radio Frequency Communication	
Federal	
Title 47, CFR, Section 15.2524, Federal Communications Commission (FCC)	Prohibits operation of devices that can interfere with radio-frequency communication.
State	
California Public Utilities Commission (CPUC) General Order 52 (GO-52)	Governs the construction and operation of power and communications lines to prevent or mitigate interference.
Audible Noise	
Local	
Kern County General Plan, Noise Element	References the County's Ordinance Code for noise limits.
Hazardous and Nuisance Shocks	
State	
CPUC GO-95, "Rules for Overhead Electric Line Construction"	Governs clearance requirements to prevent hazardous shocks, grounding techniques to minimize nuisance shocks, and maintenance and inspection requirements.
Title 8, California Code of Regulations (CCR) Section 2700 et seq. "High Voltage Safety Orders"	Specifies requirements and minimum standards for safely installing, operating, working around, and maintaining electrical installations and equipment.
National Electrical Safety Code	Specifies grounding procedures to limit nuisance shocks. Also specifies minimum conductor ground clearances.

Applicable LORS	Description
Industry Standards	
Institute of Electrical and Electronics Engineers (IEEE) 1119, "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Specifies the guidelines for grounding-related practices within the right-of-way and substations.
Electric and Magnetic Fields	
State	
GO-131-D, CPUC "Rules for Planning and Construction of Electric Generation Line and Substation Facilities in California"	Specifies application and noticing requirements for new line construction including EMF reduction.
CPUC Decision 93-11-013	Specifies CPUC requirements for reducing power frequency electric and magnetic fields.
Industry Standards	
American National Standards Institute (ANSI/IEEE) 644-1944 Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines	Specifies standard procedures for measuring electric and magnetic fields from an operating electric line.
Fire Hazards	
State	
14 CCR Sections 1250-1258, "Fire Prevention Standards for Electric Utilities"	Provides specific exemptions from electric pole and tower firebreak and conductor clearance standards and specifies when and where standards apply.

SETTING

As noted in the **Project Description** section, the site for the proposed BSEP is a 2,012-acre parcel in unincorporated Kern County, California, at the western edge of the Mojave Desert, approximately 15 miles north of the town of Mojave. The site is largely vacant and significantly disturbed from agricultural activities of the mid-1980s. There are several abandoned structures but no nearby residences. The nearest is approximately 0.3 miles from the project's property boundaries. At the western boundary of the proposed project site are two LADWP transmission lines sharing the same 250-foot north-south LDWP right-of -way. One of them is the 500-kV Celilo-Sylmar direct current (DC) line; the other is the Inyo-Barren Ridge 230-kV alternating current (AC) line. The Barren Ridge switching station to be interconnected is approximately 1.5 miles southwest of the southwest corner of the proposed project site. LADWP designed the Barren Ridge switching station to accommodate transmission of power from additional renewable power projects in the area and would therefore be able to handle the power from the proposed BSEP with minimal modification. Construction of BSEP would involve rerouting of an existing Southern California Edison (SCE) distribution line running east-west across the northern portion of the project site (Beacon Solar 2008 pp 2-29 through 2-32).

PROJECT DESCRIPTION

The proposed line would consist of the following segments:

- An approximately 3.5-mile 230-kV, single-circuit, overhead transmission line approximately 1.6 miles of which would lie within the 2,012-acre project site and running west from the power generators and south across private property to the Barren Ridge switching station;
- The project's on-site 230-kV switchyard from which the conductors would extend to the connection points at the Barren Ridge station; and
- Project-related modifications within the Barren Ridge switching station.

The conductors for the proposed line would be erected on mono-pole steel/concrete structures of a minimum of 79 feet and a maximum of 110 feet as typical of similar LADWP lines. A total of 36 of such poles would be used. Since the line would be connected to the LADWP power system, its conductors would be standard low-corona aluminum, steel-reinforced cables utilized by LADWP for lines in this voltage class. The applied design and construction would be in keeping with LADWP guidelines that ensure line safety and efficiency together with reliability, and maintainability (Beacon Solar 2008 pp 2-30, and 5.14-1 through 5.14-12).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

The potential magnitude of the line impacts of concern in this staff analysis depends on compliance with the listed design-related LORS and industry standards. These LORS have been established to maintain impacts below levels of potential significance. Thus, if staff determines that the project would comply with applicable LORS, we would conclude that any transmission line-related safety and nuisance impacts would be less than significant. The nature of these individual impacts is discussed below together with the potential for compliance with the LORS that apply.

DIRECT IMPACTS AND MITIGATION

Aviation Safety

Any potential hazard to area aircraft would relate to the potential for collision in the navigable airspace. As noted by the applicant (Beacon Solar 2008 p 5.14-6), the nearest airport to the project and related facilities is the California City Municipal Airport approximately 6 miles to the south and thus too far away for the line's structures to pose a collision hazard to area aircraft according to FAA criteria. The Edwards Air Force Base is located approximately 20 miles to the southwest placing it beyond the zone of potential collision hazard to any of its aircraft. While the FAA would thus, not require a "Notice of Proposed Construction and Alteration" (Form 7040), the applicant intends to file this form for FAA's information as common within the industry.

Interference with Radio-Frequency Communication

Transmission line-related radio-frequency interference is one of the indirect effects of line operation and is produced by the physical interactions of line electric fields. Such interference is due to the radio noise produced by the action of the electric fields on the surface of the energized conductor. The process involved is known as corona discharge, but is referred to as spark gap electric discharge when it occurs within gaps between the conductor and insulators or metal fittings. When generated, such noise manifests itself as perceivable interference with radio or television signal reception or interference with other forms of radio communication. Since the level of interference depends on factors such as line voltage, distance from the line to the receiving device, orientation of the antenna, signal level, line configuration and weather conditions, maximum interference levels are not specified as design criteria for modern transmission lines. The level of any such interference usually depends on the magnitude of the electric fields involved and the distance from the line. The potential for such impacts is therefore minimized by reducing the line electric fields and locating the line away from inhabited areas.

The proposed line would be built and maintained in keeping with standard LADWP practices that minimize surface irregularities and discontinuities. Moreover, the potential for such corona-related interference is usually of concern for lines of 345-kV and above, and not for 230-kV lines such as the proposed options. The proposed low-corona design is used for all LADWP lines of similar voltage rating to reduce surface-field strengths and the related potential for corona effects. Since these existing lines do not currently cause corona-related complaints along their existing routes, and there are no residences in the vicinity of either of the proposed routes, staff does not expect any residential corona-related radio-frequency interference or related complaints in the general project area. However, staff recommends Condition of Certification **TLSN-2** to ensure mitigation as required by the FCC in the unlikely event of complaints.

Audible Noise

The noise-reducing designs related to electric field intensity are not specifically mandated by federal or state regulations in terms of specific noise limits. As with radio noise, such noise is limited instead through design, construction or maintenance practices established from industry research and experience as effective without significant impacts on line safety, efficiency, maintainability, and reliability. Audible noise usually results from the action of the electric field at the surface of the line conductor and could be perceived as a characteristic crackling, frying, or hissing sound or hum, especially in wet weather. Since the noise level depends on the strength of the line electric field, the potential for perception can be assessed from estimates of the field strengths expected during operation. Such noise is usually generated during rainfall, but mainly from overhead lines of 345-kV or higher. It is, therefore, not generally expected at significant levels from lines of less than 345-kV as proposed for BSEP. Research by the Electric Power Research Institute (EPRI 1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a right-of-way of 100 feet or more. Since the low-corona designs are also aimed at minimizing field strengths, staff does not expect the proposed line operation to add significantly to current background noise levels in the project area. For an assessment of the noise from the proposed line and related facilities, please refer to staff's analysis in the **Noise and Vibration** section.

Fire Hazards

The fire hazards addressed through the related LORS in **TLSN Table 1** are those that could be caused by sparks from conductors of overhead lines, or that could result from direct contact between the line and nearby trees and other combustible objects.

Standard fire prevention and suppression measures for similar LADWP lines would be implemented for the proposed project line. The applicant's intention to ensure compliance with the clearance-related aspects of GO-95 would be an important part of this mitigation approach. Condition of Certification **TLSN-4** is recommended to ensure compliance with important aspects of the fire prevention measures (Beacon Solar 2008, pp 5.14-5 and 5.14-11).

Hazardous Shocks

Hazardous shocks are those that could result from direct or indirect contact between an individual and the energized line, whether overhead or underground. Such shocks are capable of serious physiological harm or death and remain a driving force in the design and operation of transmission and other high-voltage lines.

No design-specific federal regulations have been established to prevent hazardous shocks from overhead power lines. Safety is assured within the industry from compliance with the requirements specifying the minimum national safe operating clearances applicable in areas where the line might be accessible to the public.

The applicant's stated intention to implement the GO-95-related measures against direct contact with the energized line (Beacon Solar 2008 pp 5.14-7 through 5.14-11) would serve to minimize the risk of hazardous shocks. Staff's recommended Condition of Certification **TLSN-1** would be adequate to ensure implementation of the necessary mitigation measures.

Nuisance Shocks

Nuisance shocks are caused by current flow at levels generally incapable of causing significant physiological harm. They result mostly from direct contact with metal objects electrically charged by fields from the energized line. Such electric charges are induced in different ways by the line's electric and magnetic fields.

There are no design-specific federal or state regulations to limit nuisance shocks in the transmission line environment. For modern overhead high-voltage lines, such shocks are effectively minimized through grounding procedures specified in the National Electrical Safety Code (NESC) and the joint guidelines of the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE). For the proposed project line, the project owner will be responsible in all cases for ensuring compliance with these grounding-related practices within the right-of-way. This would be accomplished through standard industry grounding practices (Beacon Solar 2008, p 5.14-8). Staff recommends Condition of Certification **TLSN-5** to ensure such grounding for BSEP.

Electric and Magnetic Field Exposure

The possibility of deleterious health effects from EMF exposure has increased public concern in recent years about living near high-voltage lines. Both electric and magnetic fields occur

together whenever electricity flows and exposure to them together is generally referred to as EMF exposure. The CPUC, other regulatory agencies, and staff have evaluated the available evidence and concluded that such fields do not pose a significant health hazard to exposed humans. There are no health-based federal regulations or industry codes specifying environmental limits on the strengths of fields from power lines. Most regulatory agencies believe, as staff does, that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

Staff considers it important, as does the CPUC, to note that while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. Staff, therefore, considers it appropriate in light of present uncertainty, to recommend feasible reduction of such fields without affecting safety, efficiency, reliability and maintainability.

While there is considerable uncertainty about EMF health effects, the following facts have been established from the available information and have been used to establish existing policies:

- Any exposure-related health risk to the exposed individual will likely be small.
- The most biologically significant types of exposures have not been established.
- Most health concerns are about the magnetic field.
- There are measures that can be employed for field reduction, but they can affect line safety, reliability, efficiency, and maintainability, depending on the type and extent of such measures.

State

In California, the CPUC (which regulates the installation and operation of many high-voltage lines owned and operated by investor-owned utilities) has determined that only no-cost or low-cost measures are presently justified in any effort to reduce power line fields beyond levels existing before the present health concern arose. The CPUC has further determined that such reduction should be made only in connection with new or modified lines. It requires each utility within its jurisdiction to establish EMF-reducing measures and incorporate such measures into the designs for all new or upgraded power lines and related facilities within their respective service areas. The CPUC further established specific limits on the resources to be used in each case for field reduction. Such limitations were intended by the CPUC to apply to the cost of any redesign to reduce field strength or relocation to reduce exposure. Publicly owned utilities, which are not within the jurisdiction of the CPUC, voluntarily comply with these CPUC requirements. This CPUC policy resulted from assessments made to implement CPUC Decision 93-11-013.

In keeping with this CPUC policy, staff requires a showing that each proposed overhead line would be designed according to the EMF-reducing design guidelines applicable to the utility service area involved. These field-reducing measures can impact line operation if applied without appropriate regard for environmental and other local factors bearing on safety, reliability, efficiency, and maintainability. Therefore, it is up to each applicant to ensure that such measures are applied in ways that prevent significant impacts on line operation and safety. The extent of such applications would be reflected by ground-level field strengths as

measured during operation. When estimated or measured for lines of similar voltage and current-carrying capacity, such field strength values can be used by staff and other regulatory agencies to assess the effectiveness of the applied reduction measures. These field strengths can be estimated for any given design using established procedures. Estimates are specified for a height of one meter above the ground, in units of kilovolts per meter (kV/m), for the electric field, and milligauss (mG) for the companion magnetic field. Their magnitude depends on line voltage (in the case of electric fields), the geometry of the support structures, degree of cancellation from nearby conductors, distance between conductors and, in the case of magnetic fields, amount of current in the line.

Since most new lines in California are currently required by the CPUC to be designed according to the EMF-reducing guidelines of the electric utility in the service area involved, the proposed line's fields are required under this CPUC policy to be similar to fields from similar lines in that service area. Designing the chosen line according to existing LADWP field strength-reducing guidelines would constitute compliance with the CPUC requirements for line field management.

The CPUC has recently revisited the EMF management issue to assess the need for policy changes to reflect the available information on possible health impacts. The CPUC found that there is no need for significant changes to existing field management policies. Since there are no residences in the immediate vicinity of the proposed project line, there would not be the long-term residential EMF exposures mostly responsible for the health concern of recent years. The only project-related EMF exposures of potential significance are the short-term exposures of plant workers, regulatory inspectors, maintenance personnel, visitors, or individuals in the vicinity of the line. These types of exposures are short term and well understood as not significantly related to the health concern. Given the potential for human exposures, staff recommends measurements of each line's maximum fields to allow for uniform, field strength-related characterization of all lines. It is such field strength measurements that are required in Condition of Certification **TLSN-3**

Industry's Approach to Reducing Field Exposures

The present focus is on the magnetic field because unlike electric fields, it can penetrate the soil, buildings and other materials to produce the types of human exposures at the root of the health concern of recent years. The industry seeks to reduce exposure, not by setting specific exposure limits, but through design guidelines that minimize exposure in each given case. As one focuses on the strong magnetic fields from the more visible high-voltage power lines, staff considers it important, for perspective, to note that an individual in a home could be exposed too much stronger fields while using some common household appliances than from high-voltage lines (National Institute of Environmental Health Services and the U.S. Department of Energy, 1998). The difference between these types of field exposures is that the higher-level, appliance-related exposures are short-term, while the exposure from power lines are lower level, but long-term. Scientists have not established which of these types of exposures would be more biologically meaningful in the individual. Staff notes such exposure differences only to show that high-level magnetic field exposures regularly occur in areas other than around high-voltage power lines.

As with similar LADWP lines, specific field strength-reducing measures would be incorporated into the design of the proposed line to ensure the field strength minimization currently required by the CPUC in light of the concern over EMF exposure and health.

The field reduction measures to be applied include the following:

1. Increasing the distance between the conductors and the ground to an optimal level;

2. Reducing the spacing between the conductors to an optimal level;

3. Minimizing the current in the line; and

4. Arranging current flow to maximize the cancellation effects from interacting of conductor fields.

The applicant has estimated the maximum field strengths typically encountered along the route of the proposed line at a benchmark distance of 75 feet from the centerline, which would mark the edge of the 150-foot right-of-way. For the electric field, this maximum intensity was estimated as 0.2 kV/m, and 15 mG for the companion magnetic field. Staff has verified the accuracy of the applicant's assumptions for lines in this voltage class but recommends the on-site measurement requirements in Condition of Certification **TLSN-3** to validate the applicant's assumed reduction efficiency. These field intensities are similar to those of LADWP lines of similar voltage and current-carrying intensity.

CUMULATIVE IMPACTS AND MITIGATION

When field intensities are measured or estimated for a specific location, they reflect the interactive, and therefore, cumulative effects of fields from all contributing conductors. This interaction could be additive, or subtractive depending on prevailing conditions. As noted by the applicant (Beacon Solar 2008, pp 5.14-9 and 5.7-11 and 5.712), the line's conductors would be located in a new right-of- way away from the field impact zones for other area lines, eliminating the interactive and therefore, cumulative effects of fields from existing area lines. The transmission lines from approved or reasonably foreseeable future area solar and non-solar projects (the Pine Tree Wind Development Project, the LADWP Barren Ridge-Castaic Project, the Opti-Solar Sapphire Project, the Opti-Solar Turquoise Project, the Solar Millennium-Ridgecrest Project and Solar Millennium Project) would not be located close enough to the proposed line for cumulative field impacts of potential significance (Beacon Solar 2008, p 5.1-1 through 5.1-4). Since the proposed project transmission line and related switchyard would be designed according to applicable field-reducing LADWP guidelines (as currently required by the CPUC for effective field management), any contribution to total area exposures should be at levels expected for LADWP lines of similar voltage and current-carrying capacity. It is this similarity in intensity that constitutes compliance with current CPUC requirements on EMF management. The actual field strengths and contribution levels for the proposed line design would be assessed from the results of the field strength measurements specified in Condition of Certification **TLSN-3**.

COMPLIANCE WITH LORS

As previously noted, current CPUC policy on safe EMF management requires that any high-voltage line within a given area be designed to incorporate the field strength-reducing

guidelines of the main area utility lines to be interconnected. The utility in this case is LADWP. Since the proposed line and related switchyard would be designed according to the respective requirements of the LORS listed in Table 1, and operated and maintained according to current LADWP guidelines on line safety and field strength management, staff considers the presented design and operational plan to be in compliance with the health and safety requirements of concern in this analysis and recommends approval. The actual contribution of the line to the area's field exposure levels would be assessed from results of the field strength measurements required in Condition of Certification **TLSN-3**.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received no public or agency comments on the transmission line nuisance and safety aspects of the proposed BSEP.

CONCLUSIONS

Since the proposed line would pose no aviation hazard according to current FAA criteria, staff does not consider it necessary to recommend location changes on the basis of a potential hazard to area aviation.

The potential for nuisance shocks would be minimized through grounding and other field-reducing measures to be implemented in keeping with current LADWP guidelines (reflecting standard industry practices). These field-reducing measures would maintain the generated fields within levels not associated with radio-frequency interference or audible noise. The potential for hazardous shocks would be minimized through compliance with the height and clearance requirements of PUC's General Order 95. Compliance with Title 14, California Code of Regulations, Section 1250, would minimize fire hazards while the use of low-corona line design, together with appropriate corona-minimizing construction practices, would minimize the potential for corona noise and its related interference with radio-frequency communication in the area around the proposed route.

Since electric or magnetic field health effects have neither been established nor ruled out for fields from the proposed BESP line and similar transmission lines, the public health significance of any related field exposures cannot be characterized with certainty. The only conclusion to be reached with certainty is that the proposed line design and operational plan would be adequate to ensure that its electric and magnetic fields would be managed to an extent the CPUC considers appropriate in light of the available health effects information. The long-term, mostly residential magnetic exposure of health concern in recent years would be insignificant for the line given the general absence of residences along their proposed route. On-site worker or public exposure would be short term and at levels expected for LADWP lines of similar design and current-carrying capacity. Such exposure is well understood and has not been established as posing a significant human health hazard.

Since the proposed line would be operated to minimize the health, safety, and nuisance impacts of concern to staff and would be located along a route without nearby residences, staff considers the proposed design, maintenance, and construction plans as complying with the applicable laws. With the conditions of certification proposed below, any such impacts would be less than significant for either option.

PROPOSED CONDITIONS OF CERTIFICATION

TLSN-1 The project owner shall construct the proposed transmission line according to the requirements of California Public Utility Commission's GO-95, GO-52, GO-131-D, Title 8, and Group 2. High Voltage Electrical Safety Orders, Sections 2700 through 2974 of the California Code of Regulations, and Los Angeles Department of Water and Power's EMF-reduction guidelines.

Verification: At least thirty days before starting construction of the proposed line or related structures and facilities, the project owner shall submit to the Compliance Project Manager (CPM) a letter signed by a California registered electrical engineer affirming that the line will be constructed according to the requirements stated in the condition.

TLSN-2 The project owner shall ensure that every reasonable effort will be made to identify and correct, on a case-specific basis, any complaints of interference with radio or television signals from operation of the line or associated switchyard.

Verification: At least thirty days before starting line operations, the project owner shall submit to the CPM a letter signed by a California registered electrical engineer affirming the project owner's intention to comply with this requirement.

TLSN-3 The project owner shall use a qualified individual to measure the strengths of the electric and magnetic fields from the line at the points of maximum intensity for which intensity estimates were provided by the applicant. The measurements shall be made before and after energization according to the American National Standard Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) standard procedures. These measurements shall be completed not later than six months after the start of operations.

Verification: The project owner shall file copies of the pre-and post-energization measurements with the CPM within 60 days after completion of the measurements.

TLSN-4 The project owner shall ensure that the rights-of-way of the proposed transmission line are kept free of combustible material, as required under the provisions of Section 4292 of the Public Resources Code and Section 1250 of Title 14 of the California Code of Regulations.

Verification: At least thirty days before the start of operations, the project owner shall transmit to the CPM a letter affirming the project owner's intention to comply with this condition.

TLSN-5 The project owner shall ensure that all permanent metallic objects within the right-of-way of the proposed line are grounded according to industry standards regardless of ownership.

Verification: At least 30 days before the lines are energized, the project owner shall transmit to the CPM a letter affirming the intention to comply with this condition.

REFERENCES

Electric Power Research Institute (EPRI) 1982. Transmission Line Reference Book: 345 kV and Above.

Beacon Solar Energy Project. Application for Certification (08-AFC-2) of CPV Sentinel Energy project, Volumes I and II submitted to the California Energy Commission on June 25, 2007.

National Institute of Environmental Health Services 1998. An Assessment of the Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. A Working Group Report, August 1998.

VISUAL RESOURCES

Testimony of Mark R. Hamblin

SUMMARY OF CONCLUSIONS

The introduction of the proposed Beacon Solar Energy Project would visually change the existing physical environment of a property near the western edge of the northern Fremont Valley from a disturbed desert landscape to a highly human-altered landscape. Staff concludes the project would introduce an unmitigable significant adverse impact to the existing visual character or quality of the site and surroundings under the California Environmental Quality Act at key observation point (KOP) 6 and may introduce an unmitigable adverse significant impact at KOP 2.

KOP 2 is located at the U.S. Bureau of Land Management's Jawbone Canyon OHV (Off Highway Vehicle) Open Area Ridgecrest Field Office public parking/assembly area on Bureau of Land Management managed federal land approximately three miles north of the project site. KOP 6 is from a public hiking trail at the top of Chuckwalla Mountain (5,036-foot elevation) in the Piute Mountain Range approximately two miles west of the project site See the discussions of these KOPs under section C. Visual Character or Quality.

INTRODUCTION

In this section, staff evaluates the proposed project's construction and operation using criteria in the "Aesthetic" section of Appendix G in the California Environmental Quality Act (CEQA) Guidelines to determine if the project would introduce a significant impact under CEQA. Staff also determines whether the project would comply with applicable laws, ordinances, regulations, and standards (LORS) pertaining to aesthetics, or preservation and protection of sensitive visual resources.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Visual Resources Table 1 provides a general description of identified adopted federal, state, and local LORS pertaining to aesthetics, or preservation and protection of sensitive visual resources relevant to the proposed project.

VISUAL RESOURCES Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
Transportation Equity Act for the 21st Century of 1998, and Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2005.	The project site does not involve federal managed lands, nor a recognized National Scenic Byway or All-American Road within its vicinity.
State	
California Streets and Highways Code, Sections 260 through 263 – Scenic Highways	Ensures the protection of highway corridors that reflect the State's natural scenic beauty.
Local	
Kern County General Plan, adopted March 13, 2007	
Land Use, Open Space, and Conservation Element (adopted April 15, 1982)	
Chapter 1 - General Provisions - Section 1.10.7 Light and Glare	Light and glare from discretionary new development projects are to be minimized in rural as well as urban areas. Encourages the use of low-glare lighting to minimize nighttime glare effects on neighboring properties.
Chapter 2 – Circulation Element - Section 2.3.9 Scenic Route Corridors	A scenic route must be officially set as a Scenic Route by the Kern County Board of Supervisors, or the State of California.
Chapter 5 – Energy Element - Section 5.4.5 Solar Energy Development	Encourages solar energy development in the desert and valley planning regions previously disturbed that does not pose significant environmental, public health and safety hazards.
- Section 5.4.7 Transmission Lines	Discourages the siting of above-ground transmission lines in visually sensitive areas.
Applicable LORS	**Description**
Kern County Code *Title 19 Zoning*	

Chapter 19.12 - Exclusive Agriculture	
- Section 19.12.070 – Yard and Setbacks	Provides yard and setback requirements.
- Section 19.12.080 – Height Limits	There is no height limit on nonresidential structures, except in areas of protected military airspace.
- Section 19.12.110 – Signs	Identifies permitted signs.
- Section 19.12.120 – Landscaping	No landscaping is required in the Exclusive Agriculture district, except where the proposed use is subject to a plot plan review.

REGIONAL SETTING

The proposed Beacon Solar Energy Project (BSEP) would be built along the western edge of the northern Fremont Valley, approximately four miles north-north west of California City, in Kern County, California (**Visual Resources Figure 1** – Aerial View of Beacon Solar Energy Project and Vicinity).

The Fremont Valley is a slightly elongated valley bordered by mountains. The Piute Mountains are to the west, the El Paso Mountains are to the north and the Rand Mountains to the east. The larger portion of the Mojave Desert is to the southeast.

The proposed BSEP site would occupy approximately 2,012 acres of the Fremont Valley floor. The site is relatively flat with a gentle slope of one to three percent to the northwest. The site is typified by clay and gravelly loamy sand, creosote bush scrub with patches of desert saltbush scrub, desert wash scrub, alfalfa, and ruderal vegetation. The site is essentially undeveloped except for a grouping of abandoned and deteriorating buildings, structures and mobile homes that served the Fremont Valley Ranch.

The settlement of Rancho Seco is approximately one-mile northeast of the proposed project site. Honda Proving Center of California is ½-mile east. The Proving Center has a 7.5 mile oval track, and a five-mile winding road course used for testing Honda and Acura automobiles and motorcycles.

Within five miles of the project is the U.S. Bureau of Land Management, Jawbone OHV (Off Highway Vehicle) Open Area. It offers over 7,000 acres of open-use public land where individuals can ride and camp. Most of the sites within the OHV area are accessible by two-wheel drive vehicles with trailers (see Visual Resources Figure 25).

Approximately five miles to the north of the project site is Red Rock Canyon State Park. It is located where the southernmost tip of the Sierra Nevada converges with the El Paso Range. The park's approximate 16,600 acres features scenic desert cliffs, buttes

and spectacular rock formations. Miles of trails meander through the park. Street legal vehicles and OHV may travel on a dirt road system within the park. Horses are allowed on all trails in the park.

State Route (SR) 14, a four-lane highway, serves as the major transportation system through the Fremont Valley.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

The California Environmental Quality Act defines a "significant effect on the environment" to mean a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including . . . objects of historic or aesthetic significance" (California Code of Regulations, Title 14, Section 15382).

To determine whether there is a potentially significant visual resources impact generated by a project, Energy Commission staff reviews the project using the CEQA Guidelines Appendix G Environmental Checklist pertaining to "Aesthetics". The checklist questions include the following:

A. Would the project have a substantial adverse effect on a scenic vista?

B. Would the project substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?

C. Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

D. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

DIRECT/INDIRECT IMPACTS AND MITIGATION

The direct/indirect impact discussion is presented under the following CEQA headings: scenic vista, scenic resources, visual character or quality, and light or glare.

A. SCENIC VISTA

"Would the project have a substantial adverse effect on a scenic vista?"

The term "scenic vista" is not defined in CEQA. For the purpose of this analysis, "scenic vista" implies a view through or between intervening objects of exceptional scenic quality or significance. It includes the following:

- A public view to a definable scenic feature of concern; such as Lake Tahoe, San Francisco Bay, the Pacific Ocean, El Capitan in Yosemite National Park, and Mount Diablo in the San Francisco Bay area, etc.
- A public view to a broadly recognized human-made or natural scenic feature of unusual importance; such as the Golden Gate Bridge in San Francisco, the

Statute of Liberty in New York City, the Sydney Opera House in New South Wales, Australia, the U.S. Capital Building in Washington, D.C. or other state capitals; or a spectacular aesthetically pleasing City skyline such as that of San Francisco, Seattle, or Hong Kong; or a mountain peak of special regional importance such as Mount Diablo, Mount Shasta, or Mount Rainier, etc.

- A public view from an actual designated view location; such as a Caltrans public vista point along a highway, or view overlook in a national or state forest or park.
- Scenic view locations designated in a federal, state or local government adopted land use planning document (e.g.; General Plan, Specific Plan, Local Coastal Plan, highway corridor plan, etc.), or cultural resources and historical preservation plan and survey.

There is no public view to a definable scenic feature of concern in the northern Fremont Valley that the proposed project would substantially adversely affect.

There is no public view towards a broadly recognized human-made or natural scenic feature of unusual importance in the northern Fremont Valley that the proposed project would substantially adversely affect. There is no specific scenic focal point in the northern Fremont Valley that draws a viewer's eye.

There is no public view from an actual designated Caltrans public vista point along SR-14 through the northern Fremont Valley that the proposed project would adversely affect.

The U.S. Bureau of Land Management Jawbone Canyon OHV Open Area Ridgecrest Field Office off of SR-14 has a public parking/public gathering area that offers an elevated panoramic view of the Fremont Valley (see KOP 2 discussion under C. Visual Character or Quality below).

Staff did not find a federal, state, or local government designated scenic vista on the northern Fremont Valley that the proposed project would substantially adversely affect.

B. SCENIC RESOURCES

"Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway corridor?"

For the purpose of this analysis, a "scenic resource" includes a unique water feature (waterfall, transitional water, part of a stream or river, estuary); a unique physical geological terrain feature (rock masses, outcroppings, layers or spires); a tree having a unique visual/historical importance to a community (a tree linked to a famous event or person, an ancient old growth tree); historic building; or a designated federal scenic byway or state scenic highway corridor.

SR-14 is not listed by the California Department of Transportation (Caltrans) as a state scenic highway. The County of Kern has not designated SR-14 a county scenic highway according to the Kern County General Plan.

There is no identified scenic resource on the project site. There is no defined scenic resource identified in the vicinity of the project site that the proposed project would substantially damage.

C. VISUAL CHARACTER OR QUALITY

"Would the project substantially degrade the existing visual character or quality of the site and its surroundings?"

PROJECT SITE

The proposed 2,012-acre project site consists of disturbed desert (**Visual Resources Figure 2** - Existing View of the Project Site). The site has deteriorating buildings, structures and mobile homes that served the Fremont Valley Ranch (**Visual Resources Figure 3** – Deteriorating Fremont Valley Ranch Building and Structures).

The proposed BSEP's most publicly visible structures have been identified in **Visual Resources Table 2** (below) (**Visual Resources Figure 4** – General Arrangement Site Plan).

VISUAL RESOURCES Table 2
Summary of Major Publicly Visible Structures

Project Component	Number of Units	Length, Width, Diameter (approximately)	Height (approximately)	Color and Materials
Transmission Line Steel Pole, In-Line (over-crossing of railroad track and SR-14)	4	8-foot diameter	110 feet	corrugated steel, concrete
Transmission Line Steel Pole, In-Line	32	8-foot diameter	79 feet	corrugated steel, concrete
Steam Turbine Generator Enclosure	1	144-foot x 45-foot	55 feet	corrugated steel
Power Block Control Room	1	120-foot x 100-foot	50 feet	corrugated steel
Warehouse	1	70-foot x 75-foot	50 feet	corrugated steel
Deaerator/Storage Tank	1	24-foot x 8-foot diameter	50 feet	corrugated steel
Cooling Tower	1	595-foot x 55-foot (11-cell)	45 feet	corrugated steel
Take-off, Dead-end and Bus Structures*	4	35-foot x 30-foot	40 feet	corrugated steel
Raw Water Storage Tank	1	120-foot diameter	36 feet	steel

		(2,840,000 gallon)		
Administration Building	1	270-foot x 45-foot	35 feet	steel
SCA Fabrication Building	1	550-foot x 127-foot	35 feet	steel
Treated Water Storage Tank	1	136-foot diameter (2,350,000 gallon)	34 feet	steel
HTF Surge Volume Expansion Tank	16	70-foot x 14-foot diameter	20 feet	steel
Parabolic Trough	1,244 acres of coverage	492-foot x 19-foot	17-22 feet	steel, coated silver or polished aluminum, glass
*****final transmission structure design including tangent, angle, dead end, and pull-off structures and associated hardware are to be determined during the final engineering of the proposed interconnection (BSEP 2008a, pg. 2-29). Source: BSEP 2008a, pg. 2-4-2-10, pg. 2-24-32, and pg. 5.15-9, Figure 2-1. BS 2009b.				

The BSEP proposes 1,244 acres of parabolic trough solar collectors aligned on an east-west axis. Staff has provided photographs of the parabolic troughs at the Solar Electricity Generating Systems (SEGS) Kramer Junction project to illustrate the potential physical appearance of a develop BSEP. The SEGS Kramer Junction project is approximately 35 miles south of the BSEP site. SEGS has been in operation since 1985. It has a generating capacity of 150 megawatts (**Visual Resources Figure 5**).

Project Viewshed

The applicant has prepared a computer generated map which shows the area within which the project could potentially be seen (**Visual Resources Figure 6** - Regional Visibility of the BSEP). The map takes into account the visibility of the proposed project's most publicly visible structures on the project site, existing development, and other variables affecting potential visibility of the project that include: orientation of the viewer, duration of view, atmospheric conditions, lighting (daylight versus nighttime), and visual absorption capability. Visual absorption capability is the extent to which the complexity of the landscape can absorb new elements without changing the overall visual character of the area.

Beyond five miles, a project would be either not visible due to topography, natural and/or human-made screening, or of such a small size in the background that it would not be noticeable.[1]

[1] The Visual Management System of the U.S. Forrest Service uses distance zones. Distance zones are divisions of a particular landscape being viewed. The three distance zones are foreground, middleground, and background. Foreground – the limit of this zone is based upon distances at which details can be perceived. It will usually be limited to areas within ¼ to ½ mile of the observer, but must be determined on a case-by-case basis as should any distance zoning. Middleground - this zone extends from foreground

There are approximately 30-40 residences within two miles of the project site. A number of the residences have a view of the project site (**Visual Resources Figure 7** – View of Existing Residences North of Project Site (Rancho Seco), **Visual Resources Figure 8** – View of Closest Residence West of Project Site along SR-14, **Visual Resources Figure 9** – View Towards the Honda Proving Center Oval Track from its Entrance and View from 1.5 Miles South of the Proving Center Entrance).

The project site would be visible from elevated locations within federal and state identified recreational areas closest to the project site; Jawbone Canyon OHV Open Area and Red Rock Canyon State Park, and the Piute Mountains.

Key Observation Point Viewshed Evaluation

A "Key Observation Point[2]" (KOP) is selected to be representative of the most critical viewsheds[3] from off-site locations where the project would be visible to the public — for example; recreational and residential areas, travel routes, bodies of water, as well as scenic and historic resources. Because it is not feasible to analyze all the views in which a proposed project would be seen, it is necessary to select a KOP that would most clearly display the visual effects of the proposed project. A KOP may also represent a primary viewer group(s) that would potentially be affected by the project. Staff participates in the selection of KOPs with the applicant.

At the KOP, an applicant takes a photograph of the existing physical environment and uses it to prepare a representative photographic simulation of the proposed project or specific project feature. Photographic simulations portray the relative scale and extent of the project. The existing physical environment photograph (existing condition) and the photographic simulation (proposed condition) are incorporated into the project's "Application For Certification" (AFC) in the visual resources section. The applicant's photographs and photographic simulations have been attached at the end of this section; see **Figures**.

Staff assesses a KOP using the eight factors shown in **Visual Resources Diagram 1** (below): visual quality, viewer concern, visibility, number of viewers, duration of view, contrast, dominance, and view blockage. **Appendix VR-1** provides a description of the visual related terms used in the analysis of KOPs.

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zone to 3 to 5 miles from the observer. Background – this zone extends from middleground to infinity. Beyond five miles texture is generally very weak or nonexistent (Bacon, Warren R. 1979).

[2] The use of KOPs or similar view locations is common in visual resource analysis. The U.S. Bureau of Land Management (USDI BLM 1986a, 1986b, 1984) and the U.S. Forest Service (USDA Forest Service 1995) use such an approach.

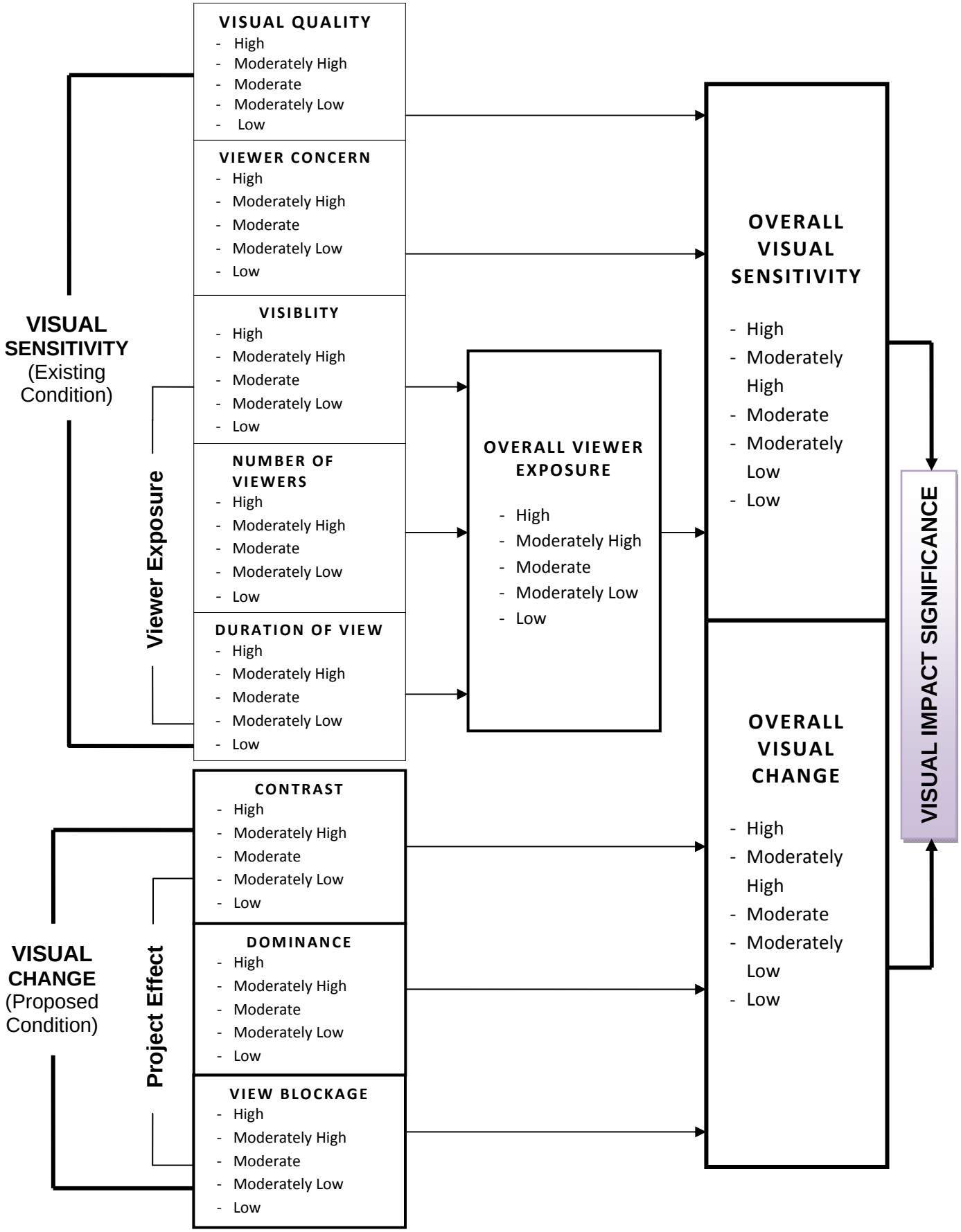
[3] The viewshed is the area visible from the selected fixed vantage point (KOP). In 35mm photography, a lens with a focal length of 50mm is referred to as "normal" because it works without reduction or magnification and creates images the way we see the scene with our naked eyes. Looking through a normal lens, you would see an image angle of view of 46 degrees.

Visual Resources Figure 10 shows the locations of the six KOPs selected for this analysis:

- KOP 1 – Chollo Street, North of East Quartz Road Looking South;
- KOP 2 – Jawbone Canyon OHV Open Area Ridgecrest Field Office Looking South;
- KOP 3 – Closest Residence West of Project Site Looking East;
- KOP 4 - Northbound State Route 14, Approximately Two Miles South of Project Site Looking Northeast;
- KOP 5 – Southbound State Route 14, East of the Project Site, Looking South; and
- KOP 6 – Chuckwalla Mountain Hiking Trail Looking East.

The applicant provided a discussion, photograph and simulation for a KOP 7 (SR-14 Southbound in Red Rock Canyon State Park) and a KOP 8 (El Paso Mountain Ridgeline Trail in Red Rock Canyon State Park) in the AFC. Staff reviewed the KOP 7 and KOP 8 information. Staff did not include KOP 7 and KOP 8 as part of this analysis. A distance of five miles from a project site is generally considered the furthest distance at which potentially adverse substantial visual impacts could occur.

VISUAL RESOURCES Diagram 1
Key Observation Point Evaluation



KOP 1 – Chollo Street, North of East Quartz Road Looking South

Visual Resources Figure 11 represents an existing view toward the project site from Chollo Street, approximately 400 feet north of East Quartz Road in Rancho Seco, one-mile northeast of the project site.

Visual Sensitivity

The observable KOP 1 physical landscape includes a foreground (0.5 mile) view of sand, ruderal vegetation and creosote bush scrub. In the background (3.5 to 5.0 miles) is a view of farm buildings and structures. A portion of the Piute Mountains is also in view. The estimated public appeal of the visual quality of the KOP 1 view is considered to be moderate.

Viewers at this KOP location would mainly be residents who live in Rancho Seco. Residential viewers in general are considered to have a higher level of viewer concern, when compared to other viewers due to a concern for protecting their place of residence and extended duration of viewing time. From this KOP, viewer concern is considered moderately high. The viewer would experience an unobstructed view of the project site (high visibility) and have a high duration of view of it. Staff estimates 20 to 30 residences within Rancho Seco may have a view of the project site. This number of residences is considered moderate. Overall viewer exposure is considered moderately high.

The overall visual sensitivity (existing condition without project) at KOP 1 is considered to be moderately high.

Visual Change

Visual Resources Figure 12 is a simulation of the proposed project's publicly visible structures after completion of construction.

The simulation does not clearly depict the solar collector field nearest the KOP location. The indistinct texture and uniform color in the simulation may understate the contrast that would be experienced by viewers. Color contrast could be strong if a neutral paint color or surface treatment is not used on project structures.

As shown, the project's notable publicly visible structures would be the 15-20 foot tall parabolic trough solar collectors, and the thirty-two 75-foot tall and four 110-foot tall steel monopoles (transmission line poles).

The degree of contrast (form, line, color, and texture) as shown by project structures would be moderate; meaning the contrast begins to attract attention and begins to dominate the characteristic landscape.

The simulation shows that the proportionate size relationship of project structures to other existing human-made and natural components in the field of view would have a moderately low dominance. Project structures would not block the view of mountains or sky from the KOP.

The overall visual change caused by the introduction of the proposed project's structures into the KOP view is considered to be moderately low as a result of a moderate contrast, moderately low dominance, and low view blockage.

When considering the moderately high overall visual sensitivity and the moderately low overall visual change, staff concludes at KOP 1 the introduction of the proposed project's publicly visible structures to the existing physical environment would create a less than significant degrading to the existing visual character or quality of the site and surroundings with the effective implementation of proposed Condition of Certification **VIS-1**. **VIS-1** requires the use of neutral colors and non-reflective surface treatments on the project's surface structures.

KOP 2 – Jawbone Canyon OHV Open Area Ridgecrest Field Office Looking South

Visual Resources Figure 13 represents an existing view toward the project site from an elevated public parking/assembly area at the U.S. Bureau of Land Management Jawbone Canyon OHV Open Area Ridgecrest Field Office (BLM Ridgecrest Field Office), approximately three miles north of the project site (**Visual Resources Figure 14** – Staff Photograph of BLM Ridgecrest Field Office).

Visual Sensitivity

The observable KOP 2 physical landscape consists of sand, creosote bush scrub and ruderal vegetation, a portion of Jawbone Canyon Road and SR-14. Property fencing and a line of wooden utility poles are in view. In the middleground (0.5 to 3.5 miles) and background views is the open expanse of the Fremont Valley. The view offers a little variety in color and texture in vegetation and soil. The estimated public appeal of the visual quality of the KOP 2 view is considered to be moderate.

Viewers at this KOP location would be motorists on SR-14. Motorists would consist of freeway travelers and recreationist. Freeway travelers are generally engaged in long distance travel. They travel at normal freeway speeds. Their focus of attention is on long range non-peripheral views. They have a low to moderate viewer concern.

Recreationists' viewer concern varies. Individuals engaged in "passive" recreation or quiet recreation, such as bird watching and hiking, have a higher sensitivity to those participating in "active" recreation (e.g.; off-highway vehicle use).

The viewer at this location is accustomed to an unobstructed view of the valley floor. There is no scenic focal point or unique feature in the view that draws the viewer's eye other than the open expanse of the valley.

SR-14 is not identified as a State Scenic Highway on the California Scenic Highway Mapping System, or as a county scenic highway according to the Kern County General Plan.

Caltrans 2007 traffic count information shows the annual average daily trips (AADT) along SR-14 at Redrock Randsburg Road, approximately four miles north of the project

site, to be 6,700 north bound trips and 6,600 south bound trips. This number of potential exposures of the project site is considered moderately high. From this KOP, motorists would have an unobstructed, high duration view of the project site.

Overall viewer exposure is considered moderately high.

The overall visual sensitivity at KOP 2 is considered to be moderately high.

Visual Change

Visual Resources Figure 15 is a simulation of the proposed project's publicly visible structures after completion of construction.

As shown, the project's notable publicly visible structures would include parabolic troughs, power block structures, the administration building and warehouse. The transmission lines poles are not visually discernable in the simulation.

The degree of contrast introduced by the parabolic troughs, and the amount of light or brightness given off by the surface area of them during operation would accentuate the contrast with the surrounding landscape and be strong (high). The degree of contrast would demand attention, would not be overlooked and would be dominant in the view at this KOP.

The approximate 1,244 acres of parabolic troughs would have a legible form with high unity which to some viewers at this location may be perceived as interesting and vivid, albeit a human-made sight. From this KOP, the parabolic trough solar collector field during operation would introduce a "glittering" effect similar to a shimmering from a body of water.

The simulation shows that the proportionate size relationship of the publicly visible project structures to other existing human-made and natural components would be co-dominant in the total field of view. Dominance is considered to be moderate. Project structures would not block a view of mountains, sky, or valley floor from KOP 2.

The overall visual change caused by the introduction of project structures into the view is considered moderate as a result of a high contrast, moderate dominance, and low view blockage.

When considering the moderately high overall visual sensitivity and the moderate overall visual change, the introduction of the project's publicly visible structures may substantially degrade the existing visual character or quality of the site and its surroundings. No available mitigation measures have been identified by Energy Commission staff to reduce the impact to less than significant at this KOP.

The applicant in their "Project Refinement" docketed June 22, 2009 offers the following visual mitigation measure suggestion.

> "To help improve the visual character of the area surrounding the Jawbone Visitors' Center, and subject to confirmation with applicable agencies, Beacon will plant and

maintain native vegetation as follows: four, eight, and 12 foot tall Joshua trees will be arranged in naturalistic groups and patterns to accomplish screening and filtering of the view toward the BSEP from the Jawbone Visitor Center. The Joshua trees will be grouped along the entry road, the parking lot, the restrooms, the visitor center, the walkways, and as necessary, in the areas across the Jawbone Canyon Road to provide maximum screening. Creosote bush and other larger native shrub species will be grouped in typical naturalistic spacing to contribute an indigenous appearance to the entry road, parking lot, and visitor center environment. Adequate irrigation will be provided during the first several years, as needed, and monitored by a qualified arborist" (BS 2009b, pg. 2-6 -2-7).

Viewers at this location are accustomed to a panoramic view of the Fremont Valley. The planting of Joshua trees and other native plants at the BLM Ridgecrest Field Office could screen and soften the view of the BSEP structures and the shimmering lake appearance during operation. The proposed plantings could also create a visual impact if not well thought out with appropriate plant species and design, and/or the plantings completely block the panoramic view of the Fremont Valley.

A preliminary vegetation plan has not been submitted for review to staff or to the BLM Ridgecrest Field Office. Without review of a plan, staff cannot conclude that the impact would be less than significant under CEQA.

In addition, the applicant's mitigation measure suggestion requires approval by another agency, the BLM. It is unknown whether such a vegetative plan is feasible or would provide effective mitigation.

KOP 3 – Closest Residence West of Project Site Looking East

Visual Resources Figure 16 represents an existing view toward the project site from SR-14, approximately 0.4-mile west of the project site.

Visual Sensitivity

The observable KOP 3 physical landscape consists of the north and southbound lanes of SR-14, ruderal vegetation and creosote bush scrub in the foreground view. In the background view is the Rand Mountains and sky. The view offers some variety in color in vegetation and soil. The estimated public appeal of the visual quality at KOP 3 is considered to be moderate.

Viewers at this KOP location would mainly be motorists. Viewer concern is considered moderately low. From this KOP, the viewer is accustomed to a view of the Fremont Valley, mountains and sky. The mountains do not have a focal point that draws the viewer's eye.

Caltrans 2007 traffic count information shows the AADT along SR-14 at Redrock Randsburg Road as 6,700 north bound trips and 6,600 south bound trips. This number of potential exposures to the project site is considered high. Viewers have a moderately high visibility view of the project site. Viewers would also have a high duration of view of it. Overall viewer exposure is considered moderately high.
The overall visual sensitivity at KOP 3 is considered to be moderate.

Visual Change

Visual Resources Figure 17 is a simulation of the proposed project's publicly visible structures after completion of construction.

Publicly visible project features would include parabolic troughs, transmission pole lines, the administration building and warehouse. The degree of contrast introduced by structures is considered moderately low; the contrast can be seen but does not attract attention.

The simulation of the public visible structures shows that their proportionate size relationship to other existing human-made and natural components would have a moderately low dominance in the total field of view. Project structures would not block a view of the Rand Mountains or sky.

The overall visual change is considered to be moderately low as a result of a moderately low contrast, moderately low dominance, and low view blockage.

When considering the moderate overall visual sensitivity and the moderately low overall visual change, the introduction of the proposed project's publicly visible structures to the existing physical environment would create a less than significant impact to the existing visual character or quality of the site and surroundings with the effective implementation of proposed Condition of Certification **VIS-1**.

KOP 4 - Northbound State Route 14, Approximately Two Miles South of Project Site Looking Northeast

Visual Resources Figure 18 represents an existing view from northbound SR-14, approximately two miles south of the project site, 0.4-mile west of it.

Visual Sensitivity

The observable KOP 4 physical landscape consists of the gentle sloping expanse of the western edge of the northern Fremont Valley with ruderal vegetation, Mohave Creosote Bush Scrub, the El Paso Mountains, and a faint view of Rancho Seco. The view offers variety and color in vegetation. The mountains do not have a focal point that draws the viewer's eye to a feature. The estimated public appeal of the visual quality at KOP 4 is considered to be moderate.

Viewers at this KOP would consist of motorists on SR-14. Viewer concern is considered moderate. Viewers are accustomed to a view of open space, mountains and sky.

Viewers would have a high visibility and a high duration view of the proposed project site. Caltrans 2007 traffic count information shows the AADT of 6,700 north bound trips, and 6,600 south bound trips on SR-14 at Redrock Randsburg Road. This number of potential exposures to the project site is considered high. Overall viewer exposure is considered moderate.

The overall visual sensitivity at KOP 4 is considered to be moderate.

Visual Change

Visual Resources Figure 19 is a simulation of the proposed project's publicly visible structures after completion of construction.

Publicly visible project structures include the parabolic troughs, power block structures, the administration building and warehouse, and transmission lines poles. The degree of contrast introduced by the structures is considered moderately low.

As simulated the publicly visible project structures would have a moderately low dominance in the total field of view. The structures would not block the view of mountains or sky.

The overall visual change caused by the introduction of the proposed project's structures into the view is considered to be moderately low as a result of a moderately low contrast, moderately low dominance, and low view blockage.

When considering the moderate overall visual sensitivity and the moderately low overall visual change, the introduction of the proposed project's publicly visible structures to the existing physical environment would create a less than significant impact to the existing visual character or quality of the site and surroundings with the effective implementation of proposed Condition of Certification **VIS-1**.

KOP 5 – Southbound State Route 14, East of the Project Site, Looking South

Visual Resources Figure 20 represents an existing view of southbound SR-14 looking towards the location of the proposed project's overhead transmission line crossing of SR-14.

Visual Sensitivity

The observable KOP 5 physical landscape consists of the southbound lanes of SR-14 and ruderal vegetation. The view offers variety and color in vegetation. The estimated public appeal of the visual quality at KOP 5 is considered to be moderately low.

Viewers at this KOP location would be motorists. Viewer concern is considered low.

Viewers on SR-14 would have an unobstructed, highly visible, high duration view of the proposed overhead transmission line at the KOP. Caltrans 2007 traffic count information shows the AADT of 6,700 north bound trips and 6,600 south bound trips on SR-14 at Redrock Randsburg Road. This number of potential exposures to the project site is considered high.

Overall viewer exposure is considered moderately high.

The overall visual sensitivity at KOP 5 is considered to be moderate.

Visual Change

Visual Resources Figure 21 is a simulation of the proposed project's overhead transmission line crossing SR-14.

The publicly visible project structures would include 110-foot tall steel monopoles. The contrast introduced by the structures would be moderate. The simulation shows the proportionate size relationship of project structures to other existing human-made and natural components would be low in the total field of view.

The overall visual change caused by the introduction of the overhead transmission line into the view is considered to be low as a result of a moderate contrast, low dominance, and low view blockage.

When considering the moderate overall visual sensitivity and the low overall visual change, the introduction of the proposed project's publicly visible structures to the existing physical environment would create a less than significant impact to the existing visual character or quality of the site and surroundings with the effective implementation of proposed Condition of Certification **VIS-1**.

KOP 6 – Chuckwalla Mountain Hiking Trail Looking East

Visual Resources Figure 22 represents an existing view from a public hiking trail to Chuckwalla Mountain (5,036-foot peak elevation) in the Piute Mountain Range on federal land managed by the BLM, approximately two miles west of the project site (**Visual Resources Figure 23** – Views From Summit of Chuckwalla Mountain of the Fremont Valley).

The primary approach to Chuckwalla Mountain is by traveling SR-14 to Jawbone Canyon Road (next to the BLM Ridgecrest Field Office) through Jawbone Canyon. The Chuckwalla Mountain hiking trail: Hiking route 2 - northwest slope is an eight mile round trip with 3,100 feet of elevation gain. It is rated a Class 1 hike - least difficult level.

Visual Sensitivity

The observable physical landscape from KOP 6 includes an elevated panoramic view of the northern Fremont Valley. The view offers variety in color and texture in vegetation and soil. Also in view is the expanse of the Rand Mountains, and distant views of the Granite Mountains and the greater Mojave Desert. Human-made modifications in the view include the Honda Proving Center's 7.5-mile asphalt oval track, Fremont Valley Ranch buildings, SR-14, and Rancho Seco. The estimated public appeal of the visual quality of the KOP 6 view is considered to be moderately high.

Primary viewers at this KOP would be hikers. Hikers are considered "passive" recreationist. They are considered to have a high sensitivity to the visual environment. Viewer concern is considered moderately high.

A viewer would have an unobstructed, highly visible view of the project site. The viewer's exposure to the project site could be a high duration of view. The number of hikers that use the trail is unknown to staff. For the purposes of this KOP analysis, staff used 11 to 25 hikers per day. This number of hikers potentially exposed to a view of the project site is considered low.

Overall viewer exposure at KOP 6 is considered moderate.

The overall visual sensitivity at KOP 6 is considered to be moderately high.

Visual Change

Visual Resources Figure 24 is a simulation of the proposed project's publicly visible structures after completion of construction.

Publicly visible structures would include transmission line poles and parabolic troughs. Structures in the power block, and the administration building and warehouse are not visually discernable. The project's paved access road, 24-foot wide earthen road, and its transmission line monopoles would introduce noticeable lighter colored lines into the view. Also in the view, would be stormwater retention basins in the solar collector field, and evaporation ponds.

The degree of contrast introduced by the amount of light or brightness that is given off by the surface area of the parabolic troughs during operation would accentuate the contrast with the surrounding landscape. At this KOP, a view of the parabolic troughs during operation would introduce a "glittering" effect similar to a shimmering from a body of water. The degree of contrast introduced by the project from this KOP is moderately high.

The simulation shows that the proportionate size relationship of the publicly visible project structures to other existing human-made and natural components is considered to be co-dominant in the total field of view. Dominance is considered to be moderately high. Project structures would not block the view of mountains or sky from KOP 6.

The overall visual change caused by the introduction of the proposed project's structures into the KOP 6 view is considered to be moderate as a result of moderately high contrast, moderately high dominance, and low view blockage.

When considering the moderately high overall visual sensitivity and the moderate to moderately high overall visual change, the introduction of the project's publicly visible structures would introduce a substantial degrading to the existing visual character or quality of the site and its surroundings at this KOP. The project's publicly visible structures and the glittering from the parabolic troughs would be seen at various locations along the eight mile hiking trail, and other elevated locations along the western edge of the northern Fremont Valley. No available mitigation measures have been identified by staff to reduce the adverse impact to less than significant at this KOP.

In the AFC, the applicant's visual analyst concluded the following:

> "From elevated locations at certain times of the day (e.g., viewed from the west in the afternoon hours of a sunny day with the sun behind the viewer), the facility would contrast substantially with the surrounding environment. At such times, the solar mirrors would be facing the viewer and the solar field visually would resemble a body of water (not necessarily and unpleasant view), because the mirrors would reflect the blue sky. At other times (e.g., when the backs of the mirrors are toward the viewer, such as during morning hours when looking from the west, or on cloudier days), the facility's visual contrast would be much less" (BS 2008a, pg. 1-9-10).

The applicant in their “Project Refinement” docketed June 22, 2009 offers the following visual mitigation measure suggestion.

> “Beacon is happy to explore visual impact mitigation measures with the BLM and CEC Staff. For example, if allowable under BLM rules and guidelines, BLM may be interested in reclaiming and rerouting the affected portion of the trail in accordance with BLM's cultural modification removal and desert landscape restoration program and Beacon could play a role in funding/implementing that effort. Beacon is in the process of trying to establish a dialogue with the appropriate BLM representatives to discuss this option. Beacon is committed to mitigating all significant impacts down to “less-than-significant” and looks forward to working with CEC and BLM staff to find an acceptable solution to this issue” (BS 2009b, pg. 2-7).

The applicant’s mitigation measure suggestion requires approval by the BLM. It is unknown to Energy Commission staff whether such a plan is feasible or provides effective mitigation.

PROJECT LINEARS

The BSEP proposes to connect to the Los Angeles Department of Water and Power (LADWP) transmission system approximately 1.5 miles west-southwest of the project site. Two existing LADWP transmission lines, the Celilo-Sylmar 500 kV DC intertie line, and the Inyo-Barren Ridge 230 kV line are at this location. Both lines run within an approximate 250-foot wide, north-south LADWP right of way (ROW).

The proposed project’s transmission line involves the installation of 36 steel/concrete monopoles, 79 feet and 110 feet in height, and a span length expected to average approximately 500 feet. New transmission poles are to be of a neutral color and have a non-reflective surface (BS 2008a, pg. 5.15-12). The insulators are to be made of a non-reflective and non-refractive material, and the conductors are to be non-specular (i.e., their surfaces will have a dulled finish so that they do not reflect sunlight) (BS 2008a, pg. 5-15-10). The degree of contrast introduced by the transmission poles as simulated in Visual Resources Figure 21 appears low in the setting.

The BSEP was designed using on-site groundwater for domestic and process use. Surface equipment and structures are anticipated to be less than eight-feet in height. Pipelines are to be installed underground.

An alternative water supply being discussed involves tertiary treated reclaimed water from the Community of Rosamond’s wastewater treatment facility located about 40 miles south of the project site. If selected, pipeline construction equipment and excavated earth material would be stored along the pipeline ROW during construction.

Propane is to fuel the boilers used for startup and HTF heating (freeze protection). A propane storage and delivery system (unloading station, storage tanks, vaporizing skids, etc.) is to be constructed in the power block. Two pressurized horizontal carbon steel storage tanks each 18,000 gallons (gross) and 16 HTF expansion tanks are proposed. The propane tanks are approximately 11 to 13 feet in height. The HTF tanks are approximately 20 feet tall. The propane and HTF expansion tanks would be a few of

the many elements that make up the power block. The tanks and other elements in the power block would not be readily discernable to a viewer from the KOPs.

With the burying of pipelines and the restoration of ground surfaces, the linear routes would not create a change to the existing visual character or quality of the area. Staff has proposed Condition of Certification **VIS-2** in order to provide restoration of ground surfaces affected by temporary construction activities.

PUBLICLY VISIBLE WATER VAPOR PLUMES

The project proposes use of an evaporative cooling tower. A formed plume above the cooling tower potentially could substantially degrade the existing visual character or quality of the project site and its vicinity.

The proposed project's cooling tower plume frequencies and dimensions were calculated using the Combustion Stack Visible Plume (CSVP) model and three-years (2002-2004) of meteorological data from the Mojave Airport obtained by the applicant from the U.S. EPA Air Quality System Meteorological Data System, and relative humidity data from Fox Field in Lancaster, California. Refer to **Appendix VR-2** at the end of this visual resources section for a more complete description of staff's visible plume modeling analysis.

For the worst-case operating profile, visible water vapor plumes from the project's cooling towers are predicted to have a plume frequency of 33.5 percent of the seasonal (November through April) daylight clear hours.

A plume frequency threshold of 20 percent of seasonal (typically from November through April) daylight no rain/fog high visual contrast (i.e. "clear") hours is used to assess a potential plume appearance impact significance. If it is determined that the seasonal daylight clear hour plume frequency is greater than 20 percent, then plume dimensions are determined and a significance analysis is included in the Visual Resources section of the Staff Assessment for the proposed project.

Staff considers the 20th percentile plume to be the reasonable worst case plume dimensions on which to base its visual impact analysis. Staff assesses the visual change in terms of contrast, dominance and view blockage that would be caused by the 20th percentile plume dimensions. The 20th percentile plume is the smallest of the plumes that are predicted to occur zero to 20 percent of the time. Eighty (80) percent of the time the dimensions of the clear hour plumes would be smaller than the 20th percentile plume dimensions. A one percentile clear hour plume would be extremely large (physical size) and very noticeable to a wide area. It occurs very infrequently.

The 20th percentile plume dimensions from the proposed project's eleven-cell cooling tower are predicted to be 111 feet high, 77 feet wide, and 86 feet long. Since the proposed cooling towers are 44.3 feet tall, the effective plume height over the top of the cooling tower would be 66.7 feet. Staff did not prepare a photographic simulation of the water vapor plumes for the project.

The 20th percentile plume dimensions for the project's cooling tower plumes are predicted to visually appear subordinate when compared to other human-made and natural elements in the KOP viewsheds. Considering the existing landscape and characteristics, the small size of the two BSEP boilers and their limited operation, the degree of visual change potentially introduced by publicly visibility plumes is considered to be less than significant.

CONSTRUCTION IMPACTS

Construction Laydown Area

A construction laydown and construction parking area is to be on the 2,012-acre project site. A 22-acre laydown area is to be west of the power block location (see **Visual Resources Figure 3**) and a 2.5-acre construction parking area south of it. The laydown area is to be relocated periodically as the solar collector field is built out.

Construction Activities

Construction activities for the project would occur over an approximate 25-month period; Monday through Friday between the hours of 7:00 a.m. and 7:00 p.m.

Construction activities on the BSEP site and the laydown area would be highly visible to the surrounding area due to the flat, open viewing conditions and would contrast significantly with the existing visual character of the area.

Typically screening of construction site activities, and the laydown and construction parking areas is accomplished by attaching fabric or adding wooden slats to a perimeter fence. This screening is effective in limiting ground level exposure of a project close to the viewer. Staff believes that the use of fabric or wooden slat screening would provide limited surface level visual screening of the construction site from SR-14 viewers due to the project site's size and distance from SR-14, particularly the power block.

Construction activities have the potential to introduce light offsite to surrounding properties and up-lighting to the nighttime sky. If bright exterior lights were not hooded, and lights not directed onsite they could introduce significant light to the vicinity. The applicant states in the AFC:

> "To the extent feasible and consistent with worker safety codes, lighting that might be installed to facilitate possible nighttime construction activities will be directed toward the center of the construction site and shielded to prevent light from straying offsite. Task-specific construction lighting will be used to the extent practical while complying with worker safety regulations" (BS 2008a, pg. 5.15-15).

Staff has proposed Condition of Certification **VIS-3** to provide a construction activity lighting measure, and Condition of Certification **VIS-2** to provide restoration of ground surfaces affected by temporary construction activities.

Staff concludes the project's temporary construction activities would create a substantial visual impact that would be mitigated to a less than significant impact with the effective implementation of Conditions of Certification **VIS-2** and **VIS-3**.

ALTERNATIVE COOLING SYSTEM – AIR COOLED CONDENSER

This section offers a visual discussion of a hypothetical operation of an air cooled condenser (ACC) with the proposed BSEP.

An ACC condenses exhaust steam from the steam turbine and returns condensate to the boiler. It uses multiple finned heat exchange tubes mounted on a large steel framework to perform this function. Visually, it would look like a large steel box on narrow columns. The steel box covering extends from approximately 35 feet to 85 feet above the ground.

The steel box covering provides a wind barrier that surrounds multiple "cells." Each cell consists of a single fan and many tubes over which fan-forced air flows. Fans are used to draw air in the bottom of the frame (below the steel box covering). A typical fan is approximately 32 feet in diameter.

A typical ACC structure includes the supporting structure, steam ducting from the steam turbine interface, auxiliaries such as the condensate and drain pumps, condensate and duct drain tanks, air evacuation units and related piping works and instrumentation.

Based on the 250 MW BSEP facility design, the Energy Commission staff's consultant has calculated an ACC for the project to be 127 feet (height) x 337 feet (length) x 212 feet (width) in size. It is estimated to have 35 cells configured in a 5-cell by 7-cell arrangement (CEC 2009w). Visual staff has provided a photograph of the ACC for the 350 MW Hermosillo Generating Station in Sonora, Mexico as an illustration of the potential physical appearance of an ACC for the BSEP (**Visual Resources Figure 26**).

From the KOPs, the ACC would appear in silhouette with other equipment in the power block (e.g.; steam turbine generator enclosure, cooling tower, power block control room, etc.). The ACC would make an incremental contribution to the BSEP's overall degree of contrast, dominance and view blockage created by public visible structures. It is noted that the use of an ACC would eliminate publicly visible plumes and ground hugging plumes (fog).

Condition of Certification **VIS-1** (surface treatment), **VIS-4** (exterior lighting), and **VIS-7** (provides for military review of project structures exceeding 100 feet in height) have already been recommended for the project by staff.

D. LIGHT OR GLARE

> "Would the project create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?"

The BSEP during operation has the potential to introduce offsite light and glare to surrounding properties, and up-lighting to the nighttime sky if typically bright exterior lights were not hooded and lights were not directed onsite.

Light

Light trespass and glare[4] are quite subjective, they are difficult to eliminate, but they can be minimized through good design practices. In many cases, all that is required is the proper placement of poles, selection of lights, and shielding accessories.

The applicant states in the AFC that project light fixtures will be restricted to areas required for safety, security, and operations. Lighting will be directed onsite; it would be shielded from public view, and non-glare fixtures and use of switches, sensors, and timers to minimize the time that lights not needed for safety and security are on would be specified.

Staff concludes that the project would introduce a new source of substantial light to nighttime views that would be less than significant with the effective implementation of the applicant's proposed mitigation measures and staff's recommended Condition of Certification **VIS-4**.

Glare (project structure reflection)

More than half of the 2,012-acre project site will be taken up by parabolic trough solar collector arrays. Parabolic troughs track the sun's movement across the sky. Troughs are stowed facing the ground so no glare occurs. When a parabolic trough rotates from stow into the tracking position, a horizontal glare may occur for a short period of time at the beginning and end of daily operations. A parabolic trough's tracking system during normal operation is designed to minimize horizontal glare. A tracking system includes the drive, sensors, and controls. In cases where glare occurs, it is typically addressed by aligning the unit.

CURE provided photographs (see **Visual Resources Figure 27**) taken of the Kramer Junction SEGS facility on April 25, 2009 at 7 a.m. The photographs show glare from the facility. CURE's concern is that if the proposed BSEP is to employ the same technology currently used by the Kramer Junction facility could similar glare be expected by the BSEP during operation?

The Kramer Junction parabolic trough facility was constructed between 1985 and 1991. It uses an LS-2 tracking system, a standard motor and gear box configuration, and an LS-3 tracking system, a hydraulic drive system (see **Visual Resources Figure 5**). Energy Commission staff anticipates that the BSEP will use a newer tracking system technology to that used at Kramer Junction. A specific tracking system for the BSEP parabolic troughs has not been selected by the applicant and will not be selected until final design.

A recently licensed Energy Commission project which included use of parabolic troughs was the Victorville 2 Solar–Gas Hybrid Power Project (licensed July 16, 2008). It uses a VV2 single axis tracking system.

[4] For the purposes of this analysis "direct glare" is used and is defined as the visual discomfort resulting from insufficiently shielded light sources in the field of view.

The applicant for the Victorville project provided the following statements regarding the VV2's tracking system and incident rays (docketed October 9, 2007):

- "The heat collection element (HCE) is designed to absorb and collect incident rays reflecting off the parabolic mirror, some incident rays will strike the HCE directly as it is located in front of the mirror. As a result, there will be some reflections from the glass coating the HCE; however, these reflections will be minor as the HCEs are designed to absorb sunlight, not reflect it.
- The reflected incident rays of the sun will generally be directed to the lower portion of the HCE glass encasement by design and will produce a glow from the reflected scattered beams as they enter the collector. If an aircraft were positioned at exactly the right angle above the array, this "glow" phenomenon could be visible along the entire length of the collector element for an individual row of mirrors. However, there are no reflected incident rays of sunlight associated with this glow and the brilliance/intensity of the light is much less by comparison to reflected sunlight." (LW 2007)

Staff concludes the potential amount of spilled reflected rays from the parabolic trough solar collectors during normal operation would be infrequent in the number of occurrences and short in duration of time that they would not represent a substantial new source of glare in the area.

The applicant states in the AFC that project equipment other than the solar arrays will have non-reflective surfaces and neutral colors to minimize their visual impacts (BS 2008a, pg. 5.15-9). With the effective implementation of the proposed surface treatment, project structures would not be a source of substantial glare that could adversely affect daytime views; see Condition of Certification **VIS-1**.

CUMULATIVE IMPACTS AND MITIGATION

As defined in Section 15355 of the CEQA Guidelines (California Code of Regulations, Title 14), a cumulative impact is created as a result of the combination of the project under consideration together with other existing or reasonably foreseeable projects causing related impacts. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. In other words, while any one project may not create a significant impact to visual resources, the combination of the new project with all existing or planned projects in an area may create significant impacts. A significant cumulative impact would depend on the degree to which (1) the viewshed is altered; (2) view of a scenic resource is impaired; or (3) visual quality is diminished.

Honda Proving Center of California is located approximately ½-mile east of the BSEP site. It is not open to the public. The facility offers a variety of environments for vehicle evaluation including paved test courses modeled after common North American public roads. The Proving Center has a 7.5 mile asphalt oval track, as well as a five-mile winding road course used primarily for testing Honda and Acura automobiles. Despite its large size, the complex is hard to see from nearby public roads. The asphalt oval track can be seen from KOP 6.

In the AFC, two projects have been identified in the cumulative impacts analysis: the Pine Tree Wind Development Project, and the Los Angeles Department of Water and Power (LADWP) Barren Ridge-Castaic Transmission Project. The two proposed projects would not be in the view of the KOPs.

The Pine Tree Wind Development Project is currently under construction and consists of 80, 1.5 megawatt wind turbine generators located on approximately 8,000 acres in the mountains six miles west of the BSEP site. It is expected to be completed in 2009.

The proposed LADWP Barren Ridge-Castaic Transmission Project is a multiple phase project to access renewable energy resources in the Tehachapi Mountain and Mojave Desert areas of California. The project includes constructing a new 75 mile 230-kilovolt (kV) line from the Barren Ridge Switching Station north of Mojave to the Castaic Power Plant, upgrading the Owens-Rinaldi 230-kV line, and construction of a new electrical switching station at Haskell Canyon in Los Angeles County. The segment of the project closest to the BSEP is approximately two miles. The project is currently under environmental review which began in early 2008.

The combination of the Honda Proving Center of California, the proposed BSEP, and a segment of the LADWP Barren Ridge-Castaic Transmission Project would not create a cumulative impact from the KOPs.

COMPLIANCE WITH LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Staff considers federal, state, and local LORS relevant to aesthetics, or protection and preservation of sensitive visual resources. Staff examines land use planning documents such as a Corridor Management Plan, Local Coastal Plan, General Plan, zoning ordinances, and other government or municipal code sections applicable to the project site and surrounding area pertaining to aesthetics, or protection and preservation of sensitive visual resources.

Visual Resources Table 3 (below) provides an analysis of the applicable LORS relevant to the proposed project. Conditions of Certification have been proposed to make the project conform to a LORS where appropriate.

VISUAL RESOURCES Table 3
Proposed Project's Consistency with
LORS Applicable to Visual Resources

LORS		Consistency Determination	Basis for Consistency
Source	**Policy and Strategy Descriptions**		
Local			
Kern County General Plan **Land Use, Open Space and Conservation Element**			
Chapter 1 – General Provisions Section 1.10.7 Lighting and Glare	Light and glare from discretionary new development projects are to be minimized in rural as well as urban areas. Encourages the use of low-glare lighting to minimize nighttime glare effects on neighboring properties.	YES AS CONDITIONED	Lighting at the BSEP is to be restricted to areas required for safety, security, and operation. Exterior lights are to be hooded, and lights directed onsite so that light or glare will be minimized. Low-pressure sodium lamps and fixtures of a non-glare type are to be used. Switched lighting is to be provided for areas where continuous lighting is not required for normal operation, safety, or security; this will allow these areas to remain dark most of the time (BS 2008a, pg. 5.15-9). Nighttime project construction activities may occur at certain times during the construction period. To the extent possible, the nighttime construction lighting will point toward the center of the site where activities are occurring, and will be shielded. Task specific lighting will be used to the extent practical. Illumination is to be provided that meets State and Federal worker safety regulations. Correspondence received from the Kern County Planning Department regarding the BSEP dated September 16, 2008 has recommended a condition of approval pertaining to lighting. The recommendation is that all exterior lighting shall be directed away from nearby properties and roads. The lighting standards shall be equipped with glare shields or baffles and shall not exceed 40 feet in height above grade (KC 2008f). Staff has proposed Condition of Certification **VIS-3** and **VIS-4**.

Chapter 2 – Circulation Element Section 2.3.9 Scenic Route Corridors	A scenic route must be officially set as a Scenic Route by the Kern County Board of Supervisors, or the State of California.	YES AS PROPOSED	SR-14 is not listed as a state scenic highway. The County of Kern has not designated SR-14 as a county scenic highway.
Chapter 5 – Energy Element Section 5.4.7 Transmission Lines	Discourages the siting of above-ground transmission lines in visually sensitive areas.	YES AS PROPOSED	The project's transmission lines would cross over SR-14 to connect to the Barren Ridge Switching Station. SR-14 is not listed as a state or county scenic highway.
Kern County Code Title 19 Zoning			
Section 19.12.070 Yard and Setbacks	A. **Front Yard**. Front-yard minimum setback for all buildings: 1. Fifty-five (55) feet from the legal centerline of any existing or proposed public or private local street or access easements. 2. Seventy (70) feet from the legal centerline of any existing or proposed secondary highway. 3. Eighty (80) feet from the legal centerline of any existing or proposed major highway. In no case shall the front-yard minimum setback be less than twenty five (25) feet from the right-of-way established by any Official or Specific Plan Line, street, or access easement. B. **Side Yard**. There shall be a side yard on each side of a building of not less than five (5) feet, except that on the street side of corner lots, buildings shall be set back a minimum of ten (10) feet from the right-of-way of any local street, existing or proposed secondary or major highway, or the right-of-way established by any Official or Specific Plan Line. C. **Rear Yard**. There shall be a rear yard of not less than five (5) feet except that in the case of through lots, the designated rear yard shall be in accordance with the front-yard setback requirements.	YES AS PROPOSED	As shown on Figure1-2 in the AFC the project would comply with the county's yard requirement s and setbacks.

Section 19.12.080 Height Limits	B. There is no height limit on nonresidential structures, except in areas of protected military airspace as specified in Section 19.08.160.B.	YES AS CONDITIONED	County figure 19.08.160 B shows the northern Fremont Valley as an area where all wind turbines and communication towers over 80 feet in height, and all other structures over 100 feet in height are subject to military review. The BSEP's tallest structures would be the four 110–foot tall transmission line steel poles. Staff has proposed Condition of Certification **VIS-7**. The condition provides for military review of project structures and buildings exceeding 100 feet in height prior to the start of their construction.
Section 19.12.110 Signs	The following types of signs are permitted in the A District in accordance with the requirements of Chapter 19.84 of this title: A. Temporary real estate signs advertising the property for sale or for rent, not to exceed sixteen (16) square feet each, excluding the area of any vertical and/or horizontal support members. B. Temporary construction signs. C. Temporary political, religious, or civic campaign signs. D. Agricultural signs. E. Agricultural industry signs, when approved in conjunction with a conditional use permit. F. Institutional identification signs, when approved in conjunction with a conditional use permit. G. Off-site directional signs for agricultural product direct marketing facilities pursuant to Subsection C of Section 19.12.130 of this chapter. H. Oilfield identification signs.	YES AS CONDITIONED	The AFC and supplements do not discuss the installation of publicly visible signs for the project. Correspondence received from the Kern County Planning Department regarding the BSEP dated September 16, 2008 has recommended a condition of approval pertaining to signs. The recommendation is that all signs shall comply with the signage regulations of the applicable base zone district and with Chapter 19.84 of the Zoning Ordinance and be approved by the Director of the Kern County Planning Department prior to installation (KC 2008f). Staff has proposed Condition of Certification **VIS-5 in** case publicly visible project signs are to be installed.
Section 19.12.120 Landscaping	No landscaping is required in the A District, except where the proposed use is subject to a plot plan review pursuant to Chapter 19.80. Section 19.86.070 where landscaping is required pursuant to this chapter, the plot plan submitted in conjunction with any building permit application shall show the areas to be	YES AS CONDITIONED	The project site is within the A District and the A-1 District. The applicant has provided site drawings and plans for the development of the project in the AFC. The project's AFC and supplements do not discuss the planting of landscaping on the project site.

	landscaped, the type of landscaping proposed and amount, and shall state the proposed method of irrigation. Where no building permits are required to establish a new use on any parcel for which landscaping is required, a plot plan showing this information shall be submitted to the Planning Director prior to commencement of said use.		Correspondence received from the Kern County Planning Department regarding the BSEP dated September 16, 2008 has recommended a condition of approval pertaining to landscaping. The recommended condition is that a comprehensive landscaping and irrigation plan be approved by the Director of the Kern County Planning Department in accordance with the requirements of Chapter 19.86 of the Zoning Ordinance. A minimum of 5% of the developed area shall be landscaped with xeriscape or drought tolerant plantings and continuously maintained in good condition. Landscaping shall be installed or bonded for prior to occupancy of the building or site. Given the remote nature of the project site, as an alternative requirement the project owner may contribute the equivalent cost of the landscaping to the Kern County Parks and Recreation district, school or other non-profit organization in Kern County (KC 2008f). Staff has prepared Condition of Certification **VIS-6**

RESPONSE TO AGENCY AND PUBLIC COMMENTS

STAFF RESPONSE TO APPLICANT'S "PROJECT DESIGN REFINEMENTS, SECTION 2.1.10 VISUAL IMPACTS REDUCTION," JUNE 2009

1. **Applicant comment** – In order to help improve the visual character of the area surrounding the Jawbone Visitors' Center, and subject to confirmation with applicable agencies, Beacon will plant and maintain native vegetation as follows: four, eight, and 12 foot tall Joshua trees will be arranged in naturalistic groups and patterns to accomplish screening and filtering of the view toward the BSEP from the Jawbone Visitor Center. The Joshua trees will be grouped along the entry road, the parking lot, the restrooms, the visitor center, the walkways, and as necessary, in the areas across the Jawbone Canyon Road to provide maximum screening. Creosote bush and other larger native shrub species will be grouped in typical naturalistic spacing to contribute an indigenous appearance to the entry road, parking lot, and visitor center environment. Adequate irrigation will be provided during the first several years, as needed, and monitored by a qualified arborist.

   Staff response – The planting of Joshua trees and other native plants at the U.S. BLM Jawbone Canyon OHV Open Area Ridgecrest Field Office (BLM Ridgecrest Field Office) could screen and soften the view of the BSEP structures and the shimmering lake appearance of the parabolic troughs during operation. The

proposed plantings could also create a visual impact if not well thought out with appropriate plant species and design, and/or the plantings completely block the panoramic view of the Fremont Valley. Viewers at this location are accustomed to a panoramic view of the valley.

A preliminary vegetation plan has not been submitted for review by Energy Commission staff, or the BLM Ridgecrest Field Office. Without review of a plan, Energy Commission staff cannot conclude that the impact would reduced any substantial degrading of the existing visual character or quality to the site or surroundings to less than significant under CEQA. In addition, the applicant's suggested mitigation measure requires approval by another agency, the BLM. It is unknown whether such a plan is feasible.

2. **Applicant comment** - The other Key Observation Point (KOP) that was identified as a concern in the PSA is a hiking trail more than two miles away on Bureau of Land Management (BLM) land (KOP 6). One of the factors that Staff considered in assessing the visual impacts from this KOP was the number of trail users. Staff assumed 25 per day, and Beacon understands that this was used because there was no readily available information on user numbers. However, Beacon believes that the user numbers are much lower and is in the process of discussing this further with the BLM. Beacon continues to believe that the visual impacts from this particular KOP would not be significant given the already disturbed nature of the project area and the few number of "receptors" that would be impacted. Nevertheless, Beacon is happy to explore visual impact mitigation measures with the BLM and CEC Staff. For example, if allowable under BLM rules and guidelines, BLM may be interested in reclaiming and rerouting the affected portion of the trail in accordance with BLM's cultural modification removal and desert landscape restoration program and Beacon could play a role in funding/implementing that effort. Beacon is in the process of trying to establish a dialogue with the appropriate BLM representatives to discuss this option. Beacon is committed to mitigating all significant impacts down to "less-than-significant" and looks forward to working with CEC and BLM staff to find an acceptable solution to this issue.

   Staff response – The primary viewers at KOP 6 would be hikers using the trail to the peak of Chuckwalla Mountain. Hikers are considered passive recreationist, and are considered to have a high sensitivity to the visual environment. A viewer would have an unobstructed, highly visible view of the project site at locations on the eight-mile route. The exposure would be of extended duration from KOP 6 at the mountain peak.

   Staff assesses a KOP using eight categories (visual quality, viewer concern, visibility, number of viewers, duration of view, contrast, dominance, view blockage) (see **Visual Resources Diagram 1**). The "number of viewers" is one category used in the consideration. The number of hikers that use the trail is not known to staff. Staff used 11 to 25 hikers per day for the purposes of the KOP analysis. This number of hikers potentially exposed to the BSEP is considered low.

   At KOP 6, staff could not identify any available mitigation measures to reduce the adverse impact to a less than significant level under CEQA. Staff is open to

reviewing mitigation measure suggestions that have been prepared by the applicant in coordination with the BLM Ridgecrest Field Office. The applicant's suggested mitigation measure would not be under the Energy Commission's jurisdiction. It requires approval by the BLM, and it is unknown whether such a plan is feasible or provides effective mitigation.

STAFF RESPONSE TO APPLICANT'S VISUAL COMMENTS ON PRELIMINARY STAFF ASSESSMENT dated May 1, 2009

1. **Applicant comment** – The PSA concludes that the BSEP would change the existing physical setting of the Fremont Valley floor from a moderately disturbed desert floor landscape to a highly human-altered landscape. Staff concludes that this change would be considered a significant "aesthetic impact" under CEQA. Beacon respectfully disagrees, for the following reasons.

In determining whether a project will have a significant impact on visual resources and/or aesthetics, the lead agency has the discretion to determine whether to classify an impact as "significant," depending on the nature of the area affected. *Mira Mar Mobile Comm. v. City of Oceanside* (2004) 119 Cal.App.4th 477, 493; see also *National Parks & Conservation Assn. v. County of Riverside* (1999) 71 Cal.App.4th 1341, 1357 (varying thresholds of significance may apply depending on nature of area affected). "In exercising its discretion, a lead agency must necessarily make a policy decision in distinguishing between substantial and insubstantial adverse environmental impacts based, in part, on the setting." *Mira Mar,* 119 Cal.App.4th at 493. Here, although Beacon agrees that the project would change the current view, Beacon does not agree with the significance of the impact. The PSA has failed to properly apply its "visual character or quality" significance threshold to the BSEP. In employing the third question of the Appendix G significance thresholds related to "aesthetics," Staff should have focused on whether BSEP would "substantially degrade the existing visual character of the site and its surroundings" (Emphasis added. See Cal. Code Regs., tit. 14, Appendix G, section I, subd. (c)). A project's environmental context is a key consideration in aesthetic impacts analysis (Bowman v. City of Berkeley (2004) 122 Cal. App. 4th 572, 589). Despite the fact that some, or perhaps all, environmental impacts have an aesthetic facet, does not mean that all adverse aesthetic impacts affect environment (Id. At 591, quoting Maryland-National Cap. Ok. & Pl. Com'n v. U.S. Postal Serv. (D.C. Cir. 1973) 487 F. 2d 1029, 1038-1039). Instead, the PSA concluded that the Project would change the visual quality of the desert floor of the entire "Fremont Valley" (PSA at 4.12-26). However, the significance threshold used by Staff clearly asks whether a project would impact the visual character of the "site and its surroundings.

Beacon disagrees with PSA's implication that the site's "surroundings" include the Fremont Valley in its entirety. The PSA also failed to emphasize the highly degraded character of the site as it exists now. Without an accurate aesthetic baseline established, it is difficult for Staff to properly analyze whether a significant impact will occur as a result of the Project. The ranch that comprises the project site was historically intensively farmed, which is also a highly human altered landscape. Historic aerial photographs of the area show the land to be substantially denuded and altered, including "a compound of twelve deteriorating buildings and mobile homes that served the former farm operation" (PSA at 4.12-5). Currently, the outlines of the ranch are

clearly distinguishable from the surrounding desert landscape, even from low level vantage points such as SR-14. Simply put, the project would change the view from one highly human-altered landscape to an alternative highly human-altered landscape.

Beacon provided simulations with and without BSEP features for eight Key Observation Points. The changes in visual characteristics from the KOPs were not found by Beacon to be significantly different between the existing and proposed conditions, certainly not to motorists driving by at high speed on SR-14. While some hikers on the neighboring hills would see a difference, the current view is far from pristine desert landscape, as discussed above, and the significance of the change should appropriately take that into account.

No "substantial" degradation of the "existing" visual character of the project site will occur as a result of BSEP since there will be little change in aesthetic quality from the existing highly human-altered setting.

Therefore, the PSA's conclusion that there will be a "significant adverse change to the visual character and quality" (PSA at 4.12-26) of the existing physical setting reveals that Staff has misapplied the threshold of significance.

Regarding Condition of Certification VIS-6 the applicant recommends the following changes (shown below).

VIS-6 **Unless an alternative approach is agreed to with Kern County, the** project owner shall provide a comprehensive landscaping and irrigation plan for the project site in accordance with the requirements of Chapter 19.86 of the Kern County Zoning Ordinance. ~~A minimum of five (5) percent of the developed area shall be landscaped with xeriscape or drought tolerant plantings that are to be continuously maintained in good condition.~~ Landscaping shall be installed or bonded prior to the start of commercial operation.

Staff response –The applicant's visual analyst worked with staff in the selection of the KOPs for the project provided in the AFC. The applicant's analyst provided KOP photographs that show the existing physical condition without the project, and prepared photographic simulations to show how the proposed project would appear in the existing condition at operation.

As the baseline for the visual resources section in the Staff Assessment, staff used the existing physical setting at the time of the filing of the project's AFC with the California Energy Commission on March 17, 2008.

Staff assesses a KOP using eight factors: visual quality, viewer concern, visibility, number of viewers, duration of view, contrast, dominance, and view blockage; see **Visual Resources Diagram 1**. Appendix VR-1 provides a description of the visual related terms shown in the Diagram 1.

The California Environmental Quality Act defines a "significant effect on the environment" to mean a "substantial, or potentially substantial, adverse change in any of

the physical conditions within the area affected by the project including...objects of historic or aesthetic significance" (California Code of Regulations, Title 14, Section 15382).

Staff concurs with the applicant's visual analyst's statement pertaining to the proposed project's impact from elevated locations found in the AFC on page 1-9-10, which states:

> "From elevated locations at certain times of the day (e.g., viewed from the west in the afternoon hours of a sunny day with the sun behind the viewer), the facility would contrast substantially with the surrounding environment. At such times, the solar mirrors would be facing the viewer and the solar field visually would resemble a body of water (not necessarily and unpleasant view), because the mirrors would reflect the blue sky. At other times (e.g., when the backs of the mirrors are toward the viewer, such as during morning hours when looking from the west, or on cloudier days), the facility's visual contrast would be much less" (BS 2008a, pg. 1-9-10).

Regarding the applicant's suggested changes to staff's proposed Condition of Certification **VIS-6**; staff offers the following revision to VIS-6 (new text has been underlined and bolded and deleted text in strikeout) below:

VIS-6 The project owner shall provide a comprehensive landscaping and irrigation plan for the project site in accordance with the requirements of Chapter 19.86 of the Kern County Zoning Ordinance. ~~A minimum of five (5) percent of the developed area shall be landscaped with xeriscape or drought tolerant plantings that are to be continuously maintained in good condition.~~ Landscaping shall be installed or bonded prior to the start of commercial operation.

An alternative to providing a comprehensive landscaping and irrigation plan for the project site, the project owner may provide to the CPM a copy of the receipt demonstrating payment of the equivalent cost of the landscaping to the Kern County Parks and Recreation District, a Kern County public school or other non-profit organization in the County of Kern prior to the start of commercial operation.

The project owner shall submit to the Director of the Kern County Planning Department for comment a comprehensive landscaping and irrigation plan**, or shall discuss with the Director the alternative described above to a landscaping and irrigation plan.**

The applicant shall allow the Director of the Kern County Planning Department **up to** 60 calendar days to review the comprehensive landscaping and irrigation plan and provide written comments to the project owner. The project owner shall provide a copy of the Director of the Kern County Planning Department's written comments **on the landscaping and irrigation plan or the alternative** to the CPM for review and approval.

The project owner shall not implement the landscaping and irrigation plan~~,~~ **or the alternative** until the project owner receives approval ~~of the plan or alternative~~

~~described~~ from the CPM. ~~The~~ **P**lanting must be completed by the start of commercial operation, and the planting must occur during the optimal planting season.

Verification: Prior to commercial operation and at least 45 days prior to installing the landscaping, the project owner shall provide a copy of the landscaping and irrigation plan to the Director of the Kern County Planning Department for review. The project owner shall allow the Director of the Kern County Planning Department up to 60 days to provide comment on the submitted landscaping and irrigation plan.

The project owner shall provide to the CPM a copy of the transmittal letter submitted to the Director of the Kern County Planning Department requesting their review of the submitted landscaping and irrigation plan.

~~If the CPM determines that the landscape plan requires revision, the project owner shall provide to the CPM and the Director of the Kern County Planning Department a landscaping and irrigation plan with the specified revision(s) for review and to the CPM for final approval before the plan is implemented.~~

The project owner shall notify the CPM within seven days after completing installation of the landscaping and irrigation that the landscaping and irrigation is ready for inspection. ~~If the alternative to the planting of onsite landscaping is invoked by the project owner,~~

In-lieu of the filing of a landscaping and irrigation plan, prior to the start of commercial operation, the property owner shall provide to the CPM a copy of the receipt demonstrating payment to the Kern County Parks and Recreation **District**, a Kern County public school or other non-profit organization in the County of Kern ~~prior to the start of commercial operation.~~

STAFF RESPONSE TO CALIFORNIA UNIONS FOR RELIABLE ENERGY (CURE) VISUAL COMMENTS ON PSA dated April 30, 2009

1. **CURE comment** - To evaluate impacts on visual resources, the PSA "evaluates the existing physical environmental setting, the KOP, and the visual change created by the proposed project to the viewshed." However, the KOPs provided by the Applicant are not representative of the most critical viewsheds.

   California State Route 14 is located approximately a half-mile to the west of the Project site. No KOPs were established to simulate hazards that may be potentially posed to motorists on State Highway 14 from light that may be directed horizontally from the project. KOP 4 was prepared and included in the AFC to simulate a narrow view of the highway and the transmission corridor for a traveler headed northbound on State Route 14, approximately two miles south of the Project site. Because of the narrow field of view, KOP 4 does not show the simulated mirror array of the Project. In addition, KOP 5 was prepared to simulate a view looking south from a location just east of the Project. KOP 5, however, portrays only a small sliver of the array of mirrors and does not portray reflected light. Thus, neither of these views are representative of the reflection potential when it is greatest in the early morning or late afternoon.

The PSA should be revised to include an analysis of KOPs that are representative of the most critical viewsheds.

Staff response – A KOP is selected to be representative of the most critical viewsheds from offsite locations where the project would be visible to the public — for example; recreational and residential areas, travel routes, bodies of water, as well as scenic and historic resources. Because it is not feasible to analyze all the views in which a proposed project would be seen, it is necessary to select a KOP that would most clearly display the visual effects of the proposed project (includes integral associated facilities; such as overhead transmission lines) the way we see the scene with the naked eye (image angle of 46^0).

The applicant's visual analyst and Energy Commission visual staff selected the key observation points (KOPs) for the purpose of assessing potential aesthetic impacts. KOPs are not selected for the purpose of assessing traffic safety hazards to motorists. See the **Traffic and Transportation** section in this FSA for a discussion regarding traffic safety matters pertaining to the proposed project.

KOP 4 is the approximate location on SR-14 where viewers would have an initial discernable view of the project's publicly visible structures. Viewers at KOP 4 would be motorists. Motorists would have a high visibility and high duration of view exposure of the project site from this KOP.

A parabolic trough solar collector tracking system tracks the sun's movement across the sky. Troughs are stowed facing the ground so no glare occurs. When a parabolic trough rotates from stow into the tracking position, a horizontal glare may occur for a short period of time at the beginning and end of daily operations. A parabolic trough's tracking system during normal operation is designed to minimize horizontal glare. In cases where the escape of incident rays occurs, it is typically addressed by aligning the parabolic trough.

2. **CURE comment** - The PSA concludes that "the project would generate a less than significant new source of light or glare to nighttime or daytime views with the effective implementation of the conditions of certification." However, a glint and glare study was not prepared for the Project.

   The photographs below (see **Visual Resources Figure 27**) were taken of the Kramer Junction SEGS facility on April 25, 2009 at 7 a.m. The Kramer Junction facility employs the same technology proposed by the Project. The photographs show a significant glare that may pose a risk to motorists passing the Project on State Route 14.

   A glint and glare study should be prepared for the Project that takes into account the potential for horizontally reflected light from the parabolic mirrors and the reflector tubes that may pose an attractive nuisance or an annoyance to motorists while gazing at the completed Project. The glint and glare study should consider seasonal changes in incident sun angle and in reflected light and should attempt to quantify the intensity of the reflected light. The results of the glint and glare study should be included in a revised PSA for public review and comment.

Staff response – It is difficult for staff to determine from the photographs shown in Visual Resources Figure 27 if the specific point of reflective light at the Kramer Junction SEGS facility equates to a new source of substantial glare for the proposed BSEP during its operation.

A parabolic trough solar collector tracking system tracks the sun's movement across the sky. Troughs are stowed facing the ground so no glare occurs. When a parabolic trough rotates from stow into the tracking position, a horizontal glare may occur for a short period of time at the beginning and end of daily operations. The commenter states that the photographs were taken at 7:00 a.m. The photograph may have been taken as the parabolic trough was rotating from the stow position. A parabolic trough's tracking system during normal operation is designed to minimize horizontal glare. In cases where the escape of incident rays occurs, it is typically addressed by aligning the parabolic trough.

The applicant states the BSEP is to use single-axis-tracking parabolic trough solar collectors, a "tracking system has not been selected for the project and will not be until final design. Regardless of which manufacturer's system is purchased, it will track the position of the sun by facing the sun during all daylight periods and the shape of the mirrors and structures focuses the reflected light on the HCE tube" (FPL 2009).

CONCLUSIONS

The visual analysis focused on two main issues. (1) Would construction and operation of the project introduce an aesthetic impact in accordance to CEQA? (2) Would the project comply with applicable LORS pertaining to aesthetics, or preservation and protection of sensitive visual resources?

1. There is no public view to a definable scenic feature of concern, or towards a broadly recognized human-made or natural scenic feature of unusual importance in the northern Fremont Valley that the proposed project would adversely affect. There is no public view from an actual designated view location on SR-14 that the proposed project would adversely affect. Staff did not find a federal, state, or local government designated scenic vista in the vicinity of the project.

2. The project does not have frontage, or traverse a segment of a road recognized as a National Scenic Byway or All American Road, or a State or County Scenic Highway.

3. There is no defined scenic resource identified in the project site vicinity that the proposed project would substantially damage.

4. The project may introduce a significant visual character or quality impact of the site and surroundings at KOP 2, and would introduce a significant visual character or quality impact and surroundings at KOP 6. The project's publicly visible structures would be seen from elevated locations along the western edge of the northern Fremont Valley; due to 1,244 acres of the project site being covered with parabolic trough solar collectors; and the amount of brightness given off from the parabolic

trough arrays during operation. At KOP 6 and possibly at KOP 2 the project would create an unmitigable significant adverse change to the visual character and quality to the existing physical setting.

5. Publicly visible water vapor plumes emitted by the project's two boilers are expected to create a less than significant impact to the visual character or quality of the site and its surroundings.

6. The project would introduce a new source of substantial light to nighttime views that is anticipated to be less than significant with the effective implementation of the applicant's proposed mitigation measures and staff's recommended conditions of certification.

7. Staff concludes the potential amount of spilled reflected rays from the parabolic trough solar collectors during normal operation would be infrequent in the number of occurrences and short in duration of time that they would not represent a substantial new source of glare in the area.

8. The combination of the Honda Proving Center of California, the proposed BSEP, and a segment of the LADWP Barren Ridge-Castaic Transmission Project would not create a cumulative impact from the KOPs.

9. The project would comply with all applicable laws, ordinances, regulations, and standards pertaining to aesthetics, or preservation and protection of sensitive visual resources with the effective implementation of the recommended conditions of certification.

PROPOSED CONDITIONS OF CERTIFICATION

Staff has drafted conditions of certification for consideration should a decision to issue a license be made on the project.

Surface Treatment of Project Structures and Buildings

VIS-1 The project owner shall color and finish the surfaces of all project structures and buildings visible to the public to ensure that they: (1) minimize visual intrusion and contrast by blending with the landscape; (2) minimize glare; and (3) comply with local design policies and ordinances. The transmission line conductors and insulators shall be non-specular and non-reflective.

The project owner shall submit a surface treatment plan to the Compliance Project Manager (CPM) for review and approval. The surface treatment plan shall include:

A A description of the overall rationale for the proposed surface treatment, including the selection of the proposed color(s) and finishes;

B A list of each major project structure and building (e.g., building, tank, and pipe; transmission line towers and/or poles; and fencing), specifying the

color(s) and finish proposed for each. Colors must be identified by vendor, name, and number; or according to a universal designation system;

C One set of color brochures or color chips showing each proposed color and finish;

D A specific schedule for completing the treatment; and

E A procedure to ensure proper treatment maintenance for the life of the project.

The project owner shall not request vendor surface treatment of any buildings or structures during their manufacture, or perform final field treatment on any buildings or structures, until the project owner has received treatment plan approval by the CPM.

The project owner shall notify the CPM that surface treatment of all listed structures and buildings has been completed and is ready for inspection; and shall submit one set of electronic color photographs from KOPs 1, 3, 4, and 5 showing the "as built" surface treated structures and buildings.

Verification: At least 45 days prior to applying vendor color(s) and finish(es) for structures or buildings to be surface treated during manufacture, the project owner shall submit the proposed treatment plan to the CPM.

If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for review and approval by the CPM before any treatment is applied. Any modifications to the treatment plan must be submitted to the CPM for approval.

Within ninety (90) days after the start of commercial operation, the project owner shall notify the CPM that surface treatment of all listed structures and buildings has been completed and is ready for inspection; and shall submit one set of electronic color photographs from KOPs 1, 3, 4, and 5 showing the "as built" surface treated structures and buildings.

The project owner shall provide a status report regarding surface treatment maintenance in the Annual Compliance Report. The report shall specify a): the condition of the surfaces of all structures and buildings at the end of the reporting year; b) major maintenance activities that occurred during the reporting year; and c) the schedule of major maintenance activities for the next year.

Surface Restoration

VIS-2 The project owner shall remove all evidence of temporary construction activities, and shall restore the ground surface to the original condition or better condition, including the replacement of any vegetation during construction where project development does not preclude it. The project owner shall submit to the CPM for approval a surface restoration plan, the

proper implementation of which will satisfy these requirements. The project owner shall complete surface restoration within 60 days after the start of commercial operation.

Verification: At least 60 days prior to the start of commercial operation, the project owner shall submit the surface restoration plan to the CPM for approval.

If the CPM notifies the project owner that any revisions of the surface restoration plan are needed, within 30 days of receiving that notification the project owner shall submit to the CPM a plan with the specified revisions.

The project owner shall complete surface restoration within 60 days after the start of commercial operation. The project owner shall notify the CPM within seven days after completion of surface restoration that the restoration is ready for inspection.

Construction Activity Lighting

VIS-3 The project owner shall ensure that lighting on the construction site and the construction laydown area minimizes potential night lighting impacts, as follows:

A All lighting shall be of minimum necessary brightness consistent with worker safety and security;

B All fixed position lighting shall be shielded/hooded to direct light downward, and toward the area to be illuminated preventing direct illumination of the night sky and direct light trespass (direct light extending outside the boundaries of the project site, the laydown area, or the site of construction of ancillary facilities, including any security related boundaries);

C Wherever feasible and safe and not needed for security, lighting shall be kept off when not in use; and

D If the project owner receives a complaint about construction lighting, the project owner shall notify the CPM and shall use the complaint resolution form included in the General Conditions section of the Compliance Plan to record each lighting complaint and to document the resolution of that complaint. The project owner shall provide a copy of each complaint form to the CPM.

Verification: Within seven days after the first use of construction lighting, the project owner shall notify the CPM that the lighting is ready for inspection.

If the CPM notifies the project owner that modifications to the lighting are needed to minimize impacts, within 15 days of receiving that notification the project owner shall implement the necessary modifications and notify the CPM that the modifications have been completed.

Within 48 hours of receiving a lighting complaint, the project owner shall provide to the CPM; a) a report of the complaint, b) a proposal to resolve the complaint, and c) a schedule for implementation of the proposal. The project owner shall notify the CPM

within 48 hours after completing implementation of the proposal. The project owner shall provide a copy of the completed complaint resolution form to the CPM in the next Monthly Compliance Report.

Permanent Exterior Lighting

VIS-4 To the extent feasible, consistent with safety and security considerations and commercial availability, the project owner shall design and install all permanent exterior lighting such that:

A light fixtures do not cause obtrusive spill light beyond the project site;

B lighting does not cause excessive reflected glare;

C direct lighting does not illuminate the nighttime sky; and

D illumination of the project and its immediate vicinity is minimized.

In addition, the project owner shall submit to the CPM for approval a lighting management plan that includes the following:

A lighting that incorporates "International Dark Sky Association" approved commercially available fixtures;

B lighting shall be directed downward or toward the area to be illuminated (hooded/shielded);

C lighting shall be the minimum necessary brightness consistent with operational safety and security;

D lights in high illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have (in addition to hoods) switches, timer switches, or motion detectors so that the lights operate only when the area is occupied; and

E a process for addressing and mitigating lighting related complaints.

Verification: At least 14 days prior to ordering any permanent exterior lighting, the project owner shall contact the CPM to determine the required documentation for the lighting management plan.

At least 60 days prior to ordering any permanent exterior lighting, the project owner shall submit to the CPM for approval a lighting management plan. If the CPM determines that the lighting management plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for approval. The project owner shall not order any exterior lighting until receiving CPM approval of the lighting management plan.

Prior to commercial operation, the project owner shall notify the CPM that the lighting has been installed and is ready for inspection. If after inspection the CPM notifies the project owner that modifications to the lighting are needed, within 30 days of receiving notification the project owner shall implement the modifications and notify the CPM that the modifications have been completed and are ready for inspection.

Within 10 days of receiving a project-related lighting complaint, the project owner shall provide the CPM with a complaint resolution form report as specified in the Compliance General Conditions including a proposal to resolve the complaint, and a schedule for implementation. The project owner shall notify the CPM within 10 days after completing implementation of the proposal. A copy of the complaint resolution form report shall be submitted to the CPM within 30 days of complaint resolution.

Publicly Visible Project-Related Signage

VIS-5 Any publicly visible project-related signage shall be the minimal signage visible to the public, and shall a) have unobtrusive colors and finishes that prevent excessive glare; and b) be consistent with the applicable design and development standards found in Chapter 19.84 *Signs* of the Kern County Code. The design of any signs required by safety regulations shall conform to the criteria established by those regulations.

The project owner shall submit a sign plan for publicly visible signs for the project to the Director of the Kern County Planning Department for comment and to the CPM for approval. The project owner shall not implement the plan until the project owner receives approval of the submittal from the CPM.

Verification: At least 30 days prior to installing publicly visible signs, the project owner shall submit a sign plan for the project to the Director of the Kern County Department of Planning for comment and to the CPM for approval. The project owner shall provide a copy of the Director of the Kern County Planning Department comments to the CPM.

If the CPM determines that the sign plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for approval by the CPM before any signage visible to the public is installed.

The project owner shall inform the CPM that the publicly visible signs have been installed and provide the CPM with electronic color photographs of the installed signage.

Landscaping

VIS-6 The project owner shall provide a comprehensive landscaping and irrigation plan for the project site in accordance with the requirements of Chapter 19.86 of the Kern County Zoning Ordinance. Landscaping shall be installed or bonded prior to the start of commercial operation.

An alternative to providing a comprehensive landscaping and irrigation plan for the project site, the project owner may provide to the CPM a copy of the receipt demonstrating payment of equivalent cost of the landscaping to the Kern County Parks and Recreation District, a Kern County public school or other non-profit organization in the County of Kern prior to the start of commercial operation.

The project owner shall submit to the Director of the Kern County Planning Department for comment a comprehensive landscaping and irrigation plan, or shall discuss with the Director the alternative described above to a landscaping and irrigation plan.

The applicant shall allow the Director of the Kern County Planning Department up to 60 calendar days to review the comprehensive landscaping and irrigation plan and provide written comments to the project owner. The project owner shall provide a copy of the Director of the Kern County Planning Department's written comments on the landscaping and irrigation plan or the alternative to the CPM for review and approval.

The project owner shall not implement the landscaping and irrigation plan or the alternative until the project owner receives approval from the CPM. Planting must be completed by the start of commercial operation, and the planting must occur during the optimal planting season.

Verification: Prior to commercial operation and at least 45 days prior to installing the landscaping, the project owner shall provide a copy of the landscaping and irrigation plan to the Director of the Kern County Planning Department for review.

The project owner shall provide to the CPM a copy of the transmittal letter submitted to the Director of the Kern County Planning Department requesting their review of the submitted landscaping and irrigation plan, or alternative.

The project owner shall notify the CPM within seven days after completing installation of the landscaping and irrigation that the landscaping and irrigation is ready for inspection.

In-lieu of the filing of a landscaping and irrigation plan, prior to the start of commercial operation, the property owner shall provide to the CPM a copy of the receipt demonstrating payment to the Kern County Parks and Recreation District, a Kern County public school or other non-profit organization in the County of Kern.

Military Review of Project Structures/Buildings Exceeding 100 Feet in Height

VIS-7 Prior to the start of construction or installation for any project related structure or building exceeding 100 feet in height, the project owner shall provide the military authority responsible for operations in the Fremont Valley flight area (shown on Figure 19.08.160, section 19.08.160 *HEIGHT OF STRUCTURES,* Kern County Zoning Ordinance) elevation drawings and a plot plan showing dimensions to review.

The project owner shall provide the military authority 60 calendar days to review drawings and the plot plan and provide a written determination to the project owner that the height of the project structure or building would not create a military mission hazard. The project owner shall provide a copy of the military authority's written determination to the CPM for approval.

The project owner shall not start construction on a project structure or building exceeding 100 feet in height until the project owner receives approval from the CPM.

Verification: Prior to the start of construction or installation for any project related structure or building exceeding 100 feet in height, the project owner shall provide to the CPM a copy of the military authority's written determination that the height of the project structure or building would not create a military mission hazard.

REFERENCES

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KCC 2007 - Kern County Code, Title 19 – Zoning. February 2007

KCGP 2007- Kern County General Plan, March 2007

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APPENDIX VR-1

KEY OBSERVATION POINT EVALUATION - TERMS AND DEFINITIONS

Basic Landscape Design Principles

Assigning values to visual resources is a subjective process. The phrase, “beauty is in the eye of the beholder,” is often quoted to emphasize the subjectivity in determining scenic values. Yet, researchers have found consistent levels of agreement among individuals asked to evaluate visual quality. Designers have used the basic design elements of form, line, color, and texture to describe and evaluate landscapes for hundreds of years. Modifications in a landscape which repeat the landscape’s basic elements are said to be in harmony with their surroundings. Modifications which do not harmonize often look out of place and are said to contrast or stand out in unpleasing ways[5].

Key Observation Point

A “Key Observation Point[6]” (KOP) is selected to be representative of the most critical viewsheds[7] from off-site locations where the project would be visible to the public — for example; recreational and residential areas, travel routes, bodies of water, as well as scenic and historic resources. Because it is not feasible to analyze all the views in which a proposed project would be seen, it is necessary to select a KOP that would most clearly display the visual effects of the proposed project. A KOP may also represent a primary viewer group(s) that would potentially be affected by the project.

At the KOP, an applicant takes a photograph of the existing physical environment and uses it to prepare a representative photographic simulation of the proposed project or specific project feature. Photographic simulations portray the relative scale and extent of the project. The existing physical environment photograph (existing condition) and the photographic simulation (proposed condition) are incorporated into the “Application For Certification” for the project in the visual resources section.

VISUAL SENSITIVITY (Existing Condition)

Visual sensitivity is comprised of the factors *visual quality*, *viewer concern*, *visibility*, *number of viewers*, and *duration of view* to achieve the *overall viewer sensitivity*. A description of each factor and its rating has been provided below.

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[5] U.S. Department of Interior - Bureau of Land Management, Manual Section 8400 - Visual Resources Management - Overview of Visual Resource Management System.

[6] The use of KOPs or similar view locations is common in visual resource analysis. The U.S. Bureau of Land Management (USDI BLM 1986a, 1986b, 1984) and the U.S. Forest Service (USDA Forest Service 1995) use such an approach.

[7] The viewshed is the area visible from the selected fixed vantage point (KOP). In 35mm photography, a lens with a focal length of 50mm is referred to as “normal” because it works without reduction or magnification and creates images the way we see the scene with our naked eyes. Looking through a normal lens, you would see an image angle of view of 46 degrees.

Visual Quality

An expression of the visual impression or appeal of a given landscape and the associated public value attributed to the resource. Visual quality is rated from high to low. A high rating is generally reserved for landscapes that would be what a viewer might think of as a “picture-postcard.” Low visual quality describes landscapes that are often dominated by visually discordant human alterations, and do not provide views that people would find inviting or interesting[8].

Landscapes rated high generally are memorable because of the way the components combine in a visual pattern. Landscapes with high visual quality are visually coherent and harmonious when each element is considered as part of the whole. In addition, the landscapes are free from encroaching elements thus retaining their visual integrity. On the contrary, landscapes rated low are often dominated by visually discordant human alterations.

Viewer Concern

Viewer concern represents the reaction of a viewer to visible changes in the view. Viewer concern can vary significantly depending on the viewer. Viewers at residential and recreational areas typically have a high concern about potential degradation of the existing visual quality and character of that view. Viewers generally expect views to be preserved. Existing discordant elements in the landscape may temper viewer concern.

Viewers in commercial and industrial areas largely consist of workers and patrons to the commercial or industrial operation. Viewers in commercial areas typically have low to moderate viewer concern. Viewers in heavy industrial areas typically have a low viewer concern.

The viewer concern for motorists varies. It is largely dependent on when and where travel occurs, the angle of view, how far the distance, and the frequency of travel of the motorist. Typically, motorists on freeway systems during periods of free flow travel have a low to moderate concern. Drivers outside of urban areas traveling long distances at normal freeway speeds usually focus their attention on long range non-peripheral views and getting to their destination. Daily commuters using inner city freeways who experience congested traffic conditions tend to focus views on the freeway itself and not on peripheral views. Commuters who experience normal freeway speeds have an increase awareness of views from the freeway. Motorists driving for pleasure have a high awareness of view. Motorists who are local residents and/or business owners typically have a higher concern due to their familiarity and their personal investment in the area.

Scenic view locations designated in a federal, state or local government adopted land use planning document (e.g.; General Plan, Specific Plan, Local Coastal Plan, highway corridor plan, etc.), or cultural resources and historical preservation plan and survey typically formalized a widely recognized visual value of a resource and the public’s

[8] Buhyoff, G.J., P.A. Miller, J.W. Roach, D. Zhou, and L.G. Fuller. 1994. An AI Methodology for Landscape Visual Assessments. AI Applications Vol. 8, No 1

desire to protect that value (e.g.; scenic area, scenic corridor, scenic highway, scenic wilderness, etc.). Where such official statements exist, the general public expectation is that the view from that location or the view of that resource will be preserved.

Visibility

Visibility is a measure of how well an object can be seen. Visibility depends on the angle or direction of view; extent of visual screening (human-made and/or natural); topography; and the distance between the object (proposed project) and existing homes, streets, or parks. In this sense, visibility is determined by considering any and all obstructions that may be in the sightline; trees and other vegetation, buildings, hills, transmission poles or towers, etc. The visibility of the proposed project rates from low to high.

Number of Viewers

Number of viewers potentially exposed to the proposed project. Typically the number of viewers is determined (counted) as follows: residential viewers - the number of residences; motorist – traffic volume; such as the Average Daily Vehicle Trips (ADT) or Annual Average Daily Vehicle Trips (AADT); and recreationists – the number of users per day (e.g.; bird watchers, boaters, hikers, snowmobilers, etc.). The number of viewers rates from low to high.

Duration of View

Duration of view is the estimated length of time of the view of the proposed project by a viewer. The view duration varies depending on the type of viewer and activity the viewer is engaged. Duration of view two minutes or longer is rated high (extended). Duration of view ten seconds or less is rated low (brief).

Residential viewers typically have the longest duration of view. A residence with a direct view of a proposed project would have an extended view of it. For motorists, the duration of view depends on the speed of travel, distance and angle of view the proposed project would be visible. For example, a motorist traveling at 60 miles per hour on a highway that would have a direct view of the proposed project, where the approximate initial point of exposure to the project is one-mile away would have a 60 second duration of view.

The duration of view for recreationists depends on whether the recreation is “active” or “passive.” Active recreation entails direct participation and typically requires use of an organized play area (e.g.; riding trail bikes, snowmobiling, or participation in a competitive team sport; such as football, soccer, softball, etc.). A view of a proposed project by an individual observing or engaged in active recreation is typically of a short duration. Viewers are focused on the activity at hand and less on the periphery.

Passive recreation involves observation and does not require use of an organized play area. Viewers are more closely tied to the surrounding physical environment where the activity takes place (e.g.; climbing, hiking, hunting, fishing, picnicking, etc.). A view of a proposed project by an individual engaged in passive recreation is typically longer in duration then someone participating in active recreation.

Overall Viewer Exposure

Overall viewer exposure consists of three factors *visibility*, *number of viewers*, and *duration of view*. Staff generally gives equal weight to these three factors in determining the level of overall viewer exposure. However, if a factor has an extreme value, staff gives additional weight to that factor. For example, if a project's visibility is very limited because it would be almost entirely screened from public view, staff gives a lower value to overall viewer exposure. Overall viewer exposure rates from low to high.

Overall Visual Sensitivity

Overall visual sensitivity is comprised of three factors *visual quality*, *viewer concern*, and *overall viewer exposure*. Staff gives equal weight to each of these three factors in determining the level of overall visual sensitivity. Overall visual sensitivity rates from low to high.

VISUAL CHANGE (Proposed Condition)

Visual change is comprised of the factors *contrast*, *dominance*, and *view blockage* to achieve the *overall visual change*. A description of each factor and its rating is provided below.

Contrast

Contrast concerns the degree to which a proposed project's visual characteristics or elements of form, line, color, and texture differ from form, line, color and texture existing in the landscape. The degree of contrast rates from weak (low) to strong (high).

Form - contrast in form results from changes in the shape and mass of landforms or structures. The degree of change depends on how dissimilar the introduced forms are to those continuing to exist in the landscape.

Line - contrast in line results from changes in edge types and interruption or introduction of edges, bands, and silhouette lines. New lines may differ in their sub elements (boldness, complexity, and orientation) from existing lines.

Color - changes in value, or a gradation or variety of a color (hue) tend to create the greatest contrast. Other factors such as saturation of a color, reflectivity, color temperature, also increase the contrast.

Texture - noticeable contrast in texture usually stems from differences in the grain, density, and internal contrast. Other factors such as irregularity and directional patterns of texture may affect the rating.[9]

The extent to which the complexity of the landscape can absorb new elements without changing the overall visual character of the area is often referred to as "Visual

[9] U.S. Department of Interior - Bureau of Land Management, Manual 8431 - Visual Resource Contrast Rating

Absorption." A proposed project designed with similar forms, lines, colors, and textures to that existing in the landscape is more visually absorbent.

Dominance

Dominance is a measure of (a) the proportion of the total field of view that the proposed feature occupies; (b) a proposed feature's apparent size relative to other visible landscape features; and (c) the conspicuousness of the proposed feature due to its location in the view.

A proposed feature's level of dominance is lower in a panoramic setting than in an enclosed setting with a focus on the feature itself. A feature's level of dominance is higher if it is (1) near the center of the view; (2) elevated relative to the viewer; or (3) has the sky as a backdrop. As the distance between a viewer and a feature increases, its apparent size decreases; and consequently, its dominance decreases. The level of dominance rates from subordinate (low) to dominant (high).

View Blockage

View blockage is the extent that an existing publicly visible landscape feature human-made or natural would be blocked from view by the proposed project. The view is also disrupted when the continuity of the view is interrupted. Higher quality landscape features can be disrupted by the introduction of lower quality features (e.g.; power plant structures) into the view. The degree of view blockage rates from low to high.

Overall Visual Change

Overall visual change is comprised of three factors *contrast*, *dominance*, and *view blockage*. Staff gives equal weight to the three factors in determining the overall visual change. Overall visual change rates from low to high.

Visual Impact Significance

Visual Impact Significance is based on the rating for *Overall Visual Sensitivity* and the rating for *Overall Visual Change*.

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APPENDIX VR-2

VISIBLE PLUME MODELING ANALYSIS – WILLIAM WALTERS

INTRODUCTION

The following provides the assessment of the Beacon Solar Energy Project (Beacon or BSEP) cooling tower exhaust stack visible plumes. Staff completed a modeling analysis for the applicant's proposed unabated cooling tower design based on data provided by the applicant.

PROJECT DESCRIPTION

The proposed project is a thermal solar design that requires cooling to condense the steam that is recycled through the power block. The applicant has proposed an eleven-cell mechanical-draft cooling tower for project cooling. The applicant has not proposed to use any methods to abate visible plumes from the cooling towers.

The applicant has also proposed two small (30 MMBtu/hr) boilers that will be used for daily start-up and for freeze protection. These boilers will be operated for a maximum of 1,000 hours per year. During cold weather periods, such as their use during start-up and for freeze protection in winter these boilers are likely to have visible plumes. However, due to their limited use and small size the boiler plumes are not believed to create a potentially significant visual impact and are not assessed further in this analysis.

VISIBLE PLUME MODELING METHODS

PLUME FREQUENCY AND DIMENSION MODELING

The Combustion Stack Visible Plume (CSVP) model was used to estimate plume frequency and plume dimensions for the cooling tower exhaust. This model provides conservative estimates of both plume frequency and plume size. This model uses hourly cooling tower exhaust parameters and hourly ambient condition data to determine the plume frequency. This model is based on the algorithms of the Industrial Source Complex model (Version 2), that determine temperatures at the plume centerline, but this model does not incorporate building downwash.

The modeling method combines the cooling tower cell exhausts into an equivalent single stack. This method may overestimate cooling tower plume size (particularly height) during plume hours with higher winds perpendicular to the length of the tower due to little cell interaction and the potential for building downwash, but will be more accurate during low wind and calm periods when the exhausts from the cooling tower cells will combine into one coherent body. Wind speeds are set to 1 m/s during calm hours in the modeling analysis.

CLOUD COVER DATA ANALYSIS METHOD

A plume frequency of 20 percent of seasonal (November through April) daylight no rain/fog high visual contrast (i.e. “clear”) hours is used to determine potential plume impact significance. The methodology used to determine high visual contrast hours is provided below:

> The Energy Commission has identified a “clear” sky category during which plumes have the greatest potential to cause adverse visual impacts. For this project the meteorological data set[10] used in the analysis categorizes total sky cover as “clear”, “scattered”, “broken”, “overcast”, “partially obscured”, and obscured”. For the purpose of estimating the high visual contrast hours staff has included in the “Clear” category a) all hours with total sky cover defined as “clear” plus b) half of the non-obscured hours with unlimited ceiling height (i.e. hours with a sky opacity equal to or less than 50%). The rationale for including these two components in this category is as follows: a) plumes typically contrast most with sky under clear conditions and b) for a substantial portion of the time when total sky cover is not clear or obscured the opacity of the sky cover is relatively low (equal to or less than 50%), and these clouds do not substantially reduce contrast with plumes. Staff has estimated that approximately half of the hours with sky opacity of less than 50% can be considered high visual contrast hours and are included in the “clear” sky definition.

If it is determined that the seasonal daylight clear hour plume frequency is greater than 20 percent then plume dimensions are calculated, and a significance analysis of the plumes is included in the Visual Resources section of the Staff Assessment.

COOLING TOWER VISIBLE PLUME MODELING ANALYSIS

COOLING TOWER DESIGN AND OPERATING PARAMETERS

The cooling tower design characteristics were determined through a review of the applicant’s AFC (BSEP 2008a), the air quality and visible plume modeling files (BSEP 2008b), and additional data provided by the applicant to estimate daily and seasonal cooling tower operations (BS 2009). The applicant’s cooling tower physical design parameters are presented in **Visible Plume Table 1**.

Visible Plume Table 1
Cooling Tower Physical Design Parameters

Parameter	Cooling Tower Design Parameters
Number of Cells per Tower	11 Cells (Linear Design)
Cell Height	44.3 feet (13.5 meters)
Cell Stack Diameter	28 feet (8.53 meters)
Tower Housing Length	595 feet (181.3 meters)
Tower Housing Width	48.6 feet (14.8 meters)

Source: BSEP 2008a and BSEP 2008b.

[10] This analysis uses three years of meteorological data (2002 through 2004) from the Mojave Poole Street meteorological data site that was obtained and processed by the applicant from the U.S. EPA Air Quality System Meteorological Data System, and relative humidity data from Fox Field in Lancaster.

The applicant provided estimated average heat rejection data for each hour of each month (BS 2009). The applicant also noted that at a minimum one half of the cells, assumed by staff to be 5 of 11, would have fans operating. However, the heat rejection turndown is a much greater value than one-half, which during very cold periods would likely cause freezing problems in the cooling tower if more cell fans are not turned off. Therefore, to be conservative, staff has assigned an average heat rejection of 39 MW of heat rejection to determine the number of cells operating on average for each hour of each month. The applicant's heat rejection basis and staff's cooling tower cell operating assumptions are provided in **Visible Plume Tables 2** and **3**, respectively.

Visible Plume Table 2
Cooling Tower Average Heat Rejection, MW

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.5	0	0	0	67	140	207	149	59	0	0	0	0
7.5	0	0	122	311	343	396	347	309	275	125	0	0
8.5	55	143	280	379	387	425	388	389	394	277	142	58
9.5	158	231	328	410	389	426	408	412	406	292	222	144
10.5	176	232	331	414	393	428	409	404	395	290	216	160
11.5	171	222	317	416	412	428	409	406	377	271	202	147
12.5	174	220	321	398	406	411	420	397	372	271	198	153
13.5	199	235	323	402	405	429	415	396	368	298	210	176
14.5	222	250	325	406	392	405	423	385	368	313	225	192
15.5	205	255	314	378	384	404	409	358	323	287	176	136
16.5	66	159	252	362	360	372	371	322	243	116	0	0
17.5	0	0	65	163	196	257	258	171	71	0	0	0
18.5	0	0	0	0	0	59	59	0	0	0	0	0

Source: BS 2009.

Visible Plume Table 3
Staff's Assumed Number of Operating Cooling Tower Cells

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.5	0	0	0	2	4	6	4	2	0	0	0	0
7.5	0	0	4	8	9	11	9	8	8	4	0	0
8.5	2	4	8	10	10	11	10	10	11	8	4	2
9.5	5	6	9	11	10	11	11	11	11	8	6	4
10.5	5	6	9	11	11	11	11	11	11	8	6	5
11.5	5	6	9	11	11	11	11	11	10	7	6	4
12.5	5	6	9	11	11	11	11	11	10	7	6	4
13.5	6	7	9	11	11	11	11	11	10	8	6	5
14.5	6	7	9	11	11	11	11	10	10	9	6	5
15.5	6	7	9	10	10	11	11	10	9	8	5	4
16.5	2	5	7	10	10	10	10	9	7	3	0	0
17.5	0	0	2	5	6	7	7	5	2	0	0	0
18.5	0	0	0	0	0	2	2	0	0	0	0	0

Source: Staff Analysis

Staff presents the following exhaust assumptions for three specified ambient conditions in **Visible Plume Table 4** that give the exhaust temperatures assumed by staff's heat balance at three different ambient conditions.

Visible Plume Table 4
Cooling Tower Exhaust Temperatures

Case	Inlet Air Ambient Condition	Exhaust Temperature
1	30°F, 84% RH	72.15°F
2	65°F, 27% RH	81.42°F
3	100°F, 16% RH	99.15°F

Source: Staff heat balance.

The cooling tower operation for this project is significantly different than the dozens of cooling towers evaluated for siting cases from 2001 to present. Specifically, the heat rejection load to the cooling tower is specifically related to the sun angle (time of day and year) that impacts the total power production capacity of the facility. Therefore, the cooling tower operation starts at low heat rejection loads each morning and building until the afternoon when the heat rejection load drops as the sun sets. Staff has attempted to mimic, in a simple way, the complex operating profile of the cooling tower exhaust modeling inputs. Additionally, the hourly cooling tower exhaust conditions are interpolated for the hourly ambient conditions (temperature and relative humidity) based on the assumed heat rejection for each operating cooling tower cell.

COOLING TOWER VISIBLE PLUME MODELING RESULTS

Visible Plume Table 5 provides the CSVP model visible plume frequency results for daytime operations using a three-year (2002 to 2004) meteorological data set compiled from a mixture of Mojave Poole Street and Fox Field Lancaster sources.

Visible Plume Table 5
Predicted Hours with Cooling Tower Visible Plumes
Mojave/Lancaster 2002-2004 Meteorological Data

Case	Available (hr)	Plume (hr)	Percent
Daytime	12,117	2,086	17.2%
Seasonal Daytime	5,409	1,865	34.5%
Seasonal Daytime No Rain/No Fog	5,296	1,774	33.5%
Seasonal Daytime Clear	4,689	1,425	30.4%

*Seasonal conditions occur during November through April.

The results noted above are based on the data and assumptions shown in **Visible Plume Tables 2** through **4**, and do not include night time operation as the heat load for the cooling tower is a function of the solar radiation.

Since the plume frequencies remain over 20% of the seasonal daylight clear hours the corresponding plume dimensions were estimated. The plume dimensions are estimated by the CSVP model and presented in **Visible Plume Table 6**.

Visible Plume Table 6
Predicted Cooling Tower Visible Plume Dimensions

	Cooling Tower Seasonal "Clear" Hours Plume Dimensions in Meters (feet)		
Percentile	**Length**	**Height**	**Width**
5%	63.6 (209)	142.7 (468)	37.5 (123)
10%	37.2 (122)	92.3 (303)	27.1 (89)
15%	30.2 (99)	57.4 (188)	24.3 (80)
20%	**26.1 (86)**	**33.9 (111)**	**23.5 (77)**
25%	20.9 (69)	26.4 (87)	22.2 (73)
30%	8.1 (27)	17.7 (58)	16.3 (53)

Results include the cooling tower stack height of 13.5 meters (44.3 feet), see **Visible Plume Table 1**.

These plume sizes are not dissimilar in magnitude to those predicted by the applicant using the SACTI model (BS 2008b), considering the differences in approach, with the exception that the SACTI model groups the met data and does not model calm hours which will cause some underestimation of maximum plume height during worst case hourly conditions.

APPLICANT'S PLUME ANALYSIS

The applicant prepared a plume modeling analysis using the Seasonal/Annual Cooling Tower Impact (SACTI) model. Due to the way the SACTI model over simplifies the modeling by only allowing one operating case to be modeled at a time and its grouping of the hourly meteorological data into a couple dozen cases, among a few other significant issues, staff does not use this model for plume frequency and size prediction. However, staff has reviewed the applicant's plume modeling files and found several input issues that would impact the predicted plume sizes. Those input issues include:

- The hourly profile of the heat rejection and seasonal profile of the heat rejection were not incorporated into the model, which would overestimate the potential plume sizes and plume ground fogging events.
- The gas flow rate of 7618.3 kg/s was too high in comparison with that used in the air quality modeling which would be approximately 6,700 kg/s. However, the applicant has indicated that this flow rate is correct for the maximum heat rejection rate (BS 2009).
- The heat rejection value of 451.2 MW was too high considering that the heat balance in the AFC provides a value of 438.4 MW. The applicant indicates that this peak heat rejection rate is correct regardless of the energy balance data in the AFC (BS 2009).
- The resolution of the results was low due to the spacing for data output (i.e. plume length and height output was spaced at 100 meter intervals rather than at 10 or 25 meter intervals.
- The temperature for 100°F+ hours dropped the initial 1 in the meteorological data file, where 102 hours were impacted in the daytime meteorological data file. However, if anything this would cause over prediction of summer plumes.

- Staff considers a six month seasonal period November through April to determine initial potential for significance, the applicant provided season of year results (i.e. winter, spring, etc.).
- There were input spacing issues that caused the first digit in some of the distances from tower to be truncated, which caused a minor break in the results.

The issue with the greatest impact on the interpretation of the results is the reduced output data spacing. In general, the applicant's SACTI estimated plume size results were somewhat smaller than what staff would predict using the heat rejection and air flow as supplied with the AFC, where the applicant stands by their SACTI input values regardless of the other supplied AFC data. However, staff agrees in general with the plume sizes and frequencies determined by the applicant using the SACTI model. However, staff uses the CSVP model, which provides hourly visible plume results based on actual hourly ambient data, to provide hourly plume results.

GROUND FOGGING ANALYSIS

Staff also reviewed the applicant's ground fogging modeling analysis and separately modeled the plumes using the Seasonal/Annual Cooling Tower Impact (SACTI) model. Ground fogging was predicted a few hours per year on average, but no ground fogging was predicted beyond 500 meters, or past the project fence line. Therefore, no potential for ground based traffic safety impacts on public roads are predicted for cooling tower operation.

CONCLUSIONS

Visible water vapor plumes from the proposed Beacon cooling tower could occur more than 20 percent of seasonal daylight clear hours depending on facility operation. Therefore, further visual impact analysis of worst-case plume frequencies and plume sizes has been completed.

Due to the small size and limited operation significant visible water vapor plumes are not expected from the two small BSEP boilers.

REFERENCES

BS 2008a - FPL Energy/M. O'Sullivan (tn 45646). Application for Certification, dated 03/13/08. Submitted to CEC/Docket Unit on 03/14/08.

BS 2008b - FPL Energy/M. O'Sullivan (tn 45647). Air Modeling Files. Submitted to CEC/Docket Unit on 03/14/08.

BS 2009 - FPL Energy/M. O'Sullivan. Cooling tower heat duty information from WorleyParsons and cooling tower operating information and notes on SACTI analysis by AECOM. Submitted to CEC/Docket Unit on 01/26/09.

VISUAL RESOURCES - FIGURE 1

Beacon Solar Energy Project - Aerial View of Beacon Solar Energy Project and Vicinity

SOURCE: Google Earth

VISUAL RESOURCES - FIGURE 2

Beacon Solar Energy Project - Existing View of the Project Site

1.

2.

3.

4.

SOURCE: Staff Photos

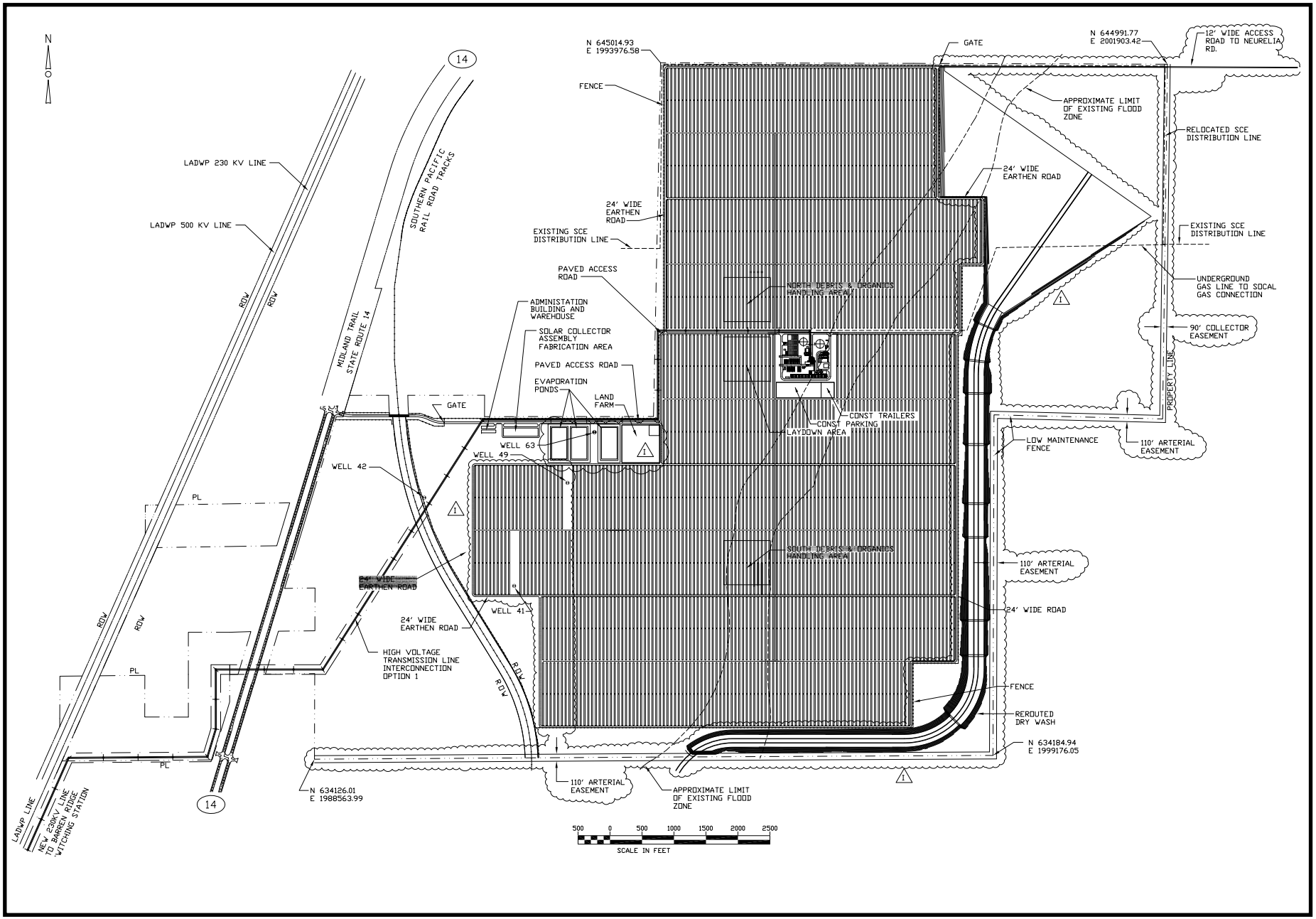
VISUAL RESOURCES - FIGURE 3

Beacon Solar Energy Project - Deteriorating Fremont Valley Ranch, Building and Structures

SOURCE: Staff Photograph

VISUAL RESOURCES - FIGURE 4

Beacon Solar Energy Project - General Arrangement Site Plan



SOURCE: Beacon Solar LLC, Project Design Refinements, June 2009

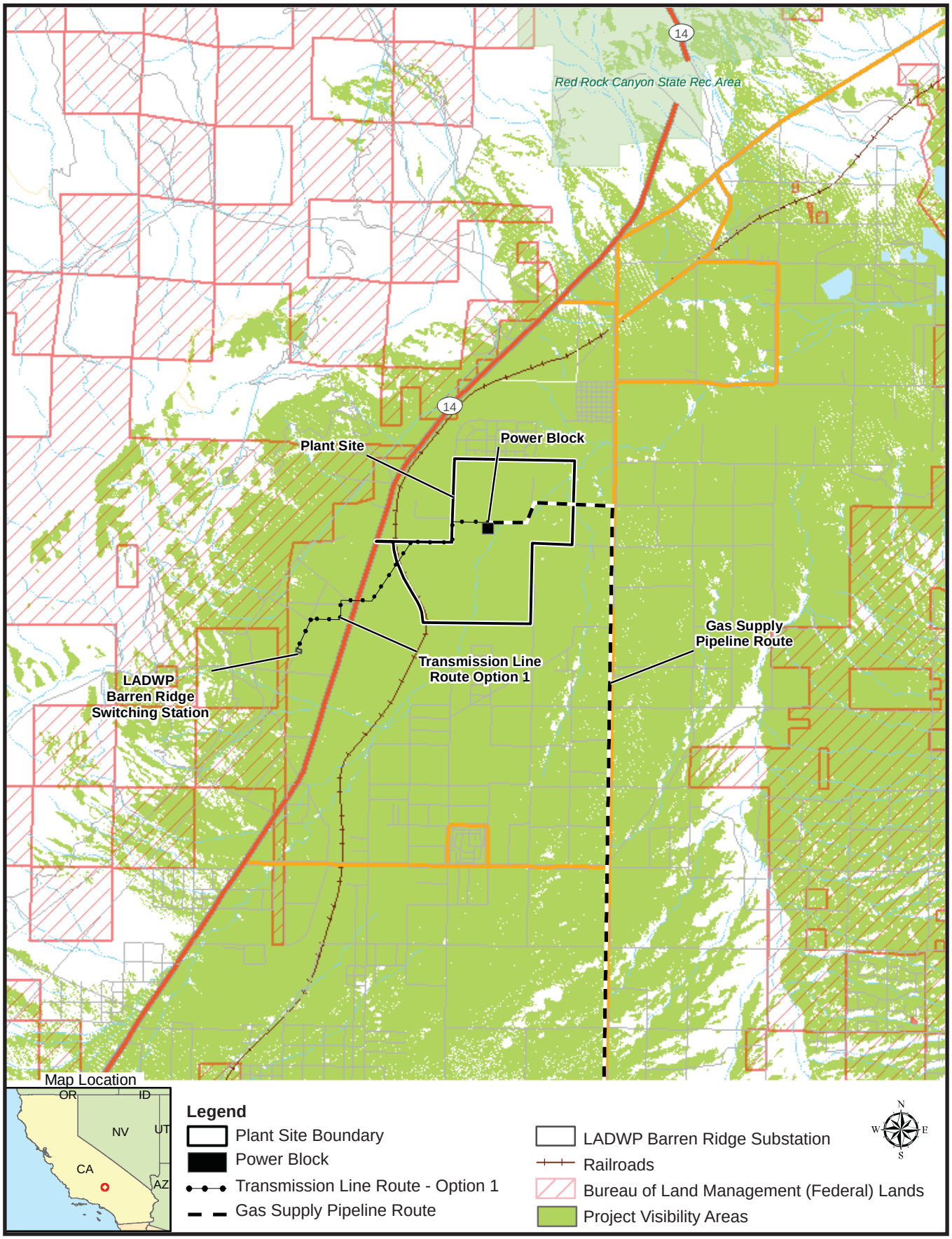
VISUAL RESOURCES - FIGURE 5

Beacon Solar Energy Project - SEGES Kramer Junction Project

SOURCE:

VISUAL RESOURCES - FIGURE 6

Beacon Solar Energy Project - Regional Visibility of the BSEP



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: AFC Figure 5.15-1a

VISUAL RESOURCES - FIGURE 7

Beacon Solar Energy Project - View of Existing Residences North of Project Site (Rancho Seco)

1.

2.

3.

4.

SOURCE: Staff Photos

VISUAL RESOURCES - FIGURE 8

Beacon Solar Energy Project - View of closest Residence West of Project Site along SR - 14

SOURCE: Staff Photo

VISUAL RESOURCES - FIGURE 9

Beacon Solar Energy Project - View towards the Honda Proving Center Oval Track from Entrance and View 1.5 miles South of the Proving Center Entrance

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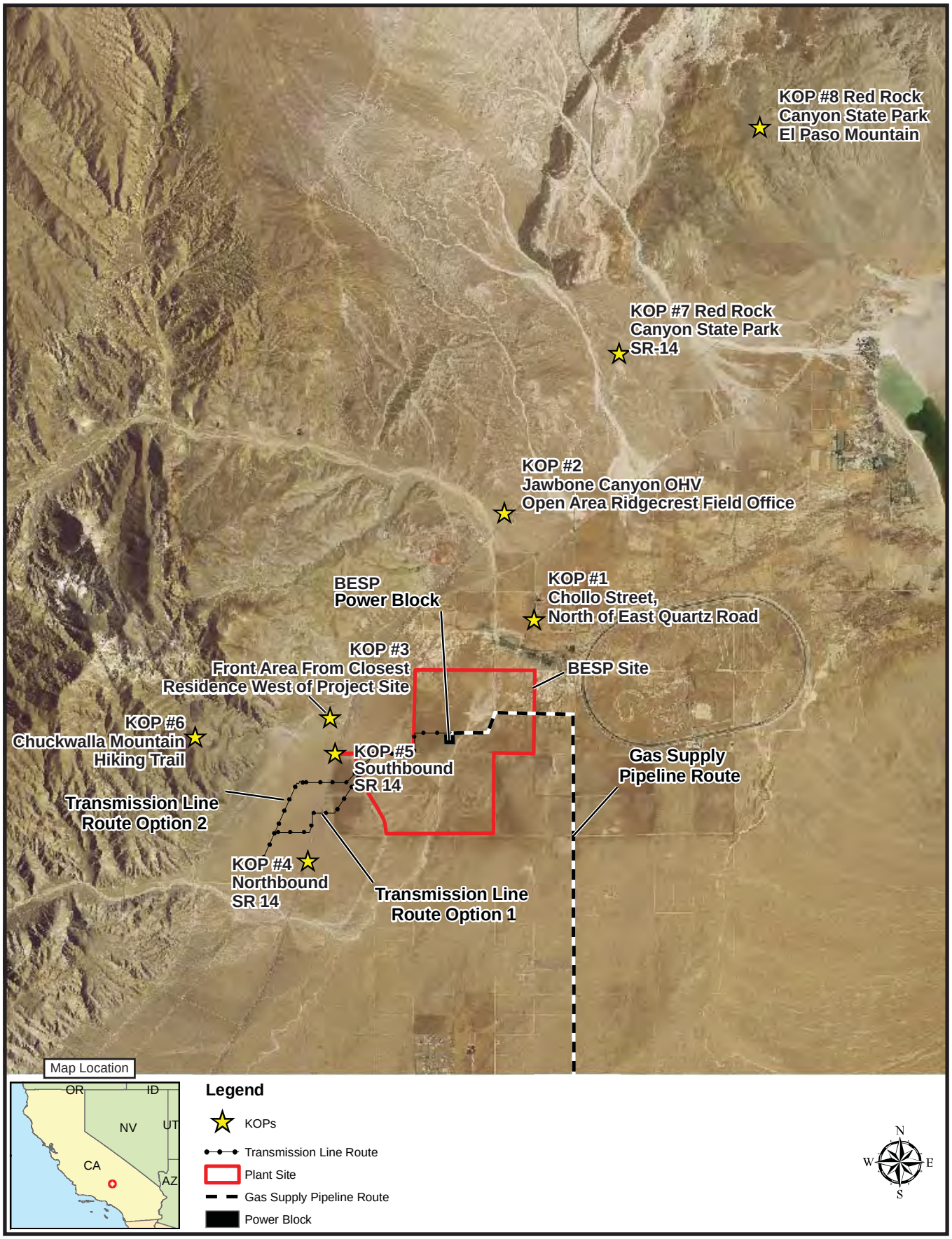
SOURCE: Staff Photo

VISUAL RESOURCES - FIGURE 10
Beacon Solar Energy Project - Key Observation Points



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SOURCE: AFC Figure 5.15-3

VISUAL RESOURCES - FIGURE 11

Beacon Solar Energy Project - KOP 1- Existing view toward the Project Site from Chollo Street in Rancho Seco

SOURCE: AFC Figure 5.15-4a

VISUAL RESOURCES - FIGURE 12

Beacon Solar Energy Project - KOP 1- Simulation of the Proposed Project's Publicly Visible Structures after Completion

SOURCE: AFC Figure 5.15-4b

VISUAL RESOURCES - FIGURE 13

Beacon Solar Energy Project - KOP 2 - Existing view toward the Project Site from the Public Parking Area of the Jawbone Canyon BLM Ridgecrest Office

SOURCE: AFC Figure 5.15-5a

VISUAL RESOURCES - FIGURE 14

Beacon Solar Energy Project - BLM Ridgecrest Field Office

SOURCE: Staff Photograph

VISUAL RESOURCES - FIGURE 15

Beacon Solar Energy Project - KOP 2 - Simulation of the Proposed Project's Publicly Visible Structures after Completion

SOURCE: AFC Figure 5.15-5b

VISUAL RESOURCES - FIGURE 16

Beacon Solar Energy Project - KOP 3 - Existing view toward the Project Site from the Highway Apron serving the closest Residence West of the Project Site

SOURCE: AFC Figure 5.15-8a

VISUAL RESOURCES - FIGURE 17

Beacon Solar Energy Project - KOP 3 - Simulation of the Proposed Project's Publicly Visible Structures after Completion of Construction

SOURCE: AFC Figure 5.15-8b

VISUAL RESOURCES - FIGURE 18

Beacon Solar Energy Project - KOP 4 - Existing view from Northbound SR 14 towards Project Site

SOURCE: AFC Figure 5.15-6a

VISUAL RESOURCES - FIGURE 19

Beacon Solar Energy Project - KOP 4 - Simulation of the Proposed Project's Visible Structures after Completion of Construction

SOURCE: AFC Figure 5.15-6b

VISUAL RESOURCES - FIGURE 20

Beacon Solar Energy Project - KOP 5 - Existing view of Southbound SR 14 looking towards the location of the Project's Proposed Overhead Transmission Line crossing of the Highway

SOURCE: AFC Figure 5.15-7a

VISUAL RESOURCES - FIGURE 21

Beacon Solar Energy Project - KOP 5 - Simulation of the Proposed Project's Overhead Transmission Line

SOURCE: AFC Figure 5.15-7b

VISUAL RESOURCES - FIGURE 22

Beacon Solar Energy Project - KOP 6 - Existing view from the Public Hiking Trail to Chuckwalla Mountain towards the Project Site

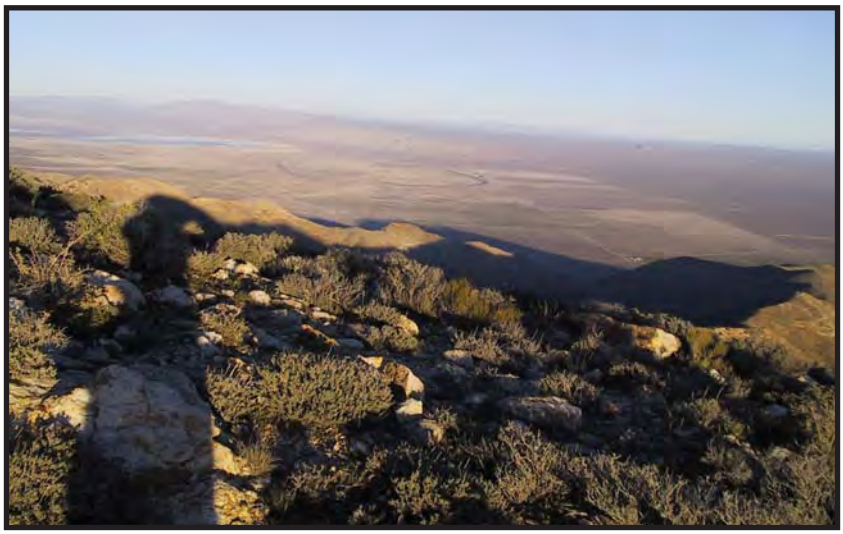
SOURCE: AFC Figure 5.15-9a

VISUAL RESOURCES - FIGURE 23

Beacon Solar Energy Project - Views From Summit of Chuckawalla Mountain of Fremont Valley

North View

East View



South View

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: Southern California Peakbagging and Hiking With Hundred Peaks Section of the Sierra Club

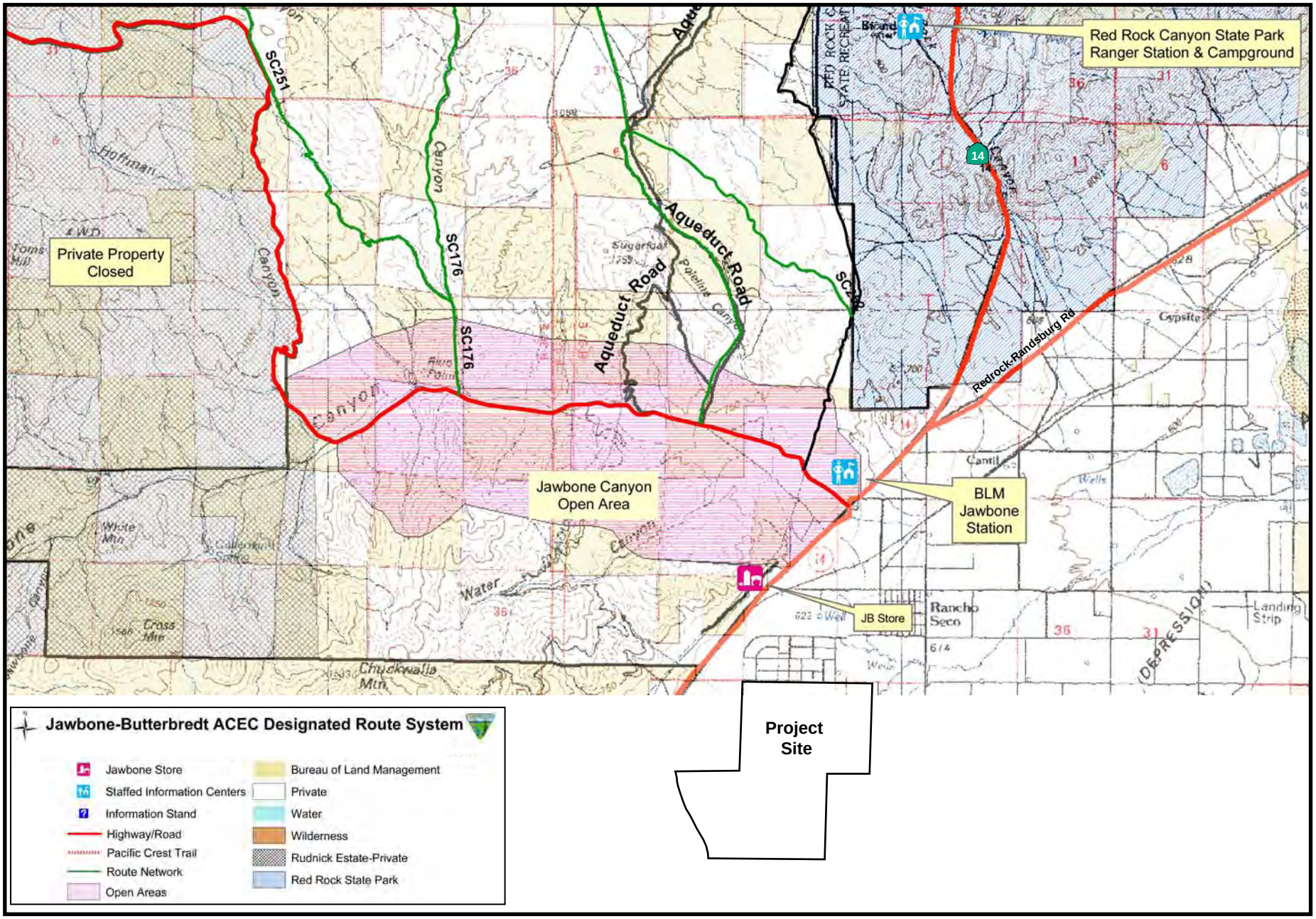
VISUAL RESOURCES - FIGURE 24

Beacon Solar Energy Project - KOP 6 - Simulation of the Proposed Project's Publicly Visible Structures after Completion

SOURCE: AFC Figure 5.15-9b

VISUAL RESOURCES - FIGURE 25

Beacon Solar Energy Project - BLM Managed Land and Red Rock State Park



SOURCE: BLM

VISUAL RESOURCES - FIGURE 26

Beacon Solar Energy Project - Hermosillo Power Plant, Sonora, Mexico - ACC For 350MW Combined Cycle Power Plant

SOURCE: SPX Cooling Technologies

VISUAL RESOURCES - FIGURE 27

Beacon Solar Energy Project - CURE Photographs - Kramer Junction Solar Facility

CURE Photograph Dated April 25, 2009 at 7:00am.

CURE Photograph Dated April 25, 2009 at 7:00am.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: ABJC2009e

WASTE MANAGEMENT

Testimony of Ellie Townsend-Hough

SUMMARY OF CONCLUSIONS

Staff concludes that management of the waste generated during demolition, construction and operation of the Beacon Solar Energy Project (BSEP) would not result in any significant adverse impacts, and would comply with applicable LORS, if the waste management practices and mitigation measures proposed in the BSEP AFC and staff's proposed conditions of certification are implemented.

INTRODUCTION

This Final Staff Assessment (FSA) presents an analysis of issues associated with managing wastes generated from constructing and operating the proposed BSEP project and any hazardous wastes already existing on site because of past activities. Staff has evaluated the proposed waste management plans and mitigation measures designed to reduce the risks and environmental impacts associated with handling, storing, and disposing of project-related hazardous and non-hazardous wastes. The technical scope of this analysis encompasses solid wastes existing on site, and those generated during facility construction and operation. Wastewater issues are more fully discussed in the **Soil and Water Resources** section of this document. Additional information related to waste management may also be covered in the **Worker Safety** and **Hazardous Materials Management** sections of this document.

Energy Commission staff's objectives in its waste management analysis are to ensure that:

- the management of wastes would be in compliance with all applicable laws, ordinances, regulations, and standards (LORS). Compliance with LORS ensures that wastes generated during the construction and operation of the proposed project would be managed in an environmentally safe manner;
- the disposal of project wastes would not result in significant adverse impacts to existing waste disposal facilities; and
- during project operation, the site is managed such that contaminants would not pose a significant risk to humans or to the environment.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following framework of federal, state, and local environmental LORS exists to ensure the safe and proper management of hazardous wastes from generation to disposal in order to reduce the risks of accidents that might impact worker and public health and the environment.

WASTE MANAGEMENT Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
RCRA, Subtitle C and D, 42 USC § 6901 to 6992k, and Section 6.12.2.1	Establishes requirements for the management of solid wastes (including hazardous wastes), landfills, underground storage tanks, and certain medical wastes. The statute also addresses program administration, implementation and delegation to states, enforcement provisions and responsibilities, as well as research, training, and grant funding provisions. RCRA Subtitle C establishes provisions for the generation, storage, treatment, and disposal of hazardous waste, including requirements addressing: • Generator record keeping practices that identify quantities of hazardous wastes generated and their disposition; • Waste labeling practices and use of appropriate containers; • Use of a manifest when transporting wastes; • Submission of periodic reports to the United States Environmental Protection Agency (USEPA) or other authorized agency; and • Corrective action to remediate releases of hazardous waste and contamination associated with RCRA-regulated facilities. RCRA Subtitle D establishes provisions for the design and operation of solid waste landfills. RCRA is administered at the federal level by USEPA and its ten regional offices. The Pacific Southwest regional office (Region 9) implements USEPA programs in California, Nevada, Arizona, and Hawaii.
40 CFR 260, *et seq.*	Contains regulations promulgated by the EPA to implement the requirements of RCRA as described above. Characteristics of hazardous waste are described in terms of ignitability, corrosively, reactivity, and toxicity, and specific types of waste are listed.
Federal CWA, 33 USC § 1251 *et seq.*	Controls discharge of wastewater to the surface waters of the U.S.
Title 40 CFR Section 112	This establishes procedures, methods, equipment, and other requirements to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into or upon the navigable waters of the United States or adjoining shorelines, or into or upon the waters of the contiguous zone, or in connection with activities under the Outer Continental Shelf Lands Act or the Deepwater Port Act of 1974. Subpart B - The Spill Prevention, Control and Countermeasures (SPCC) Plan includes procedures, methods, and equipment at the facility to prevent discharges of petroleum from reaching navigable waters.
State	
Public Resources Code § 40000 *et seq.,* California Integrated Waste Management Act of 1989	Provides an integrated statewide system of solid waste management by coordinating state and local efforts in source reduction, recycling, and land disposal safety. Counties are required to submit Integrated Waste Management Plans to the state.

Title 14, California Code of Regulations (CCR), Division 7, 17200, et seq.	These regulations further implement the provisions of the California Integrated Waste Management Act and set forth minimum standards for solid waste handling and disposal. The regulations include standards for solid waste management, as well as enforcement and program administration provisions.
Porter- Cologne Water Quality Control Act of 1998, Water Code § 13000 *et seq.*	Controls discharge of wastewater to surface waters and groundwaters of California.
Title 22, (CCR), Division 4.5. Environmental Health Standards for the Management of Hazardous Waste	These regulations establish requirements for the management and disposal of hazardous waste in accordance with the provisions of the California Hazardous Waste Control Act and federal RCRA. As with the federal requirements, waste generators must determine if their wastes are hazardous according to specified characteristics or lists of wastes. Hazardous waste generators must obtain identification numbers; prepare manifests before transporting the waste off site; and use only permitted treatment, storage, and disposal facilities. Generator standards also include requirements for record keeping, reporting, packaging, and labeling. Additionally, while not a federal requirement, California requires that hazardous waste be transported by registered hazardous waste transporters. The standards addressed by Title 22, CCR include: • Identification and Listing of Hazardous Waste (Chapter 11, §66261.1, et seq.). • Standards Applicable to Generator of Hazardous Waste (Chapter 12, §66262.10, et seq.). • Standards Applicable to Transporters of Hazardous Waste (Chapter 13, §66263.10, et seq.). • Standards for Universal Waste Management (Chapter 23, §66273.1, et seq.). • Standards for the Management of Used Oil (Chapter 29, §66279.1, et seq.). The Title 22 regulations are established and enforced at the state level by DTSC. Some generator and waste treatment standards are also enforced at the local level by CUPAs.
Title 22, (CCR) § 66262.34	Regulates accumulation periods for hazardous waste generators. Typically, hazardous waste cannot be stored onsite for more than 90 days.
Title 23, (CCR) Division 3, Chapter 30	This Chapter requires the submission of analytical test results and other monitoring information electronically over the internet to the State Water resources Control Board's Geotracker data base.
Title 22, CCR, Section §66260.20(f), Chapter 10, Article 3, Classification of a Waste as	If a person wishes to classify and manage as nonhazardous a waste which would otherwise be a non-RCRA hazardous waste because it has mitigating physical or chemical characteristics which render it insignificant as a hazard to human health and safety, livestock and wildlife, that person shall apply to the Department of Toxic Substances Control (DTSC) for its approval to classify and

Hazardous or Nonhazardous.	manage the waste as nonhazardous.
California Health and Safety Code (HSC) § 25100 *et seq.* (Hazardous Waste Control Act of 1972, as amended)	Creates the framework under which hazardous wastes must be managed in California. It mandates the DTSC under the California Environmental Protection Agency (CalEPA), to develop and publish a list of hazardous and extremely hazardous wastes and to develop and adopt criteria and guidelines for the identification of such wastes. It also requires hazardous waste generators to file notification statements with Cal EPA and create a manifest system to be used when transporting such wastes.
Title 27, CCR, §15100 et seq. (Unified Hazardous Waste and Hazardous Materials Management Regulatory Program)	Consolidates, coordinates, and makes consistent portions of the following six existing programs: • Hazardous Waste Generators and Hazardous Waste Onsite Treatment; • Underground Storage Tanks; • Hazardous Material Release Response Plans and Inventories; • California Accidental Release Prevention Program; • Aboveground Storage Tanks (spill control and countermeasure plan only); • Uniform Fire Code Hazardous Material Management Plans and Inventories; The statute requires all counties to apply to the CalEPA Secretary for the certification of a local unified program agency.
Title 14, CCR, §17200 et seq. (Minimum Standards for Solid Waste Handling and Disposal)	Sets forth minimum standards for solid waste handling and disposal, guidelines to ensure conformance of solid waste facilities with county solid waste management plans and the California Integrated Waste Management Board, as well as enforcement and administration provisions.
Title 23, CCR, Chapter 15	The regulation in this chapter establishes waste and site classification and waste management requirements for waste treatment storage, or disposal in landfills, surface impoundments, waste piles and land treatment facilities.
Local	
Health and Safety: Kern County Ordinance, Title 8	Establish requirements for the use, generation, storage, and disposal of hazardous materials and wastes within Kern County.

SETTING

The proposed BSEP is a 250 megawatt (MW) concentrated solar electric generating facility (BS 2008a, page.2-1). The facility will be located on approximately 2,012 acres of land, adjacent to California State Route 14 just north of the community of California City, in an unincorporated area of eastern Kern County, California in the western edge of the Mojave Desert (BS 2008a, page 2-1).

The solar plant is made up of parabolic trough solar thermal technology producing electrical power using a steam turbine generator that is fed from a solar steam generator. Heat transfer fluid (HTF) from the heat collection element located at the focus of the parabolic trough solar collectors circulates through a series of heat exchangers where the fluid generates high-pressure steam in the solar steam generator

at the power block, which provides steam to the project's steam turbine generator; power will be generated by the steam turbine generator (BS 2008a, Section 2.5). Natural gas is used to fuel two auxiliary boilers which will reduce plant start-up time and will supply steam for freeze protection for the HTF (BS 2008a, page 2-1).

The project will also use three 2.7-acre surface impoundments, which are double lined evaporation ponds and 800-feet by 800-feet Land Treatment Unit (LTU). The evaporation ponds will be used for the disposal of process wastewater generated primarily as spent cooling water and process water. In the BSEP Project Design Refinements, the applicant is proposing to build a LTU treat soil that may be contaminated from potential HTF spills (DB 2009r Attachment 6). Pursuant to CCR, title 27, section 20250, the surface impoundments and the land treat unit are classified as Class II waste management units.

A Spill Prevention Control Countermeasure Plan (SPCC) will be required. BSEP will comply with the Federal Code of Regulations (40 CFR 112 Subpart B) which pertains to the SPCC rule. This federal regulation requires owners or operators of non-transportation-related bulk petroleum storage facilities that have an aggregate aboveground storage capacity greater than 1,320 gallons or a buried storage capacity greater than 42,000 gallons to prepare and maintain a site-specific SPCC Plan for their facility. The SPCC Plan contains information on procedures; methods and equipment at the BSEP that are in place to prevent discharges of petroleum from reaching navigable waters. The plan would include measures for addressing discharges of HTF. The requirements for a SPCC Plan for the project are further discussed in the **Hazardous Materials Management** section of the FSA.

Hazardous and non-hazardous solid and liquid waste, including wastewater, would be generated at the BSEP project during construction and operation of the power plant. Waste would be recycled where practical and non-recyclable waste would be deposited in a Class III landfill. The hazardous waste generated during this phase of the project would consist of electrical equipment, used oils, universal wastes, solvents, and empty hazardous waste containers (BS 2008a, section 5.16.3.1). Universal wastes are hazardous wastes that contain mercury, lead, cadmium, copper, and other substances hazardous to human and environmental health. Examples of universal wastes are batteries, fluorescent tubes, and electronic devices.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

This waste management analysis addresses: a) existing project site conditions and the potential for contamination associated with prior activities on or near the project site, and b) the impacts from the generation and management of wastes during project construction and operation.

For any site in California proposed for the construction of a power plant, the applicant must provide documentation about the nature of any potential or existing releases of hazardous substances or contamination at the site. If potential or existing releases or contamination at the site are identified, the significance of the release or contamination

would be determined by site-specific factors, including, but not limited to: the amount and concentration of contaminants or contamination; the proposed use of the area where the contaminants/contamination is found; and any potential pathways for workers, the public, or sensitive species or environmental areas to be exposed to the contaminants. Any unmitigated contamination or releases of hazardous substances that pose a risk to human health or environmental receptors would be considered significant by Energy Commission staff.

As a first step in documenting existing site conditions, the Energy Commission's power plant site certification regulations require that a Phase I Environmental Site Assessment (ESA) be prepared[1] and submitted as part of an AFC. The Phase I ESA is conducted to identify any conditions indicative of releases and threatened releases of hazardous substances at the site and to identify any areas known to be contaminated (or a source of contamination) at or near the site.

In general, the Phase I ESA uses a qualified environmental professional to conduct inquiries into past uses and ownership of the property, research hazardous substance releases and hazardous waste disposal at the site and within a certain distance of the site, and visually inspect the property, making observations about the potential for contamination and possible areas of concern. After conducting all necessary file reviews, interviews, and site observations, the environmental professional then provides findings about the environmental conditions at the site. In addition, since the Phase I ESA does not include sampling or testing, the environmental professional may also give an opinion about the potential need for any additional investigation. Additional investigation may be needed, for example, if there were significant gaps in the information available about the site, an ongoing release is suspected, or to confirm an existing environmental condition.

If additional investigation is needed to identify the extent of possible contamination, a Phase II ESA may be required. The Phase II ESA usually includes sampling and testing of potentially contaminated media to verify the level of contamination and the potential for remediation at the site.

In conducting its assessment of the proposed project, Energy Commission staff will review the project's Phase I ESA and work with the appropriate oversight agencies as necessary to determine if additional site characterization work is needed and if any mitigation is necessary at the site to ensure protection of human health and the environment from any hazardous substance releases or contamination identified.

Regarding the management of project-related wastes generated during construction and operation of the proposed project, staff reviewed the applicant's proposed solid and hazardous waste management methods to determine whether or not the proposed waste management methods are consistent with the LORS identified for waste disposal and recycling. The federal, state, and local LORS represent a comprehensive regulatory system designed to protect human health and the environment from impacts associated

[1] Title 20, California Code of Regulations, section 1704(c) and Appendix B, section (g)(12)(A). Note that the Phase I ESA must be prepared according to American Society for Testing and Materials protocol or an equivalent method agreed upon by the applicant and the Energy Commission staff.

with management of both non-hazardous and hazardous wastes. Absent any unusual circumstances, staff considers project compliance with LORS to be sufficient to ensure that no significant impacts would occur as a result of project waste management.

Staff then reviewed the capacity available at off-site treatment and disposal sites and determined whether or not the proposed power plant's waste would impact the available capacity.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Existing Site Conditions

The facility will be located on approximately 2,012 acres of land. BSEP would be located adjacent to California State Route 14 just north of the community of California City, in an unincorporated area of eastern Kern County, California on the western edge of the Mojave Desert. Three groups of parcels were purchased for the project site. Four individual Phase I Environmental Site Assessments (ESAs) were completed for the project. The first group of parcels consists of 24 parcels covering 2,273 acres, which included the Fremont Valley Ranch complex (DB 2008d, Data Request 54), although the project will be developed on 2,012 acres of the ranch site. The Fremont Valley Ranch was developed in 1977 as an alfalfa farm. The agricultural activities ceased in the mid-1980s (BS 2008a, page 5.16-10). Two additional Phase I ESAs were completed for 14-acre and 80-acre parcels of undeveloped land (DB 2008d, Data Responses 54 and 55). Refer to **WASTE MANAGEMENT Figure 1.** The majority of parcels consist of desert that has been disturbed by past agricultural practices associated with alfalfa farming. With the exception of the main Ranch complex, 12 widely scattered irrigation wells, and several barn structures, the majority of the parcels are undeveloped land. A Phase I ESA was conducted along the transmission line route and it was determined that no recognized environmental conditions (REC), or historical RECs were identified along the pipeline route (DB 2008j, Data Request-56).

WASTE MANAGEMENT Figure 2 shows the location of recognized environmental conditions (REC's) that were identified during the Phase I ESAs. These RECs include underground storage tanks, buildings and irrigation wells in relation to the BSEP plant site boundary. Except for an open barn structure in the middle of the property and an irrigation water reservoir, all of the buildings and underground fuel storage tanks are located within the Fremont Valley Ranch complex, the group of buildings that is just south of the access road that goes onto the site from SR-14 (DB 2008j). None of the Fremont Valley Ranch complex will be within the fenced BSEP Plant Site. Note that all recognized environmental conditions are located outside the plant site boundary. Any environmental conditions that may result in an impact would not be mitigated as a part of this project.

Construction Impacts and Mitigation

Site preparation and construction of the proposed project and its associated facilities would last approximately 25 months (BS 2008a, page 1-3) and generate both non-hazardous and hazardous wastes in solid and liquid forms. Before construction can begin, the project owner will be required to develop and implement a Construction Waste Management Plan as described in the proposed Condition of Certification

WASTE-1. This plan must describe all waste streams and methods of managing each waste. Implementation of this plan will ensure that wastes are managed in accordance with appropriate LORS.

Non-Hazardous Wastes

Construction activities as described in the AFC would include site clearing and grading, installation of footings, and installation of the parabolic troughs (BS 2008a, Table 2.14-1). Construction non-hazardous solid waste, totaling about 40 cubic yards per week, would consist of paper, wood, glass, plastics from packing material, waste lumber, insulation, scrap metal and concrete, and empty non-hazardous chemical containers (BS 2008a,, Table 5.16-5). All non-hazardous wastes would be recycled to the greatest extent possible and non-recyclable wastes would be collected by a licensed hauler and disposed of in a solid waste disposal facility (Class III landfill), per Title 14, California Code of Regulations, Section 17200 et seq. (*Minimum Standards for Solid Waste Handling and Disposal*), or in clean fill sites (BS 2008a, page 5.16-12). Staff proposes Condition of Certification **WASTE-2** which will require the applicant to identify facilities receiving waste and maintain documentation showing the type and volume of waste disposed. This information shall be maintained at the project site and made accessible to regulatory agencies.

Non-hazardous liquid wastes would be generated during construction, and would include sanitary waste (BS 2008a, page 5.16-11). Please see the **Soil and Water Resources** section of this document for more information on the management of project wastewater.

Hazardous Wastes

During construction, anticipated hazardous wastes include waste paint, spent construction solvents, waste cleaners, waste oil, oily rags, waste batteries, and spent welding materials. Approximately 175 gallons of solvents, used oil, paint and oily rags, and 1,000 gallons of Chelant (a heat exchanger cleaning waste), plus 30 batteries, would be generated from construction of the project (BS 2008a, page 5.16-11). Empty hazardous material containers would be returned to the vendor or disposed at a hazardous waste facility; solvents, used oils, paint, oily rags, and adhesives would be recycled or disposed at a hazardous waste facility; and spent batteries would be disposed at a recycling facility (BS 2008a, Table 5.16-5 page 5.16-11).

The construction contractor is considered to be the generator of hazardous wastes at this site during construction. The construction contractor would be required to obtain a unique hazardous waste generator identification number for the site prior to starting construction, pursuant to proposed Condition of Certification **WASTE-3**. This would ensure compliance with California Code of Regulation Title 22, Division 4.5. Although the hazardous waste generator number is determined based on site location, both the construction contractor and the project owner/operator could be considered the generator of hazardous wastes at the site. Hazardous waste would be collected in hazardous waste accumulation containers and stored in a lay down area, warehouse/shop area, or storage tank on equipment skids for less than 90 days. The accumulated wastes would then be properly manifested, transported, and disposed of at a permitted hazardous waste management facility by licensed hazardous waste

collection and disposal companies. Staff reviewed the disposal methods in AFC Section 5.16.3.1 and concluded that all wastes would be disposed of in accordance with all applicable LORS.

In the event that construction excavation, grading, or trenching activities for the proposed project encounter potentially contaminated soils and/or specific handling, disposal, and other precautions that may be necessary pursuant to hazardous waste management LORS, staff finds that proposed Conditions of Certification **WASTE-4** and **WASTE-5** would be adequate to address any soil contamination contingency that may be encountered during construction of the project and would ensure compliance with LORS. Absent any unusual circumstances, staff considers project compliance with LORS to be sufficient to ensure that no significant impacts would occur as a result of project waste management activities.

Operation Impacts and Mitigation

The proposed BSEP would generate both non-hazardous and hazardous wastes in solid and liquid forms under normal operating conditions. Table 5.16-6 of the project AFC gives a summary of the operation waste streams, expected waste volumes and generation frequency, and management methods proposed. Before operations can begin, the project owner would be required to develop and implement an Operations Waste Management Plan as required in the proposed Condition of Certification **WASTE-6**. This would ensure that an accurate record is maintained of the project's waste storage, generation, and disposal, and compliance with waste regulations is maintained during operation.

Heat Transfer Fluid Waste

The BSEP will use solar thermal technology to power a steam-turbine generator. The solar collectors consist of parabolic trough mirrors that heat Therminol VP-1, a petroleum based oil that serves as a heat transfer fluid (HTF). This oil or HTF is a mixture of 26.5 percent biphenyl and 73.5 percent diphenyl oxide. The HTF is circulated through a solar steam generator where it transfers heat and generates high pressure steam that turns a steam turbine generator and produces electrical power (BS 2008a page 2-9).

Occasional spills of HTF from either equipment failure or human error can result in the generation of contaminated soil. HTF spills typically spread laterally on the bare ground and soak down to a relatively shallow depth. In these cases, the soil must be removed from the spill site and properly managed. The oil is regulated as a hazardous material by the State of California due to the constituent biphenyl. Biphenyl is listed in Title 22, CCR, Chapter 11 Appendix X (list #299) as an extremely hazardous waste. The listing of a chemical in Appendix X creates the regulatory presumption that a waste containing that chemical (i.e. HTF contaminated soil) is hazardous unless determined otherwise, pursuant to specified procedures.

In recent e-mail communication from DTSC (CEC 2009t), they indicated that the determination of whether a discharge of HTF constituted a hazardous waste would need to be made on a case by case basis. Title 22, CCR, section 66260.200(f) places the responsibility of determining whether a waste must be classified as hazardous on the

generator of that waste. They also indicated that once a generator establishes a history of managing waste discharges and develops a sufficient data set for characterization of the discharges as hazardous or non-hazardous, DTSC could be petitioned for their concurrence on a standardized waste classification for HTF contaminated soils generated at the facility (Title 22, CCR, section 66260.200(d)). Depending on DTSC findings an operator could modify their operations to standardize treatment and eliminate the need for case by case determinations.

The project owner has operated Luz Solar Energy Generating Stations (SEGS) III through IX using the same technology since 1989. The SEGS plants are located in San Bernardino County. The older facilities have a history of using, storing and treating HTF contaminated soils on-site in bioremediation units and LTUs, primarily LTUs. The California Department of Toxic Substances Control (DTSC) in an April 4, 1995, letter determined that a sample of soil contaminated with HTF in concentrations of less than 10,000 mg/kg was classified as a non-hazardous waste. Soils with concentrations below 10,000 mg/kg were placed in the LTU for treatment and are used as back fill material on the project property. Soil with concentrations in excess of 10,000 mg/kg is contained, handled, managed, and disposed of as a hazardous waste at an approved disposal facility. These criteria are currently used as a basis for ongoing operation of the facility. Also, based on their operation data from this facility, the applicant estimates that approximately 750 cubic yards of HTF-affected soil may be treated per year at the proposed project site.

Revised Figure 7 in the BSEP Project Design Refinement (DB 2009t, Attachment 6, page 8) presents a flow diagram of the management and treatment of the HTF-affected soil proposed by the applicant. Spills of HTF at BSEP would be cleaned up within 48 hours, and the contaminated soil would be placed in the staging area of the LTU and covered with plastic sheeting. Samples of excavated HTF contaminated soil would be collected in accordance with the United States Environmental Protection Agency's (USEPA) current version of the manual "Test Methods for Evaluating Solid Waste" (SW-846). The waste material would be characterized in accordance with State and Federal requirements and the results would be submitted to DTSC for a determination of the appropriate disposal method based on whether the waste is considered hazardous or non-hazardous. HTF contaminated soil would remain in the LTU staging area until the impacted soils are properly characterized using modified USEPA Method 8015. Modified USEPA Test Method 8015 is the most common test method used for analyzing total petroleum hydrocarbon (TPH). TPH is defined as the measurable amount of petroleum-based hydrocarbon in an environmental media. The method reports the concentration of purgeable and extractable hydrocarbons, such as gasoline and diesel range organics. Soil characterized as hazardous waste would be transported from the site by a licensed hazardous waste hauler for disposal at a Class I landfill. Soils characterized as non-hazardous would remain and be treated in the LTU.

The applicant has also proposed that once a history of discharges has been established they may petition DTSC, as described above, for their concurrence on a standardized waste classification for HTF contaminated soils generated at the facility. Depending on DTSC findings the applicant would modify their operations to standardize treatment and eliminate the need for case by case determinations.

The applicant's proposed treatment and disposal methods are generally consistent with and would provide for compliance with the Requirements of Waste Discharge established by the Lahontan Regional Water Quality Control Board (LRWQCB) and presented in **Soil and Water Resources Appendices E, F, and H**. Staff proposes Condition of Certification **WASTE-7** to address the Requirements of Waste Discharge. This would require the applicant to comply with the requirements for accidental discharges of HTF associated with the operation of the project and ensure that hazardous concentrations of contaminated HTF-soil will not be treated in the LTU. With implementation of Condition of Certification **WASTE-7** staff believes there would be no significant impacts due to HTF spills during project operation.

Non-hazardous Solid Wastes

Non-hazardous solid wastes generated during project operations would consist of HTF waste from spills, spent dematerialized resin, cooling tower basin sludge, and spent softener resin. To ensure proper disposal of the 10 tons per year of cooling tower basin sludge, staff proposes **WASTE-8** which requires that the project owner perform the appropriate tests to classify the waste and determine the appropriate method of disposal. Wastes would be recycled to the greatest extent possible and non-recyclable wastes would be removed on a regular basis for disposal in a Class III landfill (BS 2008a, pages 5.16-8 to 5.16-9). The project would generate approximately 800 cubic yards of non-hazardous solid waste per year (BS 2008a, page 5.16-13).

Non-hazardous Liquid Wastes

Non-hazardous liquid wastes generated during the project's operation are further discussed in the **Soil and Water Resources** section of this document. Non-hazardous cooling tower blowdown and the sanitary wastewater would be disposed of in evaporation ponds and a septic leach field, respectively. Stormwater drainage would be drained away from the site to collection ponds and swales, from which the water would percolate or evaporate. Stormwater that comes in contact with hazardous wastes would also be considered hazardous liquid waste. These hazardous liquid wastes are discussed below.

Hazardous Wastes

The project owner/operator would be considered the generator of hazardous wastes at the site during facility operations. Therefore, the project owner's unique hazardous waste generator identification number, obtained prior to construction in accordance with proposed Condition of Certification **WASTE-3**, would be retained and used for hazardous waste generated during facility operation.

The generation of hazardous wastes expected during routine project operation includes used hydraulic fluids, oils, greases, oily filters and rags, spent selective catalytic reduction catalysts, cleaning solutions and solvents, and batteries. In addition, spills and unauthorized releases of hazardous materials or hazardous wastes may generate contaminated soils or materials that may require corrective action and management as hazardous waste. Proper hazardous material handling and good housekeeping practices will help keep spill wastes to a minimum. However, to ensure proper cleanup and management of any contaminated soils or waste materials generated from hazardous materials spills, staff proposes Condition of Certification **WASTE-9** requiring

the project owner/operator to report, clean up, and remediate as necessary, any hazardous materials spills or releases in accordance with all applicable federal, state, and local requirements. More information on hazardous material management, spill reporting, containment, and spill control and countermeasures plan provisions for the project are provided in the **Hazardous Materials Management** section of the FSA.

The hazardous wastes generated during the operation of BSEP would be minor, with source reduction and recycling of wastes implemented whenever possible. The hazardous wastes would be temporarily stored on site, transported off site by licensed hazardous waste haulers, and recycled or disposed at authorized disposal facilities in accordance with established standards applicable to generators of hazardous waste (Title 22, CCR, §§ 66262.10 et seq.).

Impact on Existing Waste Disposal Facilities

Non-hazardous Solid Wastes

Non-hazardous waste disposal sites suitable for discarding project-related construction and operation wastes are identified in Section 5.16.2.1 of the AFC (BS 2008a). Non-hazardous solid waste would be disposed at the six permitted Class III landfills located in Kern County. As shown on Table 5.16-4 of the AFC, combined the six landfills have 65 million cubic yards of remaining capacity to operate through their estimated closure dates which vary from 2014 through 2038 (BS 2008a, page 5.16-8). Staff believes that the disposal of the solid wastes generated by BSEP can occur without significantly impacting the capacity or remaining life of any of the facilities located in Kern County.

Hazardous Wastes

Section 5.16.2.2 of the AFC discusses two of California's Class I landfills: Clean Harbor's Buttonwillow landfill in Kern County and Waste Management's Kettleman Hills landfill in Kings County (BS 2008a, page 5.16-9). The Kettleman Hills facility accepts Class I waste. In total, there is a combined excess of 16 million cubic yards of remaining hazardous waste disposal capacity at these landfills, with at least 30 years remaining in their operating lifetimes. In addition, the Kettleman Hills facility is in the process of permitting an additional 15 million cubic yards of disposal capacity, and the Buttonwillow facility has 40 years to reach its capacity at its current disposal rate (BS 2008a, page 5.16-9).

Hazardous wastes generated during construction and operation would be recycled to the extent possible and practical. Those wastes that cannot be recycled would be transported off site to a permitted treatment, storage, or disposal facility. The approximately 4 tons of hazardous waste from the BSEP requiring off-site disposal is estimated to occupy less than 10 cubic yards. This volume would be much less than the remaining capacity of either Class I waste facility. Staff believes that disposal of hazardous wastes generated by BSEP can occur without significantly impacting the capacity or remaining life of these facilities. Staff believes that the disposal of the hazardous wastes generated by BSEP can occur without significantly impacting the capacity or remaining life of any of the Class I landfills.

CUMULATIVE IMPACTS

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. “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 [14 Cal. Code Regs., § 15065(A)(3)]. Cumulative impacts can result from actions taking place over time in the same area that are minor when taken individually, but are collectively significant. No projects have been identified in the project vicinity that would create significant cumulative waste management impacts when considered together with the BSEP.

COMPLIANCE WITH LORS

Energy Commission staff concludes that the BSEP would comply with all applicable LORS regulating the management of hazardous and non-hazardous wastes during both facility construction and operation. The project owner is required to recycle and/or dispose hazardous and non-hazardous waste at facilities licensed or otherwise approved to accept the wastes. Because hazardous wastes would be produced during project operation, the BSEP would be required to obtain a hazardous waste generator identification number from U.S. EPA. The BSEP would also be required to properly store, package, and label waste; use only approved transporters; prepare hazardous waste manifests; keep detailed records; and appropriately train employees, in accordance with state and federal hazardous waste management requirements.

Staff has determined that management of the waste generated during construction and operation would comply with waste management laws, ordinances, regulations, and standards.

RESPONSE TO AGENCY PUBLIC AND INTERVENOR COMMENTS

Staff received a letter from the Department of Toxic Substances Control (DTSC). The comments in the letter stated that “DTSC has no concerns regarding the future management of hazardous waste at the proposed Beacon Solar Energy Project” (DTSC 2008A).

Bill O’Rullian, Supervisor Solid Waste Program, Kern County Environmental Health Services Department requested a requirement of the project owner to assure "cradle to grave" accountability for waste streams generated at the facility, and prevent illegal dumping, off-site stockpiles, or conditions that constitute a zoning violation or public health nuisance in the counties of Kern, Los Angeles, and San Bernardino. Staff has added Condition of Certification **WASTE-2** to address this concern.

California Unions for Reliable Energy (CURE) offered comments on staff’s Preliminary Staff Assessment pertaining to the classification of HTF-contaminated soil (ABJC 2009f pages 55 -57). CURE disputed the project owner’s use of a HTF waste classification that was established in a DTSC April 4, 1995 letter. The applicant has revised the mitigation for HTF-contaminated soil in the BSEP Project Design Refinements.

CONCLUSIONS

Consistent with the three main objectives for staff's waste management analysis (as noted in the Introduction section of this analysis), staff provides the following conclusions:

1. After review of the applicant's proposed waste management procedures, staff concludes that project wastes would be managed in compliance with all applicable waste management LORS. Staff notes that both construction and operation wastes would be characterized and managed as either hazardous or non-hazardous waste. All non-hazardous wastes would be recycled to the extent feasible, and non-recyclable wastes would be collected by a licensed hauler and disposed of at a permitted solid waste disposal facility. Hazardous wastes would be accumulated onsite in accordance with accumulation time limits (90,180, 270, or 365 days depending on waste type and volumes generated), and then properly manifested, transported to, and disposed of at a permitted hazardous waste management facility by licensed hazardous waste collection and disposal companies.

   However, to help ensure and facilitate ongoing project compliance with LORS, staff proposes Conditions of Certification **WASTE-1** through **9**. These conditions would require the project owner to do all of the following:

   - Ensure the project site is investigated and any contamination identified is remediated as necessary, with appropriate professional and regulatory agency oversight (**WASTE-1**, **3**, **4**, **5**, **7**, and **9**).
   - Obtain a hazardous waste generator identification number (**WASTE-3**).
   - Prepare Construction Waste Management and Operation Waste Management Plans detailing the types and volumes of wastes to be generated and how wastes will be managed, recycled, and/or disposed of after generation (**WASTE-1, 2,** and **6**).
   - Ensure that all spills or releases of hazardous substances are reported and cleaned-up in accordance with all applicable federal, state, and local requirements (**WASTE-7** and **8)**.

2. Existing conditions at the BSEP project site do not indicate there are areas where prior site uses may have resulted in releases of hazardous substances or soil contamination. Therefore, staff concludes that construction and operation of the proposed BSEP project would not result in contamination or releases of hazardous substances that would pose a substantial risk to human health or the environment.

3. Regarding impacts of project wastes on existing waste disposal facilities, the existing available capacity for the three Class III landfills that may be used to manage nonhazardous project wastes exceeds 87 million cubic yards. The total amount of nonhazardous wastes generated from construction and operation of BSEP would be minimal compared to the remaining landfill capacity. Therefore, disposal of project generated non-hazardous wastes would have a less than significant impact on Class III landfill capacity.

In addition, the two Class I disposal facilities that could be used for hazardous wastes generated by the construction and operation of BSEP have a combined remaining capacity in excess of 15 million cubic yards. The total amount of hazardous wastes generated by the BSEP project would contribute less than 0.02 percent of the remaining permitted capacity. Therefore, disposal of BSEP generated hazardous wastes would have a less than significant impact on the remaining capacity at Class I landfills.

Staff concludes that management of the waste generated during demolition, construction and operation of the BSEP project would not result in any significant adverse impacts, and would comply with applicable LORS, if the waste management practices and mitigation measures proposed in the BSEP project AFC, and staff's proposed conditions of certification are implemented.

PROPOSED CONDITIONS OF CERTIFICATION

WASTE-1: The project owner shall prepare a Construction Waste Management Plan for all wastes generated during construction of the facility, and shall submit the plan to the Compliance Project Manager (CPM) for review and approval. The plan shall contain, at a minimum, the following:

- a description of all construction waste streams, including projections of frequency, amounts generated and hazard classifications;
- a survey of structures to be demolished that identifies the types of waste to be managed; and
- management methods to be used for each waste stream, including temporary on-site storage, housekeeping and best management practices to be employed, treatment methods, and companies providing treatment services, waste testing methods to assure correct classification, methods of transportation, disposal requirements and sites, and recycling and waste minimization/reduction plans.

Verification: No fewer than 30 days before the start of site mobilization, the project owner shall submit the Construction Waste Management Plan to the CPM for approval.

WASTE-2: During the construction and operation phase, the project owner shall maintain copies of the contracted waste and/or refuse haulers documentation of each waste load transferred from the construction site to a disposal site and/or recycling center. The project owner shall maintain the haulers lists of the names of permitted solid waste facilities or recycling centers locations receiving the project's construction waste, and copies of all weigh tickets.

Verification: The project owner shall identify permitted solid waste facilities or recycling centers that receive construction waste and maintain copies of weigh tickets and manifests showing the type and volume of waste disposed. This information shall be maintained at the project site and made accessible to CPM and the Kern County Environmental Health Service Department Solid Waste Program.

WASTE-3: The project owner shall obtain a hazardous waste generator identification number from the United States Environmental Protection Agency prior to generating any hazardous waste during project construction and operations.

Verification: The project owner shall keep a copy of the identification number on file at the project site and provide documentation of the hazardous waste generation notification and receipt of the number to the CPM in the next scheduled Monthly Compliance Report after receipt of the number. Submittal of the notification and issued number documentation to the CPM is only needed once unless there is a change in ownership, operation, waste generation, or waste characteristics that requires a new notification to USEPA. Documentation of any new or revised hazardous waste generation notifications or changes in identification number shall be provided to the CPM in the next scheduled compliance report.

WASTE-4: The project owner shall provide the resume of an experienced and qualified Professional Engineer or Professional Geologist, who shall be available for consultation during building removal, and soil excavation and grading activities, to the CPM for review and approval. The resume shall demonstrate experience in remedial investigation and feasibility studies.

The registered professional engineer or geologist shall be given full authority by the project owner to oversee and modify earth-moving activities to prevent the release or disturbance of contaminated soil.

Verification: At least 30 days before the start of site mobilization, the project owner shall submit the resume to the CPM for review and approval.

WASTE-5: If potentially contaminated soil is unearthed during building removal or excavation at either the proposed site or at linear facilities, as evidenced by discoloration, odor, detection by handheld instruments, or other signs, the Professional Engineer or Professional Geologist shall inspect the site, determine the need for sampling to confirm the nature and extent of contamination, and file a written report to the project owner and to the CPM stating the recommended course of action.

Depending on the nature and extent of contamination, the Professional Engineer or Professional Geologist shall have the authority to temporarily suspend further activity at that location for the protection of workers or the public. If, in the opinion of the Professional Engineer or Professional Geologist, significant remediation may be required, the project owner shall contact the CPM and representatives of the Hazardous Materials Division of Kern County's Environmental Health Services Department for guidance and possible oversight.

Verification: The project owner shall submit any final reports filed by the Professional Engineer or Professional Geologist to the CPM within five days of their receipt. The project owner shall notify the CPM within 24 hours of any orders issued to halt construction.

WASTE-6: The project owner shall prepare an Operation Waste Management Plan for all wastes generated during operation of the facility (including construction,

operation and dismantling of the onsite manufacturing building) and shall submit the plan to the CPM for review and approval. The plan shall contain, at a minimum, the following:

- a detailed description of all operation and maintenance waste streams, including projections of amounts to be generated, frequency of generation, and waste hazard classifications;
- management methods to be used for each waste stream, including temporary on-site storage, housekeeping and best management practices to be employed, treatment methods and companies providing treatment services, waste testing methods to ensure correct classification, methods of transportation, disposal requirements and sites, and recycling and waste minimization/source reduction plans;
- information and summary records of conversations with the local Certified Unified Program Agency and the Department of Toxic Substances Control regarding any waste management requirements necessary for project activities. Copies of all required waste management permits, notices, and/or authorizations shall be included in the plan and updated as necessary;
- a detailed description of how facility wastes will be managed and any contingency plans to be employed, in the event of an unplanned closure or planned temporary facility closure; and
- a detailed description of how facility wastes will be managed and disposed upon closure of the facility.

Verification: The project owner shall submit the Operation Waste Management Plan to the CPM for approval no less than 30 days prior to the start of project operation. The project owner shall submit any required revisions to the CPM within 20 days of notification from the CPM that revisions are necessary. The project owner shall also document in each Annual Compliance Report the actual volume of wastes generated and the waste management methods used during the year; provide a comparison of the actual waste generation and management methods used to those proposed in the original Operation Waste Management Plan; and update the Operation Waste Management Plan as necessary to address current waste generation and management practices.

WASTE-7: The project owner shall submit to the CPM and DTSC for approval the applicant's assessment of whether the HTF contaminated soil is considered hazardous or non-hazardous under state regulations. HTF-contaminated soil that exceeds the hazardous waste levels must be disposed of in accordance with California Health and Safety Code (HSC) Section 25203. HTF-contaminated soil that does not exceed the hazardous waste levels may be discharged into the land treatment unit (LTU). For discharges into the LTU, the project owner shall comply with the Waste Discharge Requirements contained within Appendix E, F, and H, in the Soil & Water Resources section of the Final Staff Assessment.

Verification: The project owner shall document all releases and spills of HTF as described in Condition of Certification **WASTE-9** and as required in Appendix E, F, and H, in the Soil & Water Resources section of the Final Staff Assessment. Cleanup and temporary staging of HTF-contaminated soils shall be conducted in accordance with the approved Operation Waste Management Plan required in Condition of Certification of **WASTE-6**. The project owner shall sample HTF-contaminated soil in accordance with the United States Environmental Protection Agency's (USEPA) current version of "Test Methods for Evaluating Solid Waste" (SW-846). Samples shall be analyzed in accordance with USEPA Method 8015 or other method to be reviewed and approved by DTSC and the CPM.

Within 14 days of an HTF spill the project owner shall provide the results of the analyses and their assessment of whether the HTF-contaminated soil is considered hazardous or non-hazardous to DTSC and the CPM for review and approval.

If DTSC and the CPM determine the HTF-contaminated soil is considered hazardous it shall be disposed of in accordance with California Health and Safety Code (HSC) Section 25203 and procedures outlined in the approved Operation Waste Management Plan required in Condition of Certification **WASTE-6** and reported to the CPM in accordance with Condition of Certification **WASTE-9**.

If DTSC and the CPM determine the HTF-contaminated soil is considered non-hazardous it shall be retained in the LTU and treated on-site in accordance with the Waste Discharge Requirements contained within Appendix E, F, and H, in the Soil & Water Resources section of the Final Staff Assessment.

WASTE-8: The project owner shall ensure that the cooling tower basin sludge is tested pursuant to Title 22, California Code of Regulations, and section 66262.10 and report the findings to the CPM. The handling, testing, and disposal methods for sludge shall be identified in the Operation Waste Management Plan required in Condition of Certification **Waste -6**.

Verification: The project owner shall report the results of filter cake testing to the CPM within seven days of sampling. If two consecutive tests show that the sludge is non-hazardous, the project owner may apply to the CPM to discontinue testing. The test results and method and location of sludge disposal shall also be reported in the Annual Compliance Report required in Condition of Certification **Waste -6**.

WASTE-9: The project owner shall ensure that all spills or releases of hazardous substances, materials, or waste are reported, cleaned up, and remediated as necessary, in accordance with all applicable federal, state, and local requirements.

Verification: The project owner shall document all unauthorized releases and spills of hazardous substances, materials, or wastes that are in excess of reportable quantities (RQs) that occur on the project property or transmission corridors during

construction and on the project property during operation. The documentation shall include, at a minimum, the following information:

- location of release;
- date and time of release;
- reason for release;
- volume released;
- amount of contaminated soil/material generated;
- how release was managed and material cleaned up;
- if the release was reported;
- to whom the release was reported;
- release corrective action and cleanup requirements placed by regulating agencies;
- level of cleanup achieved and actions taken to prevent a similar release or spill; and
- disposition of any hazardous wastes and/or contaminated soils and materials that may have been generated by the release.

Copies of the unauthorized spill documentation shall be provided to the CPM within 30 days of the date the release was discovered.

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AECOM 2009b – AECOM Environment/M. Flack (tn 50096). Response to Regional Water Quality Control Board 01/12/09 Comments on Draft Report of Waste Discharge Application, dated 02/10/09. Submitted to CEC/Docket Unit on 02/13/09.

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BS 2008e – Beacon Solar, LLC/G. Palo (tn 46480). Draft Report of Waste Discharge, dated 05/23/08. Submitted to CEC/Docket Unit on 05/28/08.

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CEC 2008e – California Energy Commission/E. Allen (tn 45785). Request for Agency (State and Federal) Participation in the Review the Application for Certification, dated 03/27/08. Submitted to CEC/Docket Unit on 03/27/08.

CEC 2008f – California Energy Commission/E. Allen (tn 45784). Request for Agency (Local) Participation in the Review of the Application for Certification, dated 03/27/08. Submitted to CEC/Docket Unit on 03/27/08.

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CEC 2008j – California Energy Commission/M. Jones (tn 46027). Data Adequacy Recommendation, dated 04/25/08. Submitted to CEC/Docket Unit on 04/28/08.

CEC 2009n – California Energy Commission/E. Solorio (tn 50759). Beacon Preliminary Staff Assessment, dated 4/1/09. Submitted to CEC/Docket Unit on 4/1/09.

CEC 2009t – California Energy Commission/E. Solorio (tn 51934). CEC Staff Dialogue with DTSC Regarding HTF, dated 6/9/09. Submitted to CEC/Docket Unit on 6/11/09.

CEC 2008cc – California Energy Commission/B. Pfanner (tn 46719). Data Requests 1 through 70, dated 06/16/08. Submitted to CEC Docket Unit on 06/16/08.

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CRWQ 2008a – CRWQCB / M. Hakakian (tn 46189). California Regional Water Quality Control Board's Comments on Beacon AFC, dated 04/30/08. Submitted to CEC/Docket Unit on 05/07/08.

DB 2008d – Downey Brand/L. Navarrot (tn 47078). Data Responses 1-70, dated 07/16/08. Submitted to CEC/Docket Unit on 07/16/08.

DB 2008j – Downey Brand/S. Rowland (tn 47103). Phase 1 Environmental Site Assessment. Submitted to CEC/Docket Unit on 07/17/08.

DB 2008n – Downey Brand/ S. Rowlands (tn 48574). Supplemental Responses to CEC Data Request 14 & 17 through 127, dated 10/14/08. Submitted to CEC/Docket Unit on 10/14/08.

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DB 2009t – Downey Brand/S. Rowlands (tn 52163). Applicant Project Design Refinements' Revised Versions of Attachments 7a and 7b, dated 6/25/09. Submitted to CEC/Docket Unit on 6/25/09.

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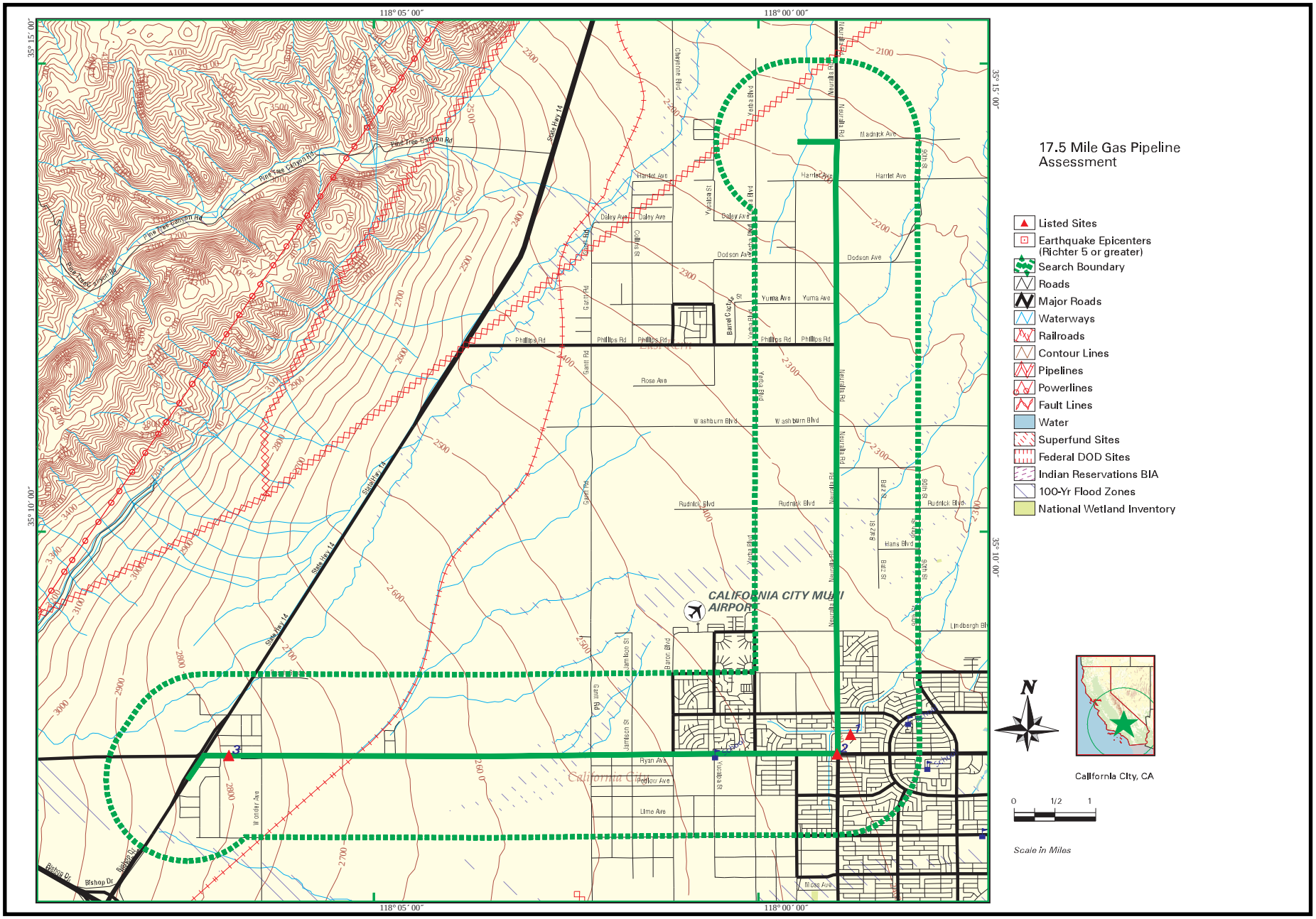
WASTE MANAGEMENT - FIGURE 1

Beacon Solar Energy Project - 17.5 Mile Gas Pipeline Assessment



SEPTEMBER 2009

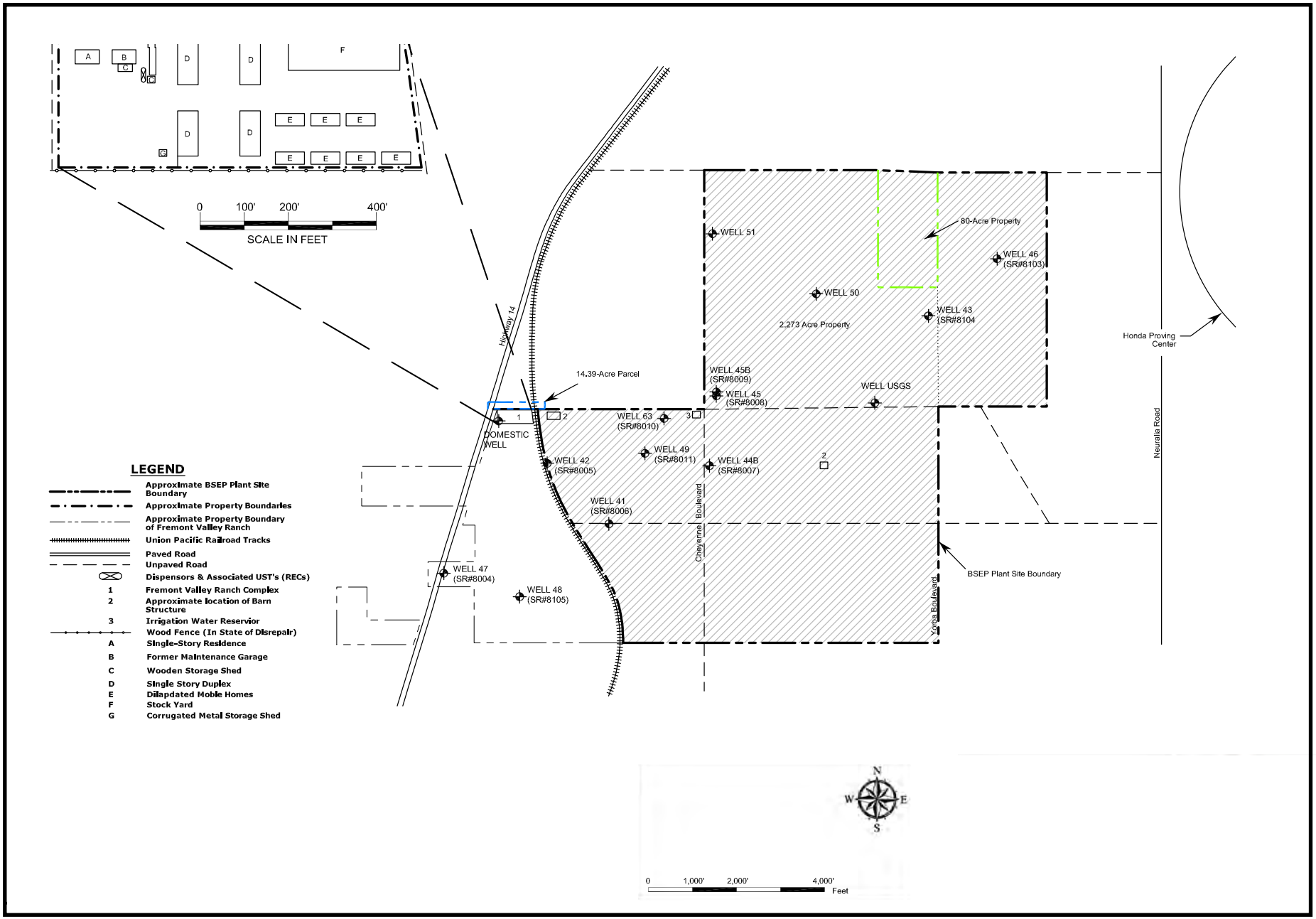
WASTE MANAGEMENT

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: CEC Data Requestes 1-70, July 2008

WASTE MANAGEMENT - FIGURE 2

Beacon Solar Energy Project - Location of Recognized Environment Conditions



SEPTEMBER 2009

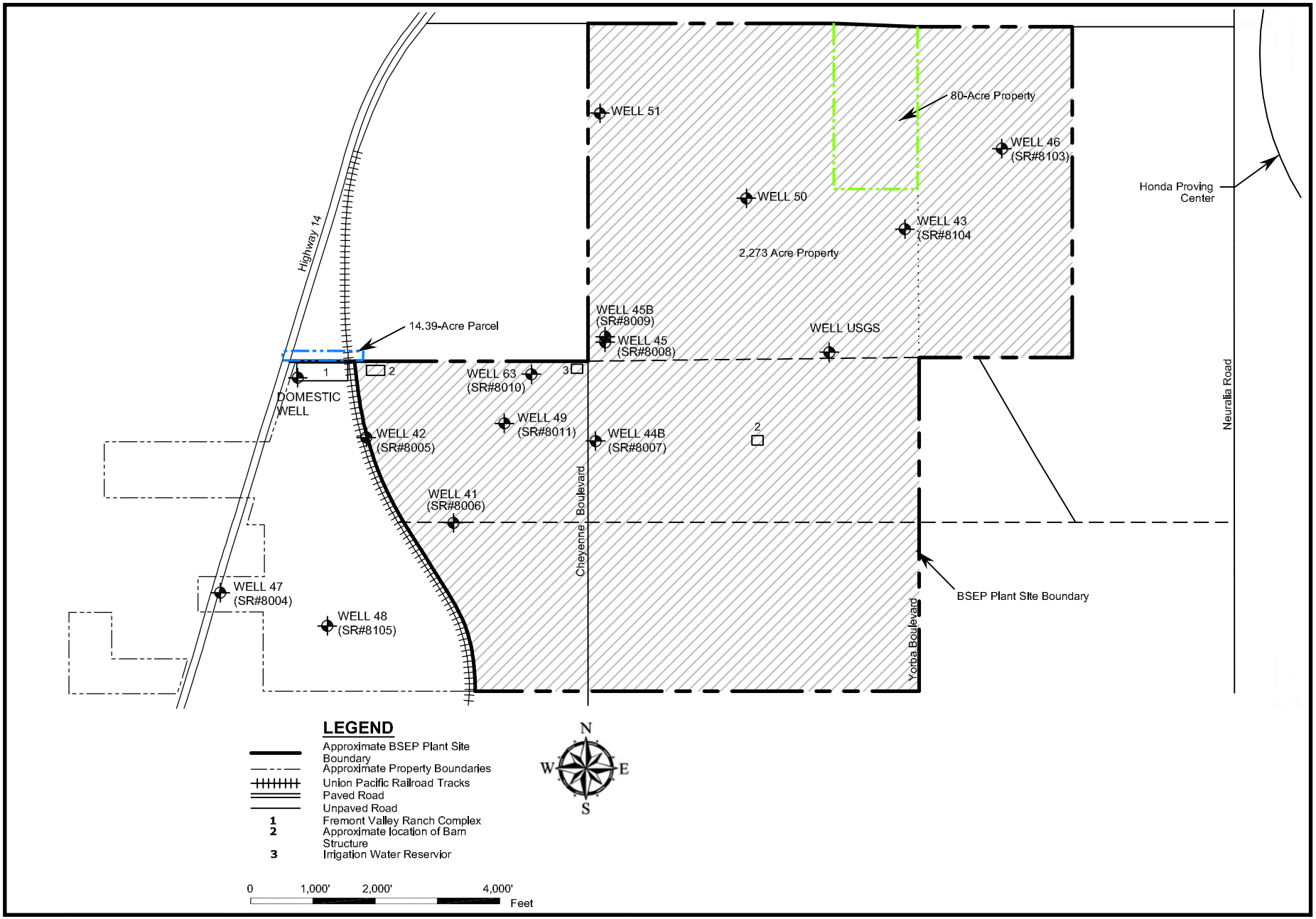
WASTE MANAGEMENT

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: CEC Data Requestes 1-70, July 2008

WASTE MANAGEMENT - FIGURE 3

Beacon Solar Energy Project - Plant Site Boundary and Property Purchases



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: CEC Data Requestes 1-70, July 2008

WORKER SAFETY AND FIRE PROTECTION

Testimony of Geoff Lesh, PE and Rick Tyler

SUMMARY OF CONCLUSIONS

Staff concludes that if the applicant for the proposed Beacon Solar Energy Project (BSEP) provides project construction safety and health, and project operations and maintenance safety and health programs, as required by conditions of certification **WORKER SAFETY -1,** through **-7**, the project would incorporate sufficient measures to both ensure adequate levels of industrial safety and comply with applicable laws, ordinances, regulations, and standards (LORS). These proposed conditions of certification ensure that these programs, proposed by the applicant, will be reviewed by the appropriate agencies before they are implemented. The conditions also require verification that the proposed plans adequately ensure worker safety and fire protection and comply with applicable LORS.

Staff also concludes that the proposed project would not have significant impacts on local fire protection services. The fire risks at the proposed facility do not pose significant added demands on local fire protection services. Staff also concludes that the Kern County Hazmat Team and the Kern County Fire Department (KCFD) are adequately equipped and staffed to respond to hazardous materials incidents at the proposed facility with an adequate response time (Eckroth 2008).

INTRODUCTION

Worker safety and fire protection are regulated through federal, state, and local LORS. Industrial workers at the facility both operate equipment and handle hazardous materials daily, and could face hazards resulting in accidents and serious injury. Protection measures are employed to eliminate or reduce these hazards or minimize their risk through special training, protective equipment, and procedural controls.

The purpose of this preliminary staff assessment (PSA) is to assess the worker safety and fire protection measures proposed by the BSEP applicant and determine whether the applicant has proposed adequate measures to:

- Comply with applicable safety LORS;
- Protect workers during the construction and operation of the facility;
- Protect against fire; and
- Provide adequate emergency response procedures.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

Worker Safety and Fire Protection Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	Description
Federal	
29 U.S. Code sections 651 et seq (Occupational Safety and Health Act of 1970)	This Act mandates safety requirements in the workplace, with the purpose of "[assuring] so far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources" (29 USC § 651).
29 CFR sections 1910.1 to 1910.1500 (Occupational Safety and Health Administration Safety and Health Regulations)	These sections define the procedures for promulgating regulations and conducting inspections to implement and enforce safety and health procedures to protect workers, particularly in the industrial sector.
29 CFR sections 1952.170 to 1952.175	These sections provide federal approval of California's plan for enforcement of its own safety and health requirements, in lieu of most of the federal requirements found in 29 CFR §1910.1 to 1910.1500.
State	
8 CCR all applicable sections (Cal/OSHA regulations)	Requires that all employers follow these regulations as they pertain to the work involved. This includes regulations pertaining to safety matters during the construction, commissioning, and operation of power plants, as well as safety around electrical components, fire safety, and hazardous materials usage, storage, and handling.
24 CCR section 3, et seq.	Incorporates the current edition of the International Building Code.
Health and Safety Code sections 25500 to 25541	Requires a Hazardous Materials Business plan detailing emergency response plans for hazardous materials emergencies at a facility.

Local (or locally enforced)	
2007 Edition of California Fire Code and all applicable NFPA standards (24 CCR Part 9)	NFPA standards are incorporated into the California State Fire Code. The fire code contains general provisions for fire safety, including road and building access, water supplies, fire protection and life safety systems, fire-resistive construction, storage of combustible materials, exits and emergency escapes, and fire alarm systems.
Title 24, California Code of Regulations (24 CCR § 3, et seq.)	The California Building Code is comprised of 11 parts containing building design and construction requirements as they relate to fire, life, and structural safety. It incorporates current editions of the International Building Code, including the electrical, mechanical, energy, and fire codes applicable to the project.

SETTING

Fire support services to the site will be under the jurisdiction of the Kern County Fire Department (KCFD). Station 14 is 19 miles from the project site, located at 1953 Highway 58, Mojave, California, and would be the first responder to BSEP with a response time of approximately 23 minutes. Kern County Fire Department also has mutual aid agreements with California City Fire Department and Edwards Air Force Base for responses requiring more assistance.

In Kern County, hazardous materials permits and spills are handled and investigated by KCFD. Kern County firefighters receive specialized training to address emergency responses to industrial hazards, and response would come from the same facilities as for fire services response.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Two issues are assessed in **WORKER SAFETY AND FIRE PROTECTION**:

1. The potential for impacts on the safety of workers during demolition, construction, and operation activities; and

2. Fire prevention/protection, emergency medical response, and hazardous materials spill response during demolition, construction, and operations.

Worker safety is essentially a LORS compliance matter and if all LORS are followed, workers will be adequately protected. Thus, the standard for staff's review and determination of significant impacts on worker health is whether the applicant has demonstrated adequate knowledge of and commitment to implementation of all pertinent and relevant Cal-OSHA standards.

Staff reviews and evaluates the on-site fire-fighting systems proposed by the applicant, as well as the time needed for off-site local fire departments to respond to a fire, medical, or hazardous material emergency at the BSEP site. If on-site systems do not follow established codes and industry standards, staff recommends additional measures. Staff reviews local fire department capabilities and response times, and interviews local fire officials to determine if they feel they are adequately staffed, and equipped to respond to the needs of a power plant. Staff then determines if the presence of the power plant would cause a significant impact on a local fire department. If it does, staff will recommend that the applicant mitigate this impact by providing additional resources to the fire department.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Worker Safety

Industrial environments are potentially dangerous during both construction and operation. Workers at the proposed project will be exposed to loud noises, moving equipment, trenches, and confined space entry and egress. Workers may sustain falls, trips, burns, lacerations, and other injuries. They may be exposed to falling equipment or structures, chemical spills, hazardous waste, fires, explosions, and electrical sparks or electrocution. It is important that BSEP has well-defined policies and procedures, training, and hazard recognition and control to minimize these hazards and protect workers. If the facility complies with all LORS, workers will be adequately protected from health and safety hazards.

A Safety and Health Program will be prepared by the applicant to minimize worker hazards during construction and operation of the project. “Safety and Health Program,” for staff, refers to measures that will be taken to ensure compliance with the applicable LORS during the construction and operation of the project.

Construction Safety and Health Program

BSEP includes the construction and operation of a hybrid power plant, that includes liquefied petroleum gas (LPG,and also known as propane) boilers and solar thermal generating equipment. For the Power Block, workers will be exposed to hazards typical of construction and operation of a gas-fired simple-cycle facility, while the solar component will present similar construction risks and minimal operational risks to workers.

Construction safety orders are published at Title 8 of the California Code of Regulations, section 1502 et seq. These requirements are promulgated by Cal/OSHA and apply to the construction phase of the project. The construction safety and health program will include the following:

- Construction injury and illness prevention program (8 CCR § 1509);
- Construction fire prevention plan (8 CCR § 1920);
- Personal protective equipment program (8 CCR §§ 1514 - 1522); and
- Emergency action program and plan.

Additional programs under General Industry Safety Orders (8 CCR §§ 3200 to 6184), Electrical Safety Orders (8 CCR §§2299 to 2974) and Unfired Pressure Vessel Safety Orders (8 CCR §§ 450 to 544) will include:

- Electrical safety program;
- Motor vehicle and heavy equipment safety program;
- Forklift operation program;
- Excavation/trenching program;
- Fall protection program;
- Scaffolding/ladder safety program;
- Articulating boom platforms program;
- Crane and material handling program;
- Housekeeping and material handling and storage program;
- Respiratory protection program;
- Employee exposure monitoring program;
- Hand and portable power tool safety program;
- Hearing conservation program;
- Back injury prevention program;
- Hazard communication program;
- Heat and cold stress monitoring and control program;
- Pressure vessel and pipeline safety program;
- Hazardous waste program;
- Hot work safety program;
- Permit-required confined space entry program; and
- Demolition procedure (if applicable).

The AFC includes adequate outlines for each of the above programs (BS 2008a, section 5.18.3.1). Prior to the project's start of construction, detailed programs and plans will be provided pursuant to Condition of Certification **WORKER SAFETY-1**.

Operations and Maintenance Safety and Health Program

Prior to the start-up of BSEP, an operations and maintenance safety and health program will be prepared. This program will include the following programs and plans:

- Injury and illness prevention program (8 CCR § 3203);
- Fire prevention program (8 CCR § 3221);
- Personal protective equipment program (8 CCR §§ 3401 to 3411); and
- Emergency action plan (8 CCR § 3220).

In addition, the requirements under General Industry Safety Orders (8 CCR §§ 3200 to 6184), Electrical Safety Orders (8 CCR §§2299 to 2974) and Unfired Pressure Vessel Safety Orders (8 CCR §§ 450 to 544) will apply to this project. Written safety programs for BSEP, which the applicant will develop, will ensure compliance with those requirements.

The AFC includes adequate outlines for an injury and illness prevention program, an emergency action plan, a fire prevention program, and a personal protective equipment program (BS 2008a, section 5.18.3.1). Prior to operation of BSEP, all detailed programs and plans will be provided pursuant to Condition of Certification **WORKER SAFETY-2**.

Safety and Health Program Elements

As mentioned above, the applicant provided the proposed outlines for both a Construction Safety and Health Program and an Operations Safety and Health Program. The measures in these plans are derived from applicable sections of state and federal law. The major items required in both Safety and Health Programs are as follows:

Injury and Illness Prevention Program (IIPP)

The IIPP will include the following components (BS 2008a, section 5.18.3.1):

- Identify persons with the authority and responsibility for implementing the program;
- Establish the safety and health policy of the plan;
- Define work rules and safe work practices for construction activities;
- Establish a system for ensuring that employees comply with safe and healthy work practices;
- Establish a system to facilitate employer-employee communication;
- Develop procedures for identifying and evaluating workplace hazards and establish necessary program(s);
- Establish methods for correcting unhealthy/unsafe conditions in a timely manner;
- Determine and establish training and instruction requirements and programs;
- Specify safety procedures; and
- Provide training and instruction.

Fire Prevention Plan

The California Code of Regulations requires an operations fire prevention plan (8 CCR § 3221). The AFC outlines a proposed fire prevention plan that is acceptable to staff (BS 2008a, section 5.18.3.1). The plan will include the following:

- Determine general program requirements;
- Determine fire hazard inventory, including ignition sources and mitigation;
- Develop good housekeeping practices and proper materials storage;
- Establish employee alarms and/or communication system(s);

- Provide portable fire extinguishers at appropriate site locations;
- Locate fixed fire fighting equipment in suitable areas;
- Specify fire control requirements and procedures;
- Establish proper flammable and combustible liquid storage facilities;
- Identify the location and use of flammable and combustible liquids;
- Provide proper dispensing and determine disposal requirements for flammable liquids;
- Establish and determine training and instruction requirements and programs; and
- Identify contacts for information on plan contents.

Staff proposes that the applicant submit a final fire prevention plan to the California Energy Commission compliance project manager (CPM) for review and approval and to the KCFD for review and comment to satisfy proposed conditions of certification **WORKER SAFETY-1** and **WORKER SAFETY-2**.

Personal Protective Equipment Program

California regulations require personal protective equipment (PPE) and first aid supplies whenever hazards in the environment, or from chemicals or mechanical irritants, could cause injury or impair bodily function through absorption, inhalation, or physical contact (8 CCR sections 3380 to 3400). The BSEP operational environment will require PPE.

All safety equipment must meet National Institute of Safety and Health (NIOSH) or American National Standards Institute (ANSI) standards and will carry markings, numbers, or certificates of approval. Respirators must meet NIOSH and Cal/OSHA standards. Each employee must be provided with the following information about protective clothing and equipment:

- Proper use, maintenance, and storage;
- When protective clothing and equipment are used;
- Benefits and limitations; and
- When and how protective clothing and equipment are replaced.

The PPE program ensures that employers comply with applicable requirements for PPE and provides employees with the information and training necessary to protect them from potential hazards in the workplace, and will be required as per proposed Conditions of Certification **WORKER SAFETY-1 and -2**.

Emergency Action Plan

California regulations require an emergency action plan (8 CCR § 3220). The AFC contains a satisfactory outline for an emergency action plan (BS 2008a, section 5.18.3.1).

The outline lists the following features:

- Establishes emergency procedures for the protection of personnel, equipment, the environment, and materials;
- Identifies fire and emergency reporting procedures;
- Determines response actions for accidents involving personnel and/or property;
- Develops response and reporting requirements for bomb threats;
- Specifies site assembly and emergency evacuation route procedures;
- Defines natural disaster responses (for example, earthquakes, high winds, and flooding);
- Establishes reporting and notification procedures for emergencies (including on-site, off-site, local authorities, and/or state jurisdictions);
- Determines alarm and communication systems needed for specific operations;
- Includes a spill response, prevention, and countermeasure (SPCC) plan;
- Identifies emergency personnel (response team) responsibilities and notification roster;
- Specifies emergency response equipment and strategic locations; and
- Establishes and determines training and instruction requirements and programs.

An emergency action plan will be required as per proposed Conditions of Certification **WORKER SAFETY-1 and -2**

Written Safety Program

In addition to the specific plans listed above, additional LORS called “safe work practices” apply to the project. Both the construction and operations safety programs will address safe work practices in a variety of programs. The components of these programs include, but are not limited to, the programs found under the heading “Construction Safety and Health Program” in this staff assessment.

In addition, the project owner would be required to provide personnel protective equipment and exposure monitoring for workers involved in activities where contaminated soil and/or contaminated groundwater exist, per staff’s proposed Conditions of Certification **WORKER SAFETY-1** and**-2**.

These proposed conditions of certification ensure that workers are properly protected from any hazardous wastes presently at the site.

Safety Training Programs

Employees will be trained in the safe work practices described in the above-referenced safety programs.

Additional Safety Issues

This solar power plant will present a unique work environment that includes a solar field located in the high desert. The area under the solar arrays must be kept free from weeds and thus herbicides will be applied as necessary. Exposure to workers via inhalation and ingestion of dusts containing herbicides poses a health risk. Finally, workers will regularly inspect the solar array for broken or non-functioning mirrors by driving up and down dirt paths between the rows of mirrors and even under the mirrors. Cleaning and servicing the mirrors will also be conducted on a routine schedule. All these activities will take place year-round and especially during the summer months of peak solar power generation, when outside ambient temperatures routinely reach 115 °F and above.

The applicant has indicated that workers will be adequately trained and protected, but has not included precautions against exposure to herbicides. Therefore, to ensure that workers are indeed protected, staff has proposed additional requirements found in Conditions of Certification **WORKER SAFETY-6**. This requirement consists of the following provisions:

- The development and implementation of Best Management Practices (BMP) for the storage and application of herbicides used to control weeds beneath and around the solar array.

A BMP requiring proper herbicide storage and application, as recommended in Condition of Certification **WORKER SAFETY-6,** will mitigate potential risks to workers from exposure to herbicides and reduce the chance that herbicides will contaminate either surface water or groundwater. Staff suggests that a BMP follow either the guidelines established by the U.S. EPA (EPA 1993), or more recent guidelines established by the State of California or U.S. EPA.

Additional Mitigation Measures

Protecting construction workers from injury and disease is one of the greatest challenges today in occupational safety and health. The following facts are reported by NIOSH:

- More than seven million persons work in the construction industry, representing 6% of the labor force. Approximately 1.5 million of these workers are self-employed;
- Of approximately 600,000 construction companies, 90% employ fewer than 20 workers. Few have formal safety and health programs;
- From 1980-1993, an average of 1,079 construction workers were killed on the job each year, with more fatal injuries than any other industry;
- Falls caused 3,859 construction worker fatalities, or 25.6% of the total, between 1980 and 1993;
- 15% of workers' compensation costs are spent on construction-related injuries;
- Ensuring safety and health in construction is a complex task involving short-term work sites, changing hazards, and multiple operations and crews working in close proximity to one another;

- In 1990, Congress directed NIOSH to conduct research and training to reduce diseases and injury among construction workers in the United States. Under this mandate, NIOSH funds both intramural and extramural research projects.

The hazards associated with the construction industry are well documented. These hazards increase in complexity in the multi-employer worksites typical of large, complex industrial projects like gas-fired power plants. In order to reduce and/or eliminate these hazards, it has become standard industry practice to hire a construction safety supervisor to ensure a safe and healthful environment for all workers. This has been evident in the audits of power plants recently conducted by the staff. The Federal Occupational Safety and Health Administration (OSHA) has also entered into strategic alliances with several professional and trade organizations to promote and recognize safety professionals trained as construction safety supervisors, construction health and safety officers, and other professional designations. The goal of these partnerships is to encourage construction subcontractors to improve their safety and health performance; to assist them in striving to eliminate the four major construction hazards (falls, electrical, caught in/between, and struck-by hazards) that account for the majority of fatalities and injuries in this industry and have been the focus of targeted OSHA inspections; to prevent serious accidents in the construction industry through implementation of enhanced safety and health programs and increased employee training; and to recognize subcontractors that have exemplary safety and health programs.

There are no OSHA or Cal-OSHA requirements that an employer hire or provide for a construction safety officer. OSHA and Cal-OSHA regulations do, however, require that safety be provided by an employer and the term “Competent Person” appears in many OSHA and Cal-OSHA standards, documents, and directives. A “Competent Person” is defined by OSHA as an individual who, by way of training and/or experience, is knowledgeable of standards, is capable of identifying workplace hazards relating to the specific operations, is designated by the employer, and has authority to take appropriate action. Therefore, in order to meet the intent of the OSHA standard to provide for a safe workplace during power plant construction, staff proposes Condition of Certification **WORKER SAFETY-3,** which would require the applicant/project owner to designate and provide for a project site construction safety supervisor.

As discussed above, the hazards associated with the construction industry are well documented. These hazards increase in complexity in the multi-employer worksites typical of large, complex industrial projects like gas-fired power plants.

Accidents, fires, and a worker death have occurred at Energy Commission-certified power plants in the recent past because of both the failure to recognize and control safety hazards and the inability to adequately monitor compliance with occupational safety and health regulations. Safety problems have been documented by Energy Commission staff in safety audits, conducted in 2005, at several power plants under construction. The findings of the audit include, but are not limited to, safety oversights like:

- Lack of posted confined-space warning placards/signs;

- Confusing and/or inadequate electrical and machinery lockout/tagout permitting and procedures;
- Confusing and/or inappropriate procedures for handing over lockout/tagout and confined space permits from the construction team to the commissioning team, and then to operations;
- Dangerous placement of hydraulic elevated platforms under one another;
- Inappropriate placement of fire extinguishers near hotwork;
- Dangerous placement of numerous power cords in standing water on the site, increasing the risk of electrocution;
- Inappropriate and unsecure placement of above-ground natural gas pipelines inside the facility, but too close to the perimeter fence; and
- Lack of adequate employee or contractor written training programs that address the proper procedures to follow in the event of the discovery of suspicious packages or objects either onsite or offsite.

In order to reduce and/or eliminate these hazards, it is necessary for the Energy Commission to require a professional Safety Monitor on-site to track compliance with Cal-OSHA regulations and periodically audit safety compliance during construction, commissioning, and the hand-over to the operations staff. These requirements are outlined in Condition of Certification **WORKER SAFETY-4**. A Safety Monitor, hired by the project owner but reporting to the Chief Building Official (CBO) and the Compliance Project Manager (CPM), will serve as an extra set of eyes to ensure that safety procedures and practices are fully implemented during construction at all power plants certified by the Energy Commission. During audits conducted by staff, most site safety professionals welcomed the audit team and actively engaged them in questions about the team's findings and recommendations. These safety professionals recognized that safety requires continuous vigilance and that the presence of an independent audit team provides a "fresh perspective" of the site.

Fire Hazards

During construction and operation of the proposed BSEP there is the potential for both small fires and major structural fires. Electrical sparks, combustion of fuel oil, natural gas, hydraulic fluid, mineral oil, insulating fluid at the project power plant switchyard or flammable liquids, explosions, and overheated equipment, may cause small fires. Major structural fires in areas without automatic fire detection and suppression systems are unlikely at power plants. Fires and explosions of natural gas or other flammable gasses or liquids are rare. Compliance with all LORS will be adequate to ensure protection from all fire hazards.

Staff reviewed the information provided in the AFC and spoke to a representative of the KCFD to determine if available fire protection services and equipment would adequately protect workers, and to further determine the project's impact on fire protection services in the area. The project will rely on both onsite fire protection systems and local fire protection services. The onsite fire protection system provides the first line of defense for small fires. In the event of a major fire, fire support services, including trained

firefighters and equipment for a sustained response, would be provided by the KCFD. California City Fire Department and Edwards Air Force Base Fire Department would be called upon if needed, and as available, through a Mutual Aid Agreement with KCFD (Eckroth 2008).

Construction

During construction, portable fire extinguishers will be located and maintained throughout the site; safety procedures and training will also be implemented (BS 2008a, section 5.18.3.1). Station #14 of the KCFD in Mojave, California, will provide fire protection backup for larger fires that cannot be extinguished using the project's portable suppression equipment .

Operation

The information in the AFC indicates that the project intends to meet the fire protection and suppression requirements of the California Fire Code, all applicable recommended NFPA standards (including Standard 850, which addresses fire protection at electric generating plants), and all Cal-OSHA requirements, with one exception(see below). Fire suppression elements in the proposed plant will include both fixed and portable fire extinguishing systems.

In addition to the fixed fire protection system, smoke detectors, flame detectors, high-temperature detectors, appropriate class of service portable extinguishers, and fire hydrants must be located throughout the facility at code-approved intervals. These systems are standard requirements of the fire code, NFPA and staff has determined that they will ensure adequate fire protection.

The applicant would be required by conditions of certification **WORKER SAFETY-1** and**-2** to provide a final fire protection and prevention program to both staff and the KCFD prior to the construction and operation of the project in order to confirm the adequacy of proposed fire protection measures.

The one exception mentioned above pertains to fire department access to the site. Both the California Fire Code (24 CCR Part 9, chapter 5, section 503.1.2) and the Uniform Fire Code (sections 901 and 902) require that access to the site be reviewed and approved by the fire department. All power plants licensed by the Energy Commission have more than one access point to the power plant site. This is sound fire safety procedure and allows for fire department vehicles and personal to access the site should the main gate be blocked. The originally proposed BSEP has only one access point, that being from SR-14 and through the main gate. Although the original AFC maked no mention of a secondary access to the site, or through the perimeter fence, the Project Design Requirements (PDR) submitted by the applicant (DB 2009r) adds a second acess point. Kern County Fire Department Fire Marshall David Goodell agrees with staff that a second access point is necessary to ensure fire department access and that a second access road is desirable. The preferred second access, as described in the PDR, would be via Neuralia Road from the east side of the proposed facility, thereby providing an alternate route to the facility that does not require crossing the railroad tracks, nor using the primary entrance off of SR-14 on the west side of the facility (Goodell 2009a, Goodell 2009b). This access point can be restricted to emergency use

only and, if possible, should be equipped with the fire department's preferred system for remote keyless entry. Therefore, staff proposes a Condition of Certification **WORKER SAFETY-7** that would require the project owner to provide a second access point to the site from Neuralia Road for emergency vehicles, and to equip this secondary gate with an acceptable entry system or keypad for fire department personnel to open the gate.

Emergency Medical Services Response

A statewide survey was conducted by staff to determine the frequency of incidents requiring emergency medical services (EMS) and off-site fire-fighters for natural gas-fired power plants in California. The purpose of this analysis was to determine what impact, if any, power plants might have on local emergency services. Staff concludes that incidents at power plants requiring fire or EMS responses are infrequent and represent an insignificant impact on local fire departments. Staff expects that BSEP's use of LPG as a replacement for natural gas will not significantly increase impacts. However, staff has determined that the potential for both work-related and non-work related heart attacks exists at power plants. In fact, staff's research on the frequency of EMS response to gas-fired power plants shows that many of the responses for cardiac emergencies involved non-work related incidences, including visitors. The need for prompt response within a few minutes is well documented in the medical literature. Staff believes that the quickest medical intervention can only be achieved with the use of an on-site defibrillator often called an Automatic External Defibrillator or AED; the response from an off-site provider would take longer regardless of the provider location. This fact is also well documented and serves as the basis for many private and public locations including airports, factories, and government buildings, all of which maintain on-site cardiac defibrillation devices. Therefore, staff concludes that with the availability of modern cost-effective AED devices, it is proper in a power plant environment to maintain these devices on-site in order to treat cardiac arrythmias resulting from industrial accidents or other non-work related causes. Therefore, an additional condition of certification, **WORKER SAFETY-5**, is proposed so that a portable AED will be located on site, and workers trained in its use.

CUMULATIVE IMPACTS AND MITIGATION

Staff reviewed the construction and operation of BSEP could have on the fire and emergency service capabilities of the KCFD. Staff agrees with the applicant that combined impacts would not be significant and that existing local services would adequately provide emergency services.

CONCLUSIONS

Staff concludes that if the applicant for the proposed BSEP project provides project construction safety and health and project operations and maintenance safety and health programs, as required by conditions of certification **WORKER SAFETY -1**, and **-2**; and fulfills the requirements of conditions of certification **WORKER SAFETY-3** through**-7**, BSEP would incorporate sufficient measures to ensure adequate levels of industrial safety and comply with applicable LORS. Staff also concludes that the proposed project would not have significant impacts on local fire protection services.

PROPOSED CONDITIONS OF CERTIFICATION

WORKER SAFETY-1 The project owner shall submit to the Compliance Project Manager (CPM) a copy of the Project Construction Safety and Health Program containing the following:

- A Construction Personal Protective Equipment Program;
- A Construction Exposure Monitoring Program;
- A Construction Injury and Illness Prevention Program;
- A Construction Emergency Action Plan; and
- A Construction Fire Prevention Plan.

The Personal Protective Equipment Program, the Exposure Monitoring Program, and the Injury and Illness Prevention Program shall be submitted to the CPM for review and approval concerning compliance of the program with all applicable Safety Orders. The Construction Emergency Action Plan and the Fire Prevention Plan shall be submitted to the Kern County Fire Department for review and comment prior to submittal to the CPM for approval.

Verification: At least thirty (30) days prior to the start of construction, the project owner shall submit to the CPM for review and approval a copy of the Project Construction Safety and Health Program. The project owner shall provide a copy of a letter to the CPM from the Kern County Fire Department stating the Fire Department's comments on the Construction Fire Prevention Plan and Emergency Action Plan.

WORKER SAFETY-2 The project owner shall submit to the CPM a copy of the Project Operations and Maintenance Safety and Health Program containing the following:

- An Operation Injury and Illness Prevention Plan;
- An Emergency Action Plan;
- Hazardous Materials Management Program;
- Fire Prevention Program (8 CCR § 3221); and;
- Personal Protective Equipment Program (8 CCR §§ 3401-3411).

The Operation Injury and Illness Prevention Plan, Emergency Action Plan, and Personal Protective Equipment Program shall be submitted to the CPM for review and approval concerning compliance of the program with all applicable Safety Orders. The Operation Fire Prevention Plan and the Emergency Action Plan shall also be submitted to the Kern County Fire Department for review and comment.

Verification: At least thirty (30) days prior to the start of first-fire or commissioning, the project owner shall submit to the CPM for approval a copy of the Project Operations and Maintenance Safety and Health Program. The project owner shall provide a copy of

a letter to the CPM from the Kern County Fire Department stating the Fire Department's comments on the Operations Fire Prevention Plan and Emergency Action Plan.

WORKER SAFETY-3 The project owner shall provide a site Construction Safety Supervisor (CSS) who, by way of training and/or experience, is knowledgeable of power plant construction activities and relevant laws, ordinances, regulations, and standards, is capable of identifying workplace hazards relating to the construction activities, and has authority to take appropriate action to assure compliance and mitigate hazards. The CSS shall:

- Have over-all authority for coordination and implementation of all occupational safety and health practices, policies, and programs;
- Assure that the safety program for the project complies with Cal/OSHA and federal regulations related to power plant projects;
- Assure that all construction and commissioning workers and supervisors receive adequate safety training;
- Complete accident and safety-related incident investigations, emergency response reports for injuries, and inform the CPM of safety-related incidents; and
- Assure that all the plans identified in Worker Safety 1 and 2 are implemented.

Verification: At least thirty (30) days prior to the start of site mobilization, the project owner shall submit to the CPM the name and contact information for the Construction Safety Supervisor (CSS). The contact information of any replacement (CSS) shall be submitted to the CPM within one business day.

The CSS shall submit in the Monthly Compliance Report a monthly safety inspection report to include:

- Record of all employees trained for that month (all records shall be kept on site for the duration of the project);
- Summary report of safety management actions and safety-related incidents that occurred during the month;
- Report of any continuing or unresolved situations and incidents that may pose danger to life or health; and
- Report of accidents and injuries that occurred during the month.

WORKER SAFETY-4 The project owner shall make payments to the Chief Building Official (CBO) for the services of a Safety Monitor based upon a reasonable fee schedule to be negotiated between the project owner and the CBO. Those services shall be in addition to other work performed by the CBO. The Safety Monitor shall be selected by and report directly to the CBO, and will be responsible for verifying that the Construction Safety Supervisor, as required in Worker Safety 3, implements all appropriate Cal/OSHA and Commission

safety requirements. The Safety Monitor shall conduct on-site (including linear facilities) safety inspections at intervals necessary to fulfill those responsibilities.

Verification: At least thirty (30) days prior to the start of construction, the project owner shall provide proof of its agreement to fund the Safety Monitor services to the CPM for review and approval.

WORKER SAFETY-5 The project owner shall ensure that a portable automatic external defibrillator (AED) is located on site during construction and operations and shall implement a program to ensure that workers are properly trained in its use and that the equipment is properly maintained and functioning at all times. During construction and commissioning, the following persons shall be trained in its use and shall be on-site whenever the workers that they supervise are on-site: the Construction Project Manager or delegate, the Construction Safety Supervisor or delegate, and all shift foremen. During operations, all power plant employees shall be trained in its use. The training program shall be submitted to the CPM for review and approval.

Verification: At least thirty (30) days prior to the start of site mobilization the project owner shall submit to the CPM proof that a portable AED exists on site and a copy of the training and maintenance program for review and approval.

WORKER SAFETY-6 The project owner shall prepare and implement a Best Management Practices (BMPs) for the storage and application of herbicides used to control weeds beneath and around the solar array. These plans shall be submitted to the CPM for review and approval.

Verification: At least thirty (30) days prior to the start of site mobilization, the project owner shall submit to the CPM for review and approval a copy of the Best Management Practices (BMPs) for the storage and application of herbicides.

WORKER SAFETY-7 The project owner shall identify and provide a second access point for emergency personnel to enter the site. This access would enter from Neuralia Road. This access and the method of gate operation shall be submitted to the Kern County Fire Department for review and comment and to the CPM for review and approval.

Verification: At least 60) days prior to the start of site mobilization, the project owner shall submit to the Kern County Fire Department and the CPM preliminary plans showing the location of a second access point to the site and a description of how the gate will be opened by the fire department. At least thirty (30) days prior to the start of site mobilization, the project owner shall submit final plans to the CPM for review and approval. The final plan submittal shall also include a letter containing comments from the Kern County Fire Department or a statement that no comments were received.

REFERENCES

BS 2008a - FPL Energy/M. O'Sullivan (tn 45646). Application for Certification, dated 03/13/08. Submitted to CEC/Docket Unit on 03/14/08.

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DB 2009r – Downey Brand/S. Rowlands (tn 52116). Applicant Project Design Refinements, dated 6/22/09. Submitted to CEC/Docket Unit on 6/22/09.

Eckroth, Jim 2008. Telephone communication with Assistant Fire Marshall, Kern County Fire Department, November 5, 2008.

Goodell, David 2009a. Telephone communication with Fire Marshall, Kern County Fire Department, March 13, 2009

Goodell, David 2009b. Telephone communication with Fire Marshall, Kern County Fire Department, March 16, 2009

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ENGINEERING ASSESSMENT

FACILITY DESIGN

Testimony of Erin Bright and Steve Baker

SUMMARY OF CONCLUSIONS

The California Energy Commission staff concludes that the design, construction, and eventual closure of the Beacon Solar Energy Project and its linear facilities would likely comply with applicable engineering laws, ordinances, regulations, and standards. The proposed conditions of certification, below, would ensure compliance with these laws, ordinances, regulations, and standards.

INTRODUCTION

Facility design encompasses the civil, structural, mechanical, and electrical engineering design of the Beacon Solar Energy Project. The purpose of this analysis is to:

- verify that the laws, ordinances, regulations, and standards (LORS) that apply to the engineering design and construction of the project have been identified;
- verify that both the project and its ancillary facilities are sufficiently described, including proposed design criteria and analysis methods, in order to provide reasonable assurance that the project will be designed and constructed in accordance with all applicable engineering LORS, in a manner that also ensures the public health and safety;
- determine whether special design features should be considered during final design to address conditions unique to the site which could influence public health and safety; and
- describe the design review and construction inspection process and establish the conditions of certification used to monitor and ensure compliance with the engineering LORS, in addition to any special design requirements.

Subjects discussed in this analysis include:

- identification of the engineering LORS that apply to facility design;
- evaluation of the applicant's proposed design criteria, including identification of criteria essential to public health and safety;
- proposed modifications and additions to the application for certification (AFC) necessary for compliance with applicable engineering LORS; and
- conditions of certification proposed by staff to ensure that the project will be designed and constructed to ensure public health and safety and comply with all applicable engineering LORS.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Lists of LORS applicable to each engineering discipline (civil, structural, mechanical, and electrical) are described in the AFC (BS 2008a, AFC § 5.7.1.3, Table 5.7-1). Key LORS are listed in **FACILITY DESIGN Table 1** below.

FACILITY DESIGN Table 1
Key Engineering Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health standards
State	2007 California Building Standards Code (CBSC) (also known as Title 24, California Code of Regulations)
Local	Kern County General Plan Kern County Zoning Ordinance
General	American National Standards Institute (ANSI) American Society of Mechanical Engineers (ASME) American Welding Society (AWS) American Society for Testing and Materials (ASTM)

SETTING

The Beacon Solar Energy Project (Beacon), a 250 MW solar thermal power plant facility utilizing a parabolic trough design with oil based heat transfer fluid, would be built on a 2,012-acre section in eastern Kern County. The site lies in Seismic Risk Zone 4. For more information on the site and related project description, please see the **Project Description** section of this document. Additional engineering design details are contained in the AFC (Appendices C and D).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The purpose of this analysis is to ensure that the project would be built to applicable engineering codes and ensure public health and life safety. This analysis further verifies that applicable engineering LORS have been identified and that the project and its ancillary facilities have been described in adequate detail. It also evaluates the applicant's proposed design criteria, describes the design review and construction inspection process, and establishes conditions of certification that would monitor and ensure compliance with engineering LORS and any other special design requirements. These conditions allow both the California Energy Commission (Energy Commission) compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme that will verify compliance with these LORS.

SITE PREPARATION AND DEVELOPMENT

Staff has evaluated the proposed design criteria for grading, flood protection, erosion control, site drainage, and site access, in addition to the criteria for designing and constructing linear support facilities such as electric transmission interconnections. The applicant proposes the use of accepted industry standards (see Beacon AFC, Appendices C and D, for representative lists of applicable industry standards), design practices, and construction methods in preparing and developing the site. Staff concludes that this project, including its linear facilities, would most likely comply with all applicable site preparation LORS and proposes conditions of certification (see below and the **Geology and Paleontology** section of this document) to ensure that compliance.

MAJOR STRUCTURES, SYSTEMS, AND EQUIPMENT

Major structures, systems, and equipment are structures and their associated components or equipment that are necessary for power production; costly or time consuming to repair or replace; used for the storage, containment, or handling of hazardous or toxic materials; or capable of becoming potential health and safety hazards if not constructed according to applicable engineering LORS. Major structures and equipment are identified in the proposed Condition of Certification **GEN-2,** below.

Beacon shall be designed and constructed to the 2007 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Building Standards Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and other applicable codes and standards in effect when the design and construction of the project actually begin. If the initial designs are submitted to the chief building official (CBO) for review and approval after the update to the 2007 CBSC takes effect, the 2007 CBSC provisions shall be replaced with the updated provisions.

Certain structures in a power plant may be required, under the CBC, to undergo dynamic lateral force (structural) analysis; others may be designed using the simpler static analysis procedure. In order to ensure that structures are analyzed according to their appropriate lateral force procedure, staff has included Condition of Certification **STRUC-1**, below, which, in part, requires the project CBO's review and approval of the owner's proposed lateral force procedures before construction begins.

PROJECT QUALITY PROCEDURES

The project's AFC (BS 2008a, AFC § 3.7.4, Appendix 2C) describes a quality control program intended to inspire confidence that its systems and components will be designed, fabricated, stored, transported, installed, and tested in accordance with all appropriate power plant technical codes and standards. Compliance with design requirements will be verified through specific inspections, audits, and testing. Implementation of this quality assurance/quality control (QA/QC) program will ensure that Beacon is actually designed, procured, fabricated, and installed as described in this analysis.

COMPLIANCE MONITORING

Under Section 104.1 in Appendix Chapter 1 of the CBC, the CBO is authorized and directed to enforce all provisions of the CBC. The Energy Commission itself serves as the building official and has the responsibility to enforce the code for all of the energy facilities it certifies. In addition, the Energy Commission has the power to interpret the CBC and adopt and enforce both rules and supplemental regulations that clarify application of the CBC's provisions.

The Energy Commission's design review and construction inspection process conforms to CBC requirements and ensures that all facility design conditions of certification are met. As provided by section 103.3 in Appendix Chapter 1 of the CBC, the Energy Commission appoints experts to perform design review and construction inspections and act as delegate CBOs on behalf of the Energy Commission. These delegates typically include the local building official and/or independent consultants hired to provide technical expertise that is not provided by the local official alone. The applicant, through permit fees provided by the CBC, section 108 in Appendix Chapter 1, pays the cost of these reviews and inspections. While building permits in addition to Energy Commission certification are not required for this project, the applicant, consistent with CBC section 108, pays in lieu of CBC permit fees to cover the costs of these reviews and inspections.

Engineering and compliance staff will invite Kern County or a third-party engineering consultant to act as CBO for this project. When an entity has been assigned CBO duties, Energy Commission staff will complete a memorandum of understanding (MOU) with that entity to outline both its roles and responsibilities and those of its subcontractors and delegates.

Staff has developed proposed conditions of certification to ensure public health and safety and compliance with engineering design LORS. Some of these conditions address the roles, responsibilities, and qualifications of the engineers who will design and build the proposed project (Conditions of Certification **GEN-1** through **GEN-8**). These engineers must be registered in California and sign and stamp every submittal of design plans, calculations, and specifications submitted to the CBO. These conditions require that every element of the project's construction (subject to CBO review and approval) be approved by the CBO before it is performed. They also require that qualified special inspectors perform or oversee special inspections required by all applicable LORS.

While the Energy Commission and delegate CBO have the authority to allow some flexibility in scheduling construction activities, these conditions are written so that no element of construction (of permanent facilities subject to CBO review and approval) that could be difficult to reverse or correct can proceed without prior CBO approval. Elements of construction that are not difficult to reverse may proceed without approval of the plans. The applicant bears the responsibility to fully modify construction elements in order to comply with all design changes resulting from the CBO's subsequent plan review and approval process.

FACILITY CLOSURE

The removal of a facility from service (decommissioning) when it reaches the end of its useful life ranges from “mothballing” to the removal of all equipment and appurtenant facilities and subsequent restoration of the site. Future conditions that could affect decommissioning are largely unknown at this time.

In order to ensure that decommissioning will be completed in a manner that is environmentally sound, safe, and protects the public health and safety, the applicant shall submit a decommissioning plan to the Energy Commission for review and approval before the project’s decommissioning begins. The plan shall include a discussion of:

- proposed decommissioning activities for the project and all appurtenant facilities that were constructed as part of the project;
- all applicable LORS and local/regional plans and proof of adherence to those applicable LORS and local/regional plans;
- the activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities; and
- decommissioning alternatives other than complete site restoration.

Satisfying the above requirements should serve as adequate protection, even in the unlikely event that the project is abandoned. Staff has proposed general conditions (see **General Conditions**) to ensure that these measures are included in the Facility Closure Plan.

AGENCY AND PUBLIC COMMENTS

No agency or public comments were received regarding Facility Design.

CONCLUSIONS AND RECOMMENDATIONS

1. The laws, ordinances, regulations, and standards (LORS) identified in the AFC and supporting documents directly apply to the project.

2. Staff has evaluated the proposed engineering LORS, design criteria, and design methods in the record, and concludes that the design, construction, and eventual closure of the project will likely comply with applicable engineering LORS.

3. The proposed conditions of certification will ensure that Beacon is designed and constructed in accordance with applicable engineering LORS. This will be accomplished through design review, plan checking, and field inspections that will be performed by the CBO or other Energy Commission delegate. Staff will audit the CBO to ensure satisfactory performance.

4. Though future conditions that could affect decommissioning are largely unknown at this time, it can reasonably be concluded that if the project owner submits a

decommissioning plan as required in the **General Conditions** section of this document prior to decommissioning, decommissioning procedures will comply with all applicable engineering LORS.

Energy Commission staff recommends that:

1. The proposed conditions of certification be adopted to ensure that the project is designed and constructed in a manner that protects the public health and safety and complies with all applicable engineering LORS;

2. The project be designed and built to the 2007 CBSC (or successor standards, if in effect when initial project engineering designs are submitted for review); and

3. The CBO reviews the final designs, checks plans, and performs field inspections during construction. Energy Commission staff shall audit and monitor the CBO to ensure satisfactory performance.

CONDITIONS OF CERTIFICATION

GEN-1 The project owner shall design, construct, and inspect the project in accordance with the 2007 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and all other applicable engineering laws, ordinances, regulations and standards (LORS) in effect at the time initial design plans are submitted to the chief building official (CBO) for review and approval (the CBSC in effect is the edition that has been adopted by the California Building Standards Commission and published at least 180 days previously). The project owner shall ensure that all the provisions of the above applicable codes are enforced during the construction, addition, alteration, moving, demolition, repair, or maintenance of the completed facility (2007 CBC, Appendix Chapter 1, § 101.2, Scope). All transmission facilities (lines, switchyards, switching stations, and substations) are covered in the conditions of certification in the **Transmission System Engineering** section of this document.

In the event that the initial engineering designs are submitted to the CBO when the successor to the 2007 CBSC is in effect, the 2007 CBSC provisions shall be replaced with the applicable successor provisions. Where, in any specific case, different sections of the code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

The project owner shall ensure that all contracts with contractors, subcontractors, and suppliers clearly specify that all work performed and materials supplied comply with the codes listed above.

Verification: Within 30 days following receipt of the certificate of occupancy, the project owner shall submit to the compliance project manager (CPM) a statement of verification, signed by the responsible design engineer, attesting that all designs, construction, installation, and inspection requirements of the applicable LORS and the Energy Commission's decision have been met in the area of facility design. The project owner shall provide the CPM a copy of the certificate of occupancy within 30 days of receipt from the CBO (2007 CBC, Appendix Chapter 1, § 110, Certificate of Occupancy).

Once the certificate of occupancy has been issued, the project owner shall inform the CPM at least 30 days prior to any construction, addition, alteration, moving, demolition, repair, or maintenance to be performed on any portion(s) of the completed facility that requires CBO approval for compliance with the above codes. The CPM will then determine if the CBO needs to approve the work.

GEN-2 Before submitting the initial engineering designs for CBO review, the project owner shall furnish the CPM and the CBO with a schedule of facility design submittals, master drawing, and master specifications lists. The schedule shall contain a list of proposed submittal packages of designs, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide specific packages to the CPM upon request.

Verification: At least 60 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO and to the CPM the schedule, the master drawing, and master specifications lists of documents to be submitted to the CBO for review and approval. These documents shall be the pertinent design documents for the major structures and equipment listed in **FACILITY DESIGN Table 2,** below. Major structures and equipment shall be added to or deleted from the table only with CPM approval. The project owner shall provide schedule updates in the monthly compliance report.

FACILITY DESIGN Table 2
Major Structures and Equipment List

Equipment/System	Quantity (Plant)
Steam Turbine Generator Foundation and Connections	1
Start-up Boilers Foundations and Connections	2
GSU Transformer Foundation and Connections	1
Unit Auxiliary Transformers Foundations and Connections	2
SUS Transformers Foundations and Connections	4
Gas Storage Area Foundation and Connections	1
Cooling Tower Foundation and Connections	1
Raw & Fire Water Storage Tank Foundation and Connections	1
Firewater Pump House Foundation and Connections	1
Process Water Storage Tank Foundation and Connections	1
Process Water Pump Skid Foundation and Connections	4
Demineralized Water Storage Tank Foundation and Connections	1
Demineralized Water Pump Skid Foundation and Connections	1
Demineralized Water Treatment Facility Foundation and Connections	1
Water Treatment Building Foundation and Connections	1
Control and Administration Building Foundation and Connections	1
Feed Water Pumps Foundations and Connections	3
Condensate Pumps Foundations and Connections	3
Economizers Foundations and Connections	4
Reheaters Foundations and Connections	9
Evaporators Foundations and Connections	9
Superheaters Foundations and Connections	5
Expansion Storage Tanks Foundations and Connections	6
HTF Freeze Protection Heat Exchangers Foundations and Connections	2
HTF Circulation Pumps Foundations and Connections	6
Steam Blowdown Tank Foundation and Connections	1
Circulating Water Pumps Foundation and Connections	1
Neutralization Storage Tank Foundation and Connections	1
Solar Field Reflectors and Receivers Foundations and Connections	1 Lot

GEN-3 The project owner shall make payments to the CBO for design review, plan checks, and construction inspections, based upon a reasonable fee schedule to be negotiated between the project owner and the CBO. These fees may be consistent with the fees listed in the 2007 CBC (2007 CBC, Appendix Chapter 1, § 108, Fees; Chapter 1, Section 108.4, Permits, Fees, Applications and Inspections), adjusted for inflation and other appropriate adjustments; may be based on the value of the facilities reviewed; may be based on hourly rates; or may be otherwise agreed upon by the project owner and the CBO.

Verification: The project owner shall make the required payments to the CBO in accordance with the agreement between the project owner and the CBO. The project owner shall send a copy of the CBO's receipt of payment to the CPM in the next monthly compliance report indicating that applicable fees have been paid.

GEN-4 Prior to the start of rough grading, the project owner shall assign a California-registered architect, structural engineer, or civil engineer, as the resident engineer in charge of the project (2007 California Administrative Code, § 4-209, Designation of Responsibilities). All transmission facilities (lines, switchyards, switching stations, and substations) are addressed in the conditions of certification in the **Transmission System Engineering** section of this document.

The resident engineer may delegate responsibility for portions of the project to other registered engineers. Registered mechanical and electrical engineers may be delegated responsibility for mechanical and electrical portions of the project, respectively. A project may be divided into parts, provided that each part is clearly defined as a distinct unit. Separate assignments of general responsibility may be made for each designated part.

The resident engineer shall:

1. Monitor progress of construction work requiring CBO design review and inspection to ensure compliance with LORS;

2. Ensure that construction of all facilities subject to CBO design review and inspection conforms in every material respect to applicable LORS, these conditions of certification, approved plans, and specifications;

3. Prepare documents to initiate changes in approved drawings and specifications when either directed by the project owner or as required by the conditions of the project;

4. Be responsible for providing project inspectors and testing agencies with complete and up-to-date sets of stamped drawings, plans, specifications, and any other required documents;

5. Be responsible for the timely submittal of construction progress reports to the CBO from the project inspectors, the contractor, and other engineers who have been delegated responsibility for portions of the project; and

6. Be responsible for notifying the CBO of corrective action or the disposition of items noted on laboratory reports or other tests when they do not conform to approved plans and specifications.

The resident engineer shall have the authority to halt construction and to require changes or remedial work if the work does not meet requirements.

If the resident engineer or the delegated engineers are reassigned or replaced, the project owner shall submit the name, qualifications and

registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, the resume and registration number of the resident engineer and any other delegated engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the resident engineer and other delegated engineer(s) within five days of the approval.

If the resident engineer or the delegated engineer(s) is subsequently reassigned or replaced, the project owner has five days to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

GEN-5 Prior to the start of rough grading, the project owner shall assign at least one of each of the following California registered engineers to the project: a civil engineer; a soils, geotechnical, or civil engineer experienced and knowledgeable in the practice of soils engineering; and an engineering geologist. Prior to the start of construction, the project owner shall assign at least one of each of the following California registered engineers to the project: a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; a mechanical engineer; and an electrical engineer. (California Business and Professions Code section 6704 et seq., and sections 6730, 6731 and 6736 require state registration to practice as a civil engineer or structural engineer in California.) All transmission facilities (lines, switchyards, switching stations, and substations) are handled in the conditions of certification in the **Transmission System Engineering** section of this document.

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (for example, proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California registered electrical engineer.

The project owner shall submit, to the CBO for review and approval, the names, qualifications, and registration numbers of all responsible engineers assigned to the project (2007 CBC, Appendix Chapter 1, § 104, Duties and Powers of Building Official).

If any one of the designated responsible engineers is subsequently reassigned or replaced, the project owner shall submit the name,

qualifications, and registration number of the newly assigned responsible engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

A. The civil engineer shall:

1. Review the foundation investigations, geotechnical, or soils reports prepared by the soils engineer, the geotechnical engineer, or by a civil engineer experienced and knowledgeable in the practice of soils engineering;

2. Design (or be responsible for the design of), stamp, and sign all plans, calculations, and specifications for proposed site work, civil works, and related facilities requiring design review and inspection by the CBO. At a minimum, these include: grading; site preparation; excavation; compaction; and construction of secondary containment, foundations, erosion and sedimentation control structures, drainage facilities, underground utilities, culverts, site access roads and sanitary sewer systems; and

3. Provide consultation to the resident engineer during the construction phase of the project and recommend changes in the design of the civil works facilities and changes to the construction procedures.

B. The soils engineer, geotechnical engineer, or civil engineer experienced and knowledgeable in the practice of soils engineering, shall:

1. Review all the engineering geology reports;

2. Prepare the foundation investigations, geotechnical or soils reports containing field exploration reports, laboratory tests, and engineering analysis detailing the nature and extent of the soils that could be susceptible to liquefaction, rapid settlement, or collapse when saturated under load (2007 CBC, Appendix J, § J104.3, Soils Report; Chapter 18, § 1802.2, Foundation and Soils Investigations);

3. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with requirements set forth in the 2007 CBC, Appendix J, section J105, Inspections, and the 2007 California Administrative Code, section 4-211, Observation and Inspection of Construction (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both); and

4. Recommend field changes to the civil engineer and resident engineer.

This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform to the predicted conditions used as the basis for design of earthwork or foundations (2007 CBC, Appendix Chapter 1, § 114, Stop Orders).

C. The engineering geologist shall:

1. Review all the engineering geology reports and prepare a final soils grading report; and

2. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with the requirements set forth in the 2007 California Administrative Code, section 4-211, Observation and Inspection of Construction (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both).

D. The design engineer shall:

1. Be directly responsible for the design of the proposed structures and equipment supports;

2. Provide consultation to the resident engineer during design and construction of the project;

3. Monitor construction progress to ensure compliance with engineering LORS;

4. Evaluate and recommend necessary changes in design; and

5. Prepare and sign all major building plans, specifications, and calculations.

E. The mechanical engineer shall be responsible for, and sign and stamp a statement with, each mechanical submittal to the CBO, stating that the proposed final design plans, specifications, and calculations conform to all of the mechanical engineering design requirements set forth in the Energy Commission's decision.

F. The electrical engineer shall:

1. Be responsible for the electrical design of the project; and

2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible civil engineer, soils (geotechnical) engineer, and engineering geologist assigned to the project.

At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of construction, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible design engineer, mechanical engineer, and electrical engineer assigned to the project.

The project owner shall notify the CPM of the CBO's approvals of the responsible engineers within five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

GEN-6 Prior to the start of an activity requiring special inspection, the project owner shall assign to the project qualified and certified special inspector(s) who shall be responsible for the special inspections required by the 2007 CBC, Chapter 17, Section 1704, Special Inspections; Chapter 17A, Section 1704A, Special Inspections; and Appendix Chapter 1, Section 109, Inspections. All transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the **Transmission System Engineering** section of this document.

A certified weld inspector, certified by the American Welding Society (AWS), and/or American Society of Mechanical Engineers (ASME) as applicable, shall inspect welding performed on site requiring special inspection (including structural, piping, tanks, and pressure vessels).

The special inspector shall:

1. Be a qualified person who shall demonstrate competence, to the satisfaction of the CBO, for inspection of the particular type of construction requiring special or continuous inspection;

2. Observe the work assigned for conformance with the approved design drawings and specifications;

3. Furnish inspection reports to the CBO and resident engineer. All discrepancies shall be brought to the immediate attention of the resident engineer for correction, then, if uncorrected, to the CBO and the CPM for corrective action (2007 CBC, Chapter 17, § 1704.1.2, Report Requirements); and

4. Submit a final signed report to the resident engineer, CBO, and CPM, stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications, and other provisions of the applicable edition of the CBC.

Verification: At least 15 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of an activity requiring special inspection, the project owner shall submit to the CBO for review and approval, with a copy to the CPM, the name(s) and qualifications of the certified weld inspector(s) or other certified special inspector(s) assigned to the project to perform one or more of the duties set forth above. The project owner shall also submit to the CPM a copy of the CBO's approval of the qualifications of all special inspectors in the next monthly compliance report.

If the special inspector is subsequently reassigned or replaced, the project owner has five days in which to submit the name and qualifications of the newly assigned special inspector to the CBO for approval. The project owner shall notify the CPM of the CBO's approval of the newly assigned inspector within five days of the approval.

GEN-7 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend required corrective actions (2007 CBC, Appendix Chapter 1, § 109.6, Approval Required; Chapter 17, § 1704.1.2, Report Requirements). The discrepancy documentation shall be submitted to the CBO for review and approval. The discrepancy documentation shall reference this condition of certification and, if appropriate, applicable sections of the CBC and/or other LORS.

Verification: The project owner shall transmit a copy of the CBO's approval of any corrective action taken to resolve a discrepancy to the CPM in the next monthly compliance report. If any corrective action is disapproved, the project owner shall advise the CPM, within five days, of the reason for disapproval and the revised corrective action to obtain CBO's approval.

GEN-8 The project owner shall obtain the CBO's final approval of all completed work that has undergone CBO design review and approval. The project owner shall request the CBO to inspect the completed structure and review the submitted documents. The project owner shall notify the CPM after obtaining the CBO's final approval. The project owner shall retain one set of approved engineering plans, specifications, and calculations (including all approved changes) at the project site or at an alternative site approved by the CPM during the operating life of the project (2007 CBC, Appendix Chapter 1, § 106.3.1, Approval of Construction Documents). Electronic copies of the approved plans, specifications, calculations, and marked-up as-builts shall be provided to the CBO for retention by the CPM.

Verification: Within 15 days of the completion of any work, the project owner shall submit to the CBO, with a copy to the CPM, in the next monthly compliance report, (a) a written notice that the completed work is ready for final inspection, and (b) a signed statement that the work conforms to the final approved plans. After storing the final approved engineering plans, specifications, and calculations described above, the project owner shall submit to the CPM a letter stating both that the above documents have been stored and the storage location of those documents.

Within 90 days of the completion of construction, the project owner shall provide to the CBO three sets of electronic copies of the above documents at the project owner's expense. These are to be provided in the form of "read only" files (Adobe .pdf 6.0), with restricted (password-protected) printing privileges, on archive quality compact discs.

CIVIL-1 The project owner shall submit to the CBO for review and approval the following:

1. Design of the proposed drainage structures and the grading plan;

2. An erosion and sedimentation control plan;

3. Related calculations and specifications, signed and stamped by the responsible civil engineer; and

4. Soils, geotechnical, or foundation investigation reports required by the 2007 CBC, Appendix J, section J104.3, Soils Report, and Chapter 18, section 1802.2, Foundation and Soils Investigation.

Verification: At least 15 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of site grading the project owner shall submit the documents described above to the CBO for design review and approval. In the next monthly compliance report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

CIVIL-2 The resident engineer shall, if appropriate, stop all earthwork and construction in the affected areas when the responsible soils engineer, geotechnical engineer, or the civil engineer experienced and knowledgeable in the practice of soils engineering identifies unforeseen adverse soil or geologic conditions. The project owner shall submit modified plans, specifications, and calculations to the CBO based on these new conditions. The project owner shall obtain approval from the CBO before resuming earthwork and construction in the affected area (2007 CBC, Appendix Chapter 1, § 114, Stop Work Orders).

Verification: The project owner shall notify the CPM within 24 hours when earthwork and construction is stopped as a result of unforeseen adverse geologic/soil conditions. Within 24 hours of the CBO's approval to resume earthwork and construction in the affected areas, the project owner shall provide to the CPM a copy of the CBO's approval.

CIVIL-3 The project owner shall perform inspections in accordance with the 2007 CBC, Appendix Chapter 1, section 109, Inspections, and Chapter 17, section 1704, Special Inspections. All plant site-grading operations, for which a grading permit is required, shall be subject to inspection by the CBO.

If, in the course of inspection, it is discovered that the work is not being performed in accordance with the approved plans, the discrepancies shall be reported immediately to the resident engineer, the CBO, and the CPM (2007 CBC, Chapter 17, § 1704.1.2, Report Requirements). The project owner shall prepare a written report, with copies to the CBO and the CPM, detailing all discrepancies, non-compliance items, and the proposed corrective action.

Verification: Within five days of the discovery of any discrepancies, the resident engineer shall transmit to the CBO and the CPM a non-conformance report (NCR), and the proposed corrective action for review and approval. Within five days of resolution of the NCR, the project owner shall submit the details of the corrective action to the CBO and the CPM. A list of NCRs, for the reporting month, shall also be included in the following monthly compliance report.

CIVIL-4 After completion of finished grading and erosion and sedimentation control and drainage work, the project owner shall obtain the CBO's approval of the final grading plans (including final changes) for the erosion and sedimentation

control work. The civil engineer shall state that the work within his/her area of responsibility was done in accordance with the final approved plans (2007 CBC, Chapter 17, § 1703.2, Written Approval).

Verification: Within 30 days (or within a project owner- and CBO-approved alternative time frame) of the completion of the erosion and sediment control mitigation and drainage work, the project owner shall submit to the CBO, for review and approval, the final grading plans (including final changes) and the responsible civil engineer's signed statement that the installation of the facilities and all erosion control measures were completed in accordance with the final approved combined grading plans and that the facilities are adequate for their intended purposes, along with a copy of the transmittal letter to the CPM. The project owner shall submit a copy of the CBO's approval to the CPM in the next monthly compliance report.

STRUC-1 Prior to the start of any increment of construction of any major structure or component listed in **FACILITY DESIGN Table 2** of Condition of Certification **GEN 2**, above, the project owner shall submit to the CBO for design review and approval the proposed lateral force procedures for project structures and the applicable designs, plans, and drawings for project structures. Proposed lateral force procedures, designs, plans, and drawings shall be those for the following items (from **Table 2**, above):

1. Major project structures;

2. Major foundations, equipment supports, and anchorage; and

3. Large field-fabricated tanks.

Construction of any structure or component shall not begin until the CBO has approved the lateral force procedures to be employed in designing that structure or component.

The project owner shall:

1. Obtain approval from the CBO of lateral force procedures proposed for project structures;

2. Obtain approval from the CBO for the final design plans, specifications, calculations, soils reports, and applicable quality control procedures. If there are conflicting requirements, the more stringent shall govern (for example, highest loads, or lowest allowable stresses shall govern). All plans, calculations, and specifications for foundations that support structures shall be filed concurrently with the structure plans, calculations, and specifications (2007 CBC, Appendix Chapter 1, § 109.6, Approval Required);

3. Submit to the CBO the required number of copies of the structural plans, specifications, calculations, and other required documents of the designated major structures prior to the start of on-site fabrication and

installation of each structure, equipment support, or foundation (2007 California Administrative Code, § 4-210, Plans, Specifications, Computations and Other Data);

4. Ensure that the final plans, calculations, and specifications clearly reflect the inclusion of approved criteria, assumptions, and methods used to develop the design. The final designs, plans, calculations, and specifications shall be signed and stamped by the responsible design engineer (2007 CBC, Appendix Chapter 1, § 106.3.4, Design Professional in Responsible Charge); and

5. Submit to the CBO the responsible design engineer's signed statement that the final design plans conform to applicable LORS (2007 CBC, Appendix Chapter 1, § 106.3.4, Design Professional in Responsible Charge).

Verification: At least 60 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of any increment of construction of any structure or component listed in **FACILITY DESIGN Table 2** of Condition of Certification **GEN-2**, above, the project owner shall submit to the CBO the above final design plans, specifications and calculations, with a copy of the transmittal letter to the CPM.

The project owner shall submit to the CPM, in the next monthly compliance report, a copy of a statement from the CBO that the proposed structural plans, specifications, and calculations have been approved and comply with the requirements set forth in applicable engineering LORS.

STRUC-2 The project owner shall submit to the CBO the required number of sets of the following documents related to work that has undergone CBO design review and approval:

1. Concrete cylinder strength test reports (including date of testing, date sample taken, design concrete strength, tested cylinder strength, age of test, type and size of sample, location and quantity of concrete placement from which sample was taken, and mix design designation and parameters);

2. Concrete pour sign-off sheets;

3. Bolt torque inspection reports (including location of test, date, bolt size, and recorded torques);

4. Field weld inspection reports (including type of weld, location of weld, inspection of non-destructive testing procedure and results, welder qualifications, certifications, qualified procedure description or number (ref: AWS); and

5. Reports covering other structural activities requiring special inspections shall be in accordance with the 2007 CBC, Chapter 17, section 1704, Special Inspections, and section 1709.1, Structural Observations.

Verification: If a discrepancy is discovered in any of the above data, the project owner shall, within five days, prepare and submit an NCR describing the nature of the discrepancies and the proposed corrective action to the CBO, with a copy of the transmittal letter to the CPM (2007 CBC, Chapter 17, § 1704.1.2, Report Requirements). The NCR shall reference the condition(s) of certification and the applicable CBC chapter and section. Within five days of resolution of the NCR, the project owner shall submit a copy of the corrective action to the CBO and the CPM.

The project owner shall transmit a copy of the CBO's approval or disapproval of the corrective action to the CPM within 15 days. If disapproved, the project owner shall advise the CPM, within five days, the reason for disapproval, and the revised corrective action necessary to obtain the CBO's approval.

STRUC-3 The project owner shall submit to the CBO design changes to the final plans required by the 2007 CBC, including the revised drawings, specifications, calculations, and a complete description of, and supporting rationale for, the proposed changes, and shall give to the CBO prior notice of the intended filing (2007 CBC, Appendix Chapter 1, § 106.1, Submittal Documents; § 106.4, Amended Construction Documents; 2007 California Administrative Code, § 4-215, Changes in Approved Drawings and Specifications).

Verification: On a schedule suitable to the CBO, the project owner shall notify the CBO of the intended filing of design changes and shall submit the required number of sets of revised drawings and the required number of copies of the other above-mentioned documents to the CBO, with a copy of the transmittal letter to the CPM. The project owner shall notify the CPM, via the monthly compliance report, when the CBO has approved the revised plans.

STRUC-4 Tanks and vessels containing quantities of toxic or hazardous materials exceeding amounts specified in the 2007 CBC, Chapter 3, Table 307.1(2), shall, at a minimum, be designed to comply with the requirements of that chapter.

Verification: At least 30 days (or within a project owner- and CBO-approved alternate time frame) prior to the start of installation of the tanks or vessels containing the above specified quantities of toxic or hazardous materials, the project owner shall submit to the CBO for design review and approval final design plans, specifications, and calculations, including a copy of the signed and stamped engineer's certification.

The project owner shall send copies of the CBO approvals of plan checks to the CPM in the following monthly compliance report. The project owner shall also transmit a copy of the CBO's inspection approvals to the CPM in the monthly compliance report following completion of any inspection.

MECH-1 The project owner shall submit, for CBO design review and approval, the proposed final design, specifications and calculations for each plant major piping and plumbing system listed in **FACILITY DESIGN Table 2**, Condition of Certification **GEN-2**, above. Physical layout drawings and drawings not related to code compliance and life safety need not be submitted. The submittal shall also include the applicable QA/QC procedures. Upon

completion of construction of any such major piping or plumbing system, the project owner shall request the CBO's inspection approval of that construction (2007 CBC, Appendix Chapter 1, § 106.1, Submittal Documents; § 109.5, Inspection Requests; § 109.6, Approval Required; 2007 California Plumbing Code, § 301.1.1, Approvals).

The responsible mechanical engineer shall stamp and sign all plans, drawings, and calculations for the major piping and plumbing systems, subject to CBO design review and approval, and submit a signed statement to the CBO when the proposed piping and plumbing systems have been designed, fabricated, and installed in accordance with all of the applicable laws, ordinances, regulations, and industry standards (2007 CBC, Appendix Chapter 1, § 106.3.4, Design Professional in Responsible Charge), which may include, but are not limited to:

- American National Standards Institute (ANSI) B31.1 (Power Piping Code);
- ANSI B31.2 (Fuel Gas Piping Code);
- ANSI B31.3 (Chemical Plant and Petroleum Refinery Piping Code);
- ANSI B31.8 (Gas Transmission and Distribution Piping Code);
- Title 24, California Code of Regulations, Part 5 (California Plumbing Code);
- Title 24, California Code of Regulations, Part 6 (California Energy Code, for building energy conservation systems and temperature control and ventilation systems);
- Title 24, California Code of Regulations, Part 2 (California Building Code); and
- San Luis Obispo County codes.

The CBO may deputize inspectors to carry out the functions of the code enforcement agency (2007 CBC, Appendix Chapter 1, § 103.3, Deputies).

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of any increment of major piping or plumbing construction listed in **FACILITY DESIGN Table 2**, Condition of Certification **GEN-2,** above, the project owner shall submit to the CBO for design review and approval the final plans, specifications, and calculations, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with applicable LORS, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's inspection approvals.

MECH-2 For all pressure vessels installed in the plant, the project owner shall submit to the CBO and California Occupational Safety and Health Administration (Cal/OSHA), prior to operation, the code certification papers and other

documents required by applicable LORS. Upon completion of the installation of any pressure vessel, the project owner shall request the appropriate CBO and/or Cal/OSHA inspection of that installation (2007 CBC, Appendix Chapter 1, § 109.5, Inspection Requests).

The project owner shall:

1. Ensure that all boilers and fired and unfired pressure vessels are designed, fabricated, and installed in accordance with the appropriate section of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, or other applicable code. Vendor certification, with identification of applicable code, shall be submitted for prefabricated vessels and tanks; and

2. Have the responsible design engineer submit a statement to the CBO that the proposed final design plans, specifications, and calculations conform to all of the requirements set forth in the appropriate ASME Boiler and Pressure Vessel Code or other applicable codes.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of on-site fabrication or installation of any pressure vessel, the project owner shall submit to the CBO for design review and approval, the above-listed documents, including a copy of the signed and stamped engineer's certification, with a copy of the transmittal letter to the CPM.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's and/or Cal/OSHA inspection approvals.

MECH-3 The project owner shall submit to the CBO for design review and approval the design plans, specifications, calculations, and quality control procedures for any heating, ventilating, air conditioning (HVAC), or refrigeration system. Packaged HVAC systems, where used, shall be identified with the appropriate manufacturer's data sheets.

The project owner shall design and install all HVAC and refrigeration systems within buildings and related structures in accordance with the CBC and other applicable codes. Upon completion of any increment of construction, the project owner shall request the CBO's inspection and approval of that construction. The final plans, specifications, and calculations shall include approved criteria, assumptions, and methods used to develop the design. In addition, the responsible mechanical engineer shall sign and stamp all plans, drawings, and calculations and submit a signed statement to the CBO that the proposed final design plans, specifications, and calculations conform with the applicable LORS (2007 CBC, Appendix Chapter 1, § 109.3.7, Energy Efficiency Inspections; § 106.3.4, Design Professionals in Responsible Charge).

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of construction of any HVAC or refrigeration system, the project owner shall submit to the CBO the required HVAC and refrigeration

calculations, plans, and specifications, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with the CBC and other applicable codes, with a copy of the transmittal letter to the CPM.

ELEC-1 Prior to the start of any increment of electrical construction for all electrical equipment and systems 480 Volts or higher (see a representative list, below), with the exception of underground duct work and any physical layout drawings and drawings not related to code compliance and life safety, the project owner shall submit, for CBO design review and approval, the proposed final design, specifications, and calculations (2007 CBC, Appendix Chapter 1, § 106.1, Submittal Documents). Upon approval, the above-listed plans, together with design changes and design change notices, shall remain on the site or at another accessible location for the operating life of the project. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS (2007 CBC, Appendix Chapter 1, § 109.6, Approval Required; § 109.5, Inspection Requests). All transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the **Transmission System Engineering** section of this document.

A. Final plant design plans shall include:

1. one-line diagrams for the 13.8 kV, 4.16 kV, and 480 V systems; and
2. system grounding drawings.

B. Final plant calculations must establish:

1. short-circuit ratings of plant equipment;
2. ampacity of feeder cables;
3. voltage drop in feeder cables;
4. system grounding requirements;
5. coordination study calculations for fuses, circuit breakers, and protective relay settings for the 13.8 kV, 4.16 kV, and 480 V systems;
6. system grounding requirements; and
7. lighting energy calculations.

C. The following activities shall be reported to the CPM in the monthly compliance report:

1. Receipt or delay of major electrical equipment;
2. Testing or energization of major electrical equipment; and

3. A signed statement by the registered electrical engineer certifying that the proposed final design plans and specifications conform to requirements set forth in the Energy Commission decision.

Verification: At least 30 days (or within a project owner- and CBO-approved alternative time frame) prior to the start of each increment of electrical construction, the project owner shall submit to the CBO for design review and approval the above-listed documents. The project owner shall include in this submittal a copy of the signed and stamped statement from the responsible electrical engineer attesting compliance with the applicable LORS, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

REFERENCES

BS 2008a - FPL Energy/M. O'Sullivan (tn 45646). Application for Certification, dated 03/13/08. Submitted to CEC/Docket Unit on 03/14/08.

GEOLOGY AND PALEONTOLOGY

Testimony of Dal Hunter, Ph.D., C.E.G.

SUMMARY OF CONCLUSIONS

The proposed Beacon Solar Energy Project (BSEP) is located in a geologically active area of the northwestern Mojave Desert Geomorphic Province, east-central Kern County in Southeastern California. Because of its geologic setting, the site could be subject to intense levels of earthquake-related ground shaking. Due to its close proximity to the western and central traces of the Garlock Fault there is some potential for ground rupture in the site vicinity. The effects of strong ground shaking would need to be mitigated, to the extent practical, through structural designs required by the California Building Code (CBC 2007) and the project geotechnical report. The CBC (2007) requires that structures be designed to resist seismic stresses from ground acceleration. Subsidence due to historical ground water pumping in the Fremont Valley and/or dilation due to pull-apart faulting between the western and central strands of the Garlock Fault have resulted in formation of localized tension cracks and surface fissuring along stress planes parallel to the Garlock Fault system. A geotechnical investigation has been performed and presents standard engineering design recommendations for mitigation of seismic shaking and site soil conditions. Further investigation in the area of the proposed power block is needed to verify the absence of faults, tension cracking, and subsurface fissuring. Likewise, a geologist experienced in recognition and examination of faults and fissures should be available during trenching performed for construction of the ancillary facilities, particularly the natural gas pipeline, to document any potential near surface soil anomalies and facilitate any appropriate changes in design. The additional fault/fissure evaluation is detailed in proposed Condition of Certification **GEO-1**.

There are no known viable geologic or mineralogical resources at the proposed BSEP site. Regionally, paleontological resources have been documented within Quaternary older alluvium, similar to deposits that underlie the site, but no significant fossils were found during field explorations at the plant site. Potential impacts would also be mitigated through worker training and monitoring by qualified paleontologists, as required by proposed Conditions of Certification **PAL-1** through **PAL-7**.

Based on its independent research and review, the California Energy Commission believes that the potential is low for significant adverse impacts to the proposed project from geologic hazards during its design life and to potential geologic, mineralogic, and paleontological resources from the construction, operation, and closure of the proposed project and its proposed ancillary and linear facilities. It is staff's opinion that the BSEP could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards and in a manner that would both protect environmental quality and assure public safety, to the extent practical.

INTRODUCTION

In this section, California Energy Commission (Energy Commission) staff discusses the potential impacts of geologic hazards on the proposed BSEP site as well as the

potential to affect geologic, mineralogic, and paleontological resources. Staff's objective is to ensure that there would be no consequential adverse impacts to significant geological and paleontological resources during the project construction, operation, and closure and that operation of the plant would not expose occupants to high-probability geologic hazards. A brief geological and paleontological overview is provided. The section concludes with staff's proposed monitoring and mitigation measures for geologic hazards and geologic, mineralogic, and palentologic resources, with the proposed Conditions of Certification.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Applicable laws, ordinances, regulations, and standards (LORS) are listed in the application for certification (AFC) (BS 2008a). The following briefly describes the current LORS for both geologic hazards and resources and mineralogic and paleontological resources.

Geology and Paleontology Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	The proposed BSEP is not located on federal land. There are no federal LORS for geologic hazards and resources for this site.
State	
California Building Code (CBC), 2007	The CBC (2007) includes a series of standards that are used in project investigation, design, and construction (including grading and erosion control).
Alquist-Priolo Earthquake Fault Zoning Act, Public Resources Code (PRC), section 2621–2630	Mitigates against surface fault rupture of known active faults beneath occupied structures. Requires disclosure to potential buyers of existing real estate and a 50-foot setback for new occupied buildings. Portions of the site and proposed ancillary facilities are located within designated Alquist-Priolo Fault Zones. The proposed site layout places occupied structures outside of the 50-foot setback zone.
The Seismic Hazards Mapping Act, PRC Section 2690–2699	Areas are identified that are subject to the effects of strong ground shaking, such as liquefaction, landslides, tsunamis, and seiches.
PRC, Chapter 1.7, sections 5097.5 and 30244	Regulates removal of paleontological resources from state lands, defines unauthorized removal of fossil resources as a misdemeanor, and requires mitigation of disturbed sites.
Warren-Alquist Act, PRC, sections 25527 and 25550.5(i)	The Warren-Alquist Act requires the Energy Commission to "give the greatest consideration to the need for protecting areas of critical environmental concern, including, but not limited to, unique and irreplaceable scientific, scenic, and educational wildlife habitats; unique historical, archaeological, and cultural sites…" With respect to paleontological resources, the Energy Commission relies on guidelines from the Society for Vertebrate Paleontology, indicated below.

Applicable Law	Description
California Environmental Quality Act (CEQA), PRC sections 15000 et seq., Appendix G	Mandates that public and private entities identify the potential impacts on the environment during proposed activities. Appendix G outlines the requirements for compliance with CEQA and provides a definition of significant impacts on a fossil site.
Society for Vertebrate Paleontology (SVP), 1995	The "Measures for Assessment and Mitigation of Adverse Impacts to Non-Renewable Paleontological Resources: Standard Procedures" is a set of procedures and standards for assessing and mitigating impacts to vertebrate paleontological resources. The measures were adopted in October 1995 by the SVP, a national organization of professional scientists.
Local	
Kern County Grading Code, (Ord. 17.28.040, 2008)	Kern County grading permit is required for earth moving activities in excess of 50 cubic yards.
Kern County Floodplain Management Ordinance, (Ord. 17.48.140, 2008)	A Kern County development permit is required prior to construction or development within an area of special flood hazards, areas of flood related erosion hazards, or areas of potential mudslides.

SETTING

The proposed BSEP would be constructed on 2,012 acres of privately-owned vacant land within a 2,317-acre parcel east of State Route 14 approximately 4 miles north-northwest of California City in Kern County, California. With the exception of active drainages, the site was cleared and graded during the mid-1900's for agriculture which continued until the mid-1980's. The site is partially fenced and hosts approximately 14 disused irrigation wells. A shallow ephemeral drainage crosses the site from southwest to northeast near its center and serves to convey infrequent runoff from catchment areas south and southwest of the site to the fluvially isolated playa of Koehn Lake approximately 5 miles to the east-northeast.

The proposed BSEP would be a primary power generating facility capable of producing 250 MW of electricity from a parabolic trough linear receiver solar array. The high flash point fluid, which would circulate within the closed-loop linear receiver array, would be used to generate steam which would drive the electricity generating turbine system. A propane-fired boiler system would be used to maintain system circulation during the night and periods of heavy cloud cover, and would provide power during system startup each morning. Ancillary facilities associated with the solar array would include re-routing an existing above-ground electrical transmission line, connecting to the existing Los Angeles Department of Water and Power electrical grid, to a location along the proposed north fence line, connection to existing water supply well(s) on the

property for process water, a cooling tower, an onsite septic system, a control building, paved and unpaved roads, and various smaller outbuildings to house maintenance and security personnel and equipment. Other water sources are now being considered, one from new wells around Koehn Lake would require a 7- to 9-mile-long pipeline. A second alternate source, the Rosamond Waste Water Treatment Plant, would require a 40±-mile-long pipeline (DB 2009r).

REGIONAL SETTING

The proposed BSEP would to be located in the Koehn Lake sub-basin of Fremont Valley, an enclosed drainage basin in the northwest corner of the Mojave Desert Geomorphic Province in eastern Kern County, California. The Mojave Desert is a broad interior region of isolated mountain ranges which separate vast expanses of desert plains and interior drainage basins and occupies approximately 25,000 square miles in southeastern California and portions of Nevada, Utah, and Arizona. In California, its overall topography is dominated by southeast to northwest trending faulting with a secondary east to west trending alignment which is correlateable to Transverse Range faulting. The proposed BSEP site is located near the northwest boundary of the Mojave Desert Geomorphic Province where it terminates against the Garlock Fault. North of Fremont Valley, the Garlock fault defines the northern boundary of the Mojave Desert province where it meets the southern end of the Basin and Range province. In Fremont Valley, the Garlock Fault defines the northwest border of the Mojave Desert province, separating it from the southern end of the Sierra Nevada Geomorphic Province. Further south a portion of the Garlock Fault and the San Andreas Fault define an abrupt topographic transition between the Mojave Desert province and the Transverse Range Geomorphic Province.

PROJECT SITE DESCRIPTION

The proposed BSEP site is located on vacant land east of California State Route 14 approximately four miles north-northwest of California City and 15 miles north of Mojave in eastern Kern County, California. The site is located in an enclosed drainage basin within Fremont Valley in the northwest portion of the Mojave Desert Geomorphic Province. Drainage within the enclosed basin occurs along ephemeral streams which flow toward the normally dry lakebed of Koehn Lake approximately 5 miles northeast of the site. The site is located on partially cleared and graded land formerly used for agricultural crops including alfalfa. The property is partially fenced and approximately 14 disused irrigation wells are present on the site. Access is obtained from a gravel road leading east from SR-14 past several abandoned farm structures and across the north to south trending Union Pacific Railroad tracks. The site is relatively flat with elevations ranging from approximately 2,220 feet in the south to 2,025 feet at the northern boundary. A prominent change in topography, formed by the northeast to southwest trending scarp of the Western Garlock Fault strand, is present in the southeast portion of the site. The dry and moderately vegetated braided channel of Pine Tree Creek carries runoff from infrequent rainfall events from south-southwest to north-northeast across the center of the site toward Koehn Lake. An oval, paved automotive test track facility is located immediately east of the northeast quarter of the site.

Due to its location near the junction of three geomorphic provinces, the proposed BSEP site is in close proximity to several active and potentially active faults related to regional

strike-slip faulting and extensional tectonics. The California Geological Survey (CGS) assigns type classifications to faults according to their historic and projected potential for future activity. Type A faults have slip-rates of ≥5 mm per year and are capable of producing an earthquake of magnitude 7.0 or greater. Type B faults have slip-rates of 2 to 5 mm per year and are capable of producing an earthquake of magnitude 6.5 to 7.0. Type A and B faults within 70 miles of the site are listed in **Geology and Paleontology Table 2**, along with the orientation, type, sense of movement, and distance from the project site.

The fault characteristics information listed was derived from Blake, (2000), CGS, (2002 a and b), USGS (2006), and McGill and Sieh (1993). The CGS does not currently recognize the central strand of the Garlock Fault, but most recent studies indicate it is the only segment of the Garlock Fault which shows Holocene movement. The western segment may be undergoing a seismic creep (Pampeyan, Holzer, and Clark, 1988). Staff has assigned the central segment classification Type A based of its reported slip rate of 5 to 7 mm per year (McGill and Sieh, 1993), and potential to produce a magnitude 7.0 or greater earthquake (McGill and Rockwell, 1998). If the western and eastern segments of the Garlock Fault have the slip rates and maximum magnitudes assigned them by the CGS (2002), they too could be considered to be Type A faults.

Geology and Paleontology Table 2
Active Faults Relative to the Proposed BSEP Site

Fault Name	Distance From Site (miles)	Maximum Earthquake Magnitude (Mw)	Estimated Peak Site Acceleration (g)	Movement and Strike	Slip Rate mm/yr	Fault Type
Garlock - West Strand (Also known as the Cantil Fault)	0.0	7.3	0.705	Left-Lateral Strike Slip (East)	6.0	B
Garlock – Central Strand (Includes El Paso Fault)	0.9	7.3	0.705	Left-Lateral Strike Slip (Northeast)	5 - 11	A
Garlock - East Strand	62	7.5	0.691	Left-Lateral Strike Slip (Northeast)	7.0	B
Owl Lake	68.5	6.5	0.046	Left-Lateral Strike Slip	2.0	B
Lenwood-Lockhart-Old Woman Springs	14.3	7.5	0.260	Right-Lateral Strike Slip (Northwest)	0.6	B
Southern Sierra Nevada	18.3	7.3	0.237	Normal (North to Northeast)	0.1	B
White Wolf	22.1	7.3	0.205	Left-Lateral Reverse/Oblique Slip (South)	2.0	B
Gravel Hills-Harper Lake	31.4	7.1	0.116	Right-Lateral Strike Slip (Northwest)	0.6	B
Helendale-South Lockhart	31.6	7.3	0.128	Right-Lateral Strike Slip (Northwest)	0.6	B
Little Lake	34.7	6.9	0.097	Right-Lateral Strike Slip (Northwest)	0.7	B
Blackwater	36.5	7.1	0.104	Right-Lateral Strike Slip (Northwest)	0.6	B

Fault Name	Distance From Site (miles)	Maximum Earthquake Magnitude (Mw)	Estimated Peak Site Acceleration (g)	Movement and Strike	Slip Rate mm/yr	Fault Type
San Andreas (Entire M-1a)	46.4	8.0	0.138	Right-Lateral Strike Slip (Northwest)	34.0	A
San Andreas (Mojave M-1c-3)	46.4	7.4	0.101	Right-Lateral Strike Slip (Northwest)	30.0	A
San Andreas (Cholame-Mojave)	46.4	7.8	0.125	Right-Lateral Strike Slip (Northwest)	34.0	A
San Andreas (Carrizo)	47.4	7.4	0.099	Right-Lateral Strike Slip (Northwest)	34.0	A
Tank Canyon	49.2	6.4	0.069	Normal (Northwest)	1.0	B
Pleito Thrust	53.6	7.0	0.089	Reverse (Northeast)	2.0	B
Sierra Madre (San Fernando)	60.5	6.7	0.069	Reverse (North)	2.0	B
Panamint Valley	60.9	7.4	0.082	Right-Lateral Normal Oblique Slip (Northwest)	2.5	A
San Gabriel	61.1	7.2	0.073	Right-Lateral Strike Slip (Northwest)	1.0	B
Sierra Madre	62.0	7.2	0.088	Reverse (West)	2.0	B

The deepest well drilled in the site vicinity ends in alluvium at approximately 4,920 feet below surface. Gravity modeling suggests the valley is filled with sediments to a depth of approximately 10,500 feet and seismic reflection profiles suggest the basin alluvial fill may be as much as 13,000 feet deep (McGill and Rockwell, 1998). Valley fill deposits within enclosed desert basins tend to vary greatly in thickness, composition, and lateral distribution because they are generally deposited rapidly during short-lived runoff events of variable magnitude. This makes basin-wide correlation of deposits from individual runoff events an impractical if not impossible task and basin fill deposits are generally only referred to by their relative age if it can be determined by fossil, geomorphic, or other means.

The surface areas of the proposed plant site, which were disturbed by agricultural activities, are characterized by fine to coarse sand and subangular to subrounded fine to coarse gravel cover which may be the result of wind erosion of the fine-grained silt component. Subsurface investigation by Kleinfelder (2008) indicates the near surface formation is composed of sand and silt dominated layers with a minor clay component in scattered locations.

Ground water depth in the area is 304 to 487 feet below ground surface (Kleinfelder, 2007). The end of local irrigation in the mid-1980's probably slowed or stopped ground water overdraft in the Fremont Valley. Therefore, ground water levels in the valley may be slowly rising as annual recharge replenishes the aquifer(s) beneath the site.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section considers two types of impacts. The first is geologic hazards, which could impact the proper functioning of the proposed facility and create life/safety concerns. The second is the potential impacts the proposed facility could have on existing geologic, mineralogic, and paleontological resources in the area.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

No federal LORS concerning geologic hazards and geologic and mineralogic resources apply to this proposed project. The California Building Standards Code (CBSC) and CBC (2007) provide geotechnical and geological investigation and design guidelines, which engineers must follow when designing a facility. As a result, the criteria used to assess the significance of a geologic hazard include evaluating each hazard's potential impact on the design and construction of the proposed facility. Geologic hazards include faulting and seismicity, liquefaction, dynamic compaction, hydrocompaction, subsidence, expansive soils, landslides, tsunamis, and seiches.

The California Environmental Quality Act (CEQA) guidelines, Appendix G, provide a checklist of questions that lead agencies typically address.

- Section (V) (c) includes guidelines that determine if a project will either directly or indirectly destroy a unique paleontological resource or site or a unique geological feature.
- Sections (VI) (a), (b), (c), (d), and (e) focus on whether or not the project would expose persons or structures to geologic hazards.
- Sections (X) (a) and (b) concern the project's effects on mineral resources.

Staff has reviewed geologic and mineral resource maps for the surrounding area, as well as site-specific information provided by the applicant, to determine if geologic and mineralogic resources exist in the area and to determine if operations could adversely affect geologic and mineralogic resources.

Staff reviewed existing paleontological information and requested records searches from the San Bernardino County Museum and the Natural History Museum of Los Angeles County for the site area. Site-specific information generated by the applicant for the BSEP was also reviewed. All research was conducted in accordance with accepted assessment protocol (SVP 1995) to determine whether any known paleontological resources exist in the general area. If present or likely to be present, Conditions of Certification, which outline required procedures to mitigate impacts to potential resources, are proposed as part of the project's approval.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Ground shaking and fissuring due to subsidence settlement represent the main geologic hazards at this site. These potential hazards can be effectively mitigated through facility design by incorporating recommendations contained in the project geotechnical report. Further investigation of the power block site is necessary to verify subsurface fissuring

which could affect foundation stability is not present in that area. Proposed Conditions of Certification **GEO-1**, **GEN-1, GEN-5,** and **CIVIL-1** in the **Facility Design** section should also mitigate these impacts to a less than significant level.

The proposed BSEP site is not located within an established Mineral Resource Zone (MRZ) and no economically viable mineral deposits are known to be present. A test pit, which was excavated to explore the potential for clay montmorillonite production, is present near SR-14 and the UPRR tracks near the northwest corner of the site but no montmorillonite production is known to have occurred (CGS, 1999).

No important paleontological resources were observed on the proposed BSEP site during the paleontological field survey conducted for the AFC (BS 2008a). The site near-surface formation is composed to an unknown and probably variable depth by unconsolidated Holocene flood plain and fan deposits. Given their recent age (<10,000 years), these deposits are unlikely to contain significant paleontological resources. Older Quaternary alluvium of Pleistocene age which underlies the Holocene deposits is known to contain significant fossil resources, primarily terrestrial vertebrates. Likewise, lakebed deposits which range in age from recent to Pleistocene have potential to contain significant fossil resources, particularly as they increase in age with depth.

Overall, staff considers the probability that paleontological resources will be encountered during site construction activities to be low. However, if construction includes significant amounts of grading or deep foundation excavation and utility trenching, the potential for exposure of paleontological resources will increase with depth of the excavations. This assessment is based on SVP criteria and the paleontological report appended to the AFC (BS 2008a). Proposed Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate paleontological resource impacts, as discussed above, to less than significant levels. These conditions essentially require a worker education program in conjunction with the monitoring of earthwork activities by a qualified professional paleontologist (a paleontological resource specialist, or PRS).

The proposed Conditions of Certification allow the Energy Commission's compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with LORS applicable to geologic hazards and the protection of geologic, mineralogic, and paleontological resources.

Based on the information below, it is staff's opinion that the potential for significant adverse, direct or indirect impacts to the project, from geologic hazards, and to potential geologic, mineralogic, and paleontological resources, from the proposed project, is low.

GEOLOGICAL HAZARDS

The AFC provides documentation of potential geologic hazards at the proposed BSEP plant site, including site-specific subsurface information (Kleinfelder, 2008). Review of the AFC, coupled with staff's independent research, indicates that the potential for geologic hazards to impact the proposed plant site during its practical design life would be low if recommendations for mitigation of seismic shaking and subsidence are followed. Geologic hazards related to seismic shaking and subsidence are addressed in the project geotechnical report per CBC (2007) requirements (Kleinfelder, 2008). As a

proposed Condition of Certification (**GEO-1**), staff recommends that examination of the near surface formation in the power block area be conducted during construction to verify the absence of splay faults or fissures which could affect the integrity of foundations. Likewise, a geologist experienced in recognition and examination of faults and fissures should be available during trenching performed during construction of the ancillary facilities, particularly the natural gas pipeline, to document any potential near surface soil anomalies and facilitate any appropriate changes in design.

Staff's independent research included the review of available geologic maps, reports, and related data of the BSEP plant site. Geological information was available from the CGS, California Division of Mines and Geology (CDMG, now know as CGS), the U.S. Geological Survey (USGS), the American Geophysical Union, the Geologic Society of America, and other organizations.

Faulting and Seismicity

Energy Commission staff reviewed numerous CDMG and USGS publications as well as informational websites in order to gather data on the location, recency, and type of faulting in the project area. Type A and B faults within 70 miles of the BSEP site are listed in Table 1. Type A faults have slip-rates of $\geq$5 mm per year and are capable of producing an earthquake of magnitude 7.0 or greater. Type B faults have slip-rates of 2 to 5 mm per year and are capable of producing an earthquake of magnitude 6.5 to 7.0. The fault type, potential magnitude, and distance from the BSEP site are summarized in **Geology and Paleontology Table 2**.

Type C and otherwise undifferentiated faults which are more than 20 miles from the site are not discussed here because they are unlikely to undergo movement or generate seismicity which could affect the project.

Although 20 Type A and B faults and fault segments were identified within 70 miles of the site, the closest and most likely to impact operation of the BSEP are the central and western segments of the Garlock Fault System. The Garlock Fault is one of the major fault systems in southern California, marking the geographic boundary between the Mojave Desert geomorphic province and, in the project area, the southern end of the Sierra Nevada geomorphic province and, further north, the Basin and Range geomorphic province. Overall, the fault system is defined as an approximately 155 mile long arcuate left lateral strike slip system extending from the San Andreas Fault at the Transverse Ranges in the south, northeast and then east to the Avawatz Mountains at the southern end of Death Valley (McGill and Sieh, 1993).

The U.S. Geological Survey and other organizations recognize three separate segments along the Garlock Fault System as they are defined by geographic setting and apparent seismic activity. These are the western, central, and eastern Garlock Fault segments. The western segment extends northeast from the San Andreas Fault at the base of the Transverse Ranges to a point just north of the project area on the eastern side of Koehn Lake. Within Fremont Valley, the Garlock Fault offsets to the west across the width of the valley to form the southwestern end of the central segment. This means much of the Fremont Valley, including the BSEP site and Koehn Lake, lies in an approximately 2-mile-wide, down-to-the-north block formed by the extensional step-over between the western and central segments (McGill and Rockwell, 1998). The central

segment originates on the west side of Fremont Valley and arcs northeast approximately 65 miles to a splayed en-echelon hinge zone at the southern end of the Quail Mountains which defines the northeastern end of the central fault segment. South of the Quail Mountains the Garlock Fault bends 15 degrees to the east and the eastern segment strikes nearly east-west for 34 miles to terminate at the southern end of Death Valley (McGill and Rockwell, 2003).

Although the fault has not produced any large historic earthquakes, geomorphic and stratigraphic evidence indicates it has done so in the past and approximately 30 to 40 miles of left lateral offset has been documented along the fault since its activation during the late Miocene approximately 7 million years (My) ago (Dawson, McGill, and Rockwell, 2003). The most recent documented fault movement occurred along the Central Garlock Fault segment northwest of the project site between approximately 200 to 550 years before present (McGill and Rockwell, 1998). Although the western segment forms a prominent scarp across the southeast portion of the site, no Holocene movement has been documented on the western segment of the Garlock fault.

Holocene movement has been demonstrated on the central segment of the Garlock fault (Dawson, McGill, and Rockwell, 2003, and McGill and Sieh, 1991). In the area of Koehn Lake, approximately 5 miles north of the site, at least 5 and possibly as many as 8 surface ruptures have been recorded on the central Garlock fault in the last 5,000 years. The average recurrence rate is apparently irregular but is believed to be in the range of 700 to 1,200 years (McGill and Rockwell, 1998).

The Alquist-Priolo Act of 1973 and subsequent California state law (California Code of Regulations 2001) require that all occupied structures be set back 50 feet or more from the surface trace of an active fault. The western segment of the Garlock Fault is traceable across the southeast portion of the site, forming a topographic rise from southwest to northeast. Therefore, occupied structures will require set backs of at least 50 feet from the surface trace of the fault. Trenching should be performed beneath or near the footprint of any proposed occupied structure to demonstrate no fault splay or subsurface fissure underlies the building.

Based on previous drilling and on the soil profile generated for this site by the geotechnical investigation, the site soil class is assumed to be seismic Class D. The estimated peak horizontal ground acceleration for the power plant is 0.85 times the acceleration of gravity (0.85g) for bedrock acceleration based on 2 percent probability of exceedence in 50 years under 2007 CBC criteria. For a Class D site, the soils profile amplifies the acceleration of the ground surface to 1.94g (USGS 2008).

Liquefaction

Liquefaction is a condition in which a saturated cohesionless soil may lose shear strength because of sudden increase in pore water pressure caused by an earthquake. However, the potential for liquefaction of strata deeper than approximately 40 feet below surface is considered negligible due to the increased confining pressure and because geologic strata at this depth are generally too compact to liquefy. The reported deep ground water table of greater than 300 feet would indicate no potential

for liquefaction and standard penetration testing (blowcounts) reported in the project-specific geotechnical report (Kleinfelder, 2008) indicate strata beneath the site are generally too dense to liquefy.

Lateral Spreading

Lateral spreading of the ground surface can occur within liquefiable beds during seismic events. Lateral spreading generally requires an abrupt change in slope—that is, a nearby steep hillside or deeply eroded stream bank, etc.—but can also occur on gentle slopes such as are present at the project site. Other factors such as distance from the epicenter, magnitude of the seismic event, and thickness and depth of liquefiable layers also affect the amount of lateral spreading. Because the BSEP site is not subject to liquefaction, the potential for lateral spreading of the site surface during seismic events is negligible.

Dynamic Compaction

Dynamic compaction of soils results when relatively unconsolidated granular materials experience vibration associated with seismic events. The vibration causes a decrease in soil volume, as the soil grains tend to rearrange into a more dense state (an increase is soil density). The decrease in volume can result in settlement of overlying structural improvements. Site specific geotechnical investigation indicates the alluvial deposits in the site subsurface are generally too dense to allow significant dynamic compaction (Kleinfelder, 2008).

Hydrocompaction

Hydrocompaction (also known as hydro-collapse) is generally limited to young soils that were deposited rapidly in a saturated state, most commonly by a flash flood. The soils dry quickly, leaving an unconsolidated, low density deposit with a high percentage of voids. Foundations built on these types of compressible materials can settle excessively, particularly when landscaping irrigation dissolves the weak cementation that is preventing the immediate collapse of the soil structure. Site specific geotechnical investigation indicates the subsurface alluvial deposits which underlie the site are generally too dense to experience significant hydrocompaction (Kleinfelder, 2008).

Subsidence

Regional ground subsidence is typically caused by petroleum or ground water withdrawal that increases the effective unit weight of the soil profile, which in turn increases the effective stress on the deeper soils. This results in consolidation or settlement of the underlying soils. The nearest known petroleum or gas fields are located in the Great Valley roughly 60 miles west of the project site on the western side of the southern Sierra Nevada Geomorphic Province (California Department of Conservation [CDC] 2001). Site water supply will be provided by pumping from existing wells at the site but is not expected to rival historic pumping levels. Therefore, subsidence due to petroleum, natural gas, or future ground water production is considered very unlikely.

Local subsidence or settlement may occur when areas containing compressible soils are subjected to foundation loads. Site-specific geotechnical investigation indicates the

alluvial deposits which underlie the site are generally compacted to a medium-dense to very dense consistency and therefore are considered unlikely to support site-wide subsidence due to foundation loading. Deep foundations (drilled shafts) or mat foundations may be necessary to limit settlement of heavily loaded structures (Kleinfelder, 2008).

Tension cracking due to either historic ground water withdrawals, lateral extension between the western and central segments of the Garlock Fault, or possibly a combination of the two forces has resulted in formation of near-surface tension cracking and fissures in the site area in the past (Pampeyan, Holzer, and Clark, 1988; and BS 2008a). Near surface fissuring related to the Garlock Fault has also been documented near the eastern end of the Central Segment (Zellmer, Roquemore, and Blackerby, 1985). In the site area surface fissures appear to form when runoff from storm events causes erosion along the plane of tension cracks. Surface fissures can grow to several yards in width and depth and have caused historic damage to roads, power lines, and buried pipelines (Pampeyan, Holzer, and Clark, 1988). Additional examination of the near surface formation in the power block area should be conducted during construction to verify near surface soil stability and the absence of faults, tension cracks, or fissures which could fail and affect the integrity of power block structures (refer to proposed Condition of Certification **GEO-1**). A geologist experienced in recognition and examination of faults and fissures should be available during trenching performed for construction of the ancillary facilities, particularly the natural gas pipeline, to document any potential near surface soil anomalies and facilitate any appropriate changes in design (refer to proposed **GEO-1**).

Expansive Soils

Soil expansion occurs when clay-rich soils with an affinity for water exist in place at a moisture content below their plastic limit. The addition of moisture from irrigation, precipitation, capillary tension, water line breaks, etc. causes the clay soils to absorb water molecules into their structure, which in turn causes an increase in the overall volume of the soil. This increase in volume can correspond to excessive movement (heave) of overlying structural improvements. The silts and silty sand which form most of the site subsurface are not considered to be expansive.

Landslides

The BSEP site under consideration slopes gently to the east-northeast at a gradient of less than 1 percent. Due to the low site gradient and the absence of topographically high ground in the site vicinity there is no potential for landslide impacts to the proposed project.

Flooding

The Federal Emergency Management Agency (FEMA) has identified the majority of the BSEP site and ancillary facilities areas as lying in Unshaded Zone C, or “Areas of Minimal Flooding.” However, the zone along Pine Tree Creek which passes through the site from southwest to the northeast toward Koehn Lake is classified Zone A, “Areas of 100 year flood, base flood elevation and flood hazard not determined” (FEMA 1986).

Tsunamis and Seiches

The proposed BSEP project and associated linear facilities are not located near any significant surface water bodies and therefore there is no potential for impacts due to tsunamis and seiches.

GEOLOGIC, MINERALOGIC AND PALEONTOLOGICAL RESOURCES

Energy Commission staff has reviewed applicable geologic maps, reports, and on-line resources for this area (Blake 2000; Bryant 2000a and 2000b; CDMG 2003, 1999, 1998, 1994, 1990, 1986, 1965, and 1962; CGS 1999; Morton and Troxel 1962). Staff did not identify any geological or mineralogical resources at the proposed energy facility location.

Energy Commission staff reviewed the paleontological resources assessment in Section 5.9 and Appendix H of the AFC (ENSR 2008). Staff has also reviewed paleontological literature and records searches conducted by the San Bernardino County Museum (Scott 2008) and the Natural History Museum of Los Angeles County (McCleod 2008). No paleontological resources have been documented on the proposed BSEP plant site.

Although Quaternary alluvial and lakebed deposits, like those which underlie the project site, are known to contain a wide variety of vertebrate fossils, none have been identified at the site or within a 1-mile radius of the site. There is some potential to encounter significant vertebrate fossils if drilled shaft foundations are required to support heavily loaded structures. Any fossil brought to the surface by drilling operations would be badly disturbed and out of context as well. Given the relatively small diameter of the shaft boring (typically 18 to 48 inches), and the general scarcity of significant fossils, the chances of intersecting strata bearing significant fossils would seem remote.

This assessment is based on SVP criteria, the paleontological report appended to the AFC (BS 2008a), and the independent paleontological assessment of McLeod (2008). Proposed Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate paleontological resource impacts, as discussed above, to less than significant levels. These conditions essentially require a worker education program in conjunction with the monitoring of earthwork activities by a qualified professional paleontologist (a paleontological resource specialist, or PRS).

The proposed conditions of certification allow the Energy Commission's compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with LORS applicable to geologic hazards and the protection of geologic, mineralogic, and paleontological resources.

Construction Impacts and Mitigation

The design-level geotechnical investigation, required for the project by the CBC (2007) and proposed Condition of Certification **GEN-1**, should provide standard engineering design recommendations for mitigation of earthquake ground shaking and excessive settlement (see **Proposed Conditions of Certification, Facility Design**). Proposed Condition of Certification **GEO-1** is intended to verify that fault splays and fissures do

not underlie the major structural components of the proposed project and that any such features are identified along project linears so that appropriate design precautions can be taken.

As noted above, no viable geologic or mineralogic resources are known to exist in the vicinity of the BSEP construction site. No paleontological resources have been identified at the site although older alluvium and lakebed deposits beneath the site are considered to have a high sensitivity for paleontological impacts. Construction of the proposed project will include grading, foundation excavation, and utility trenching. Based on the soils profile, SVP assessment criteria, and the depth of the potentially fossiliferous geologic units, staff considers the probability of encountering paleontological resources to be low unless drilled shaft foundation borings, or other excavations, reach greater than 25 feet below existing ground surface. Given the small diameter of the foundation borings (24 inches), and the general scarcity of significant fossils, the chances of intersecting fossil bearing strata would seem remote. The need for other excavations to extend to depths of 25 feet or more is unlikely.

Proposed Conditions of Certification **PAL-1 to PAL-7** are designed to mitigate any paleontological resource impacts, as discussed above, to a less than significant level. Essentially, Conditions of Certification **PAL-1 to PAL-7** require a worker education program in conjunction with monitoring of earthwork activities by qualified professional paleontologists (paleontological resource specialist, or PRS). Earthwork is halted any time potential fossils are recognized by either the paleontologist or the worker. When properly implemented, the Conditions of Certification 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. A paleontological resource specialist is retained, for the project by the applicant, to produce a monitoring and mitigation plan, conduct the worker training, and provide the monitoring. During the monitoring, the PRS can and often does petition the Energy Commission for a change in the monitoring protocol. Most commonly, this is a request for lesser monitoring after sufficient monitoring has been performed to ascertain that there is little change of finding significant fossils. In other cases, the PRS can propose increased monitoring due to unexpected fossil discoveries or in response to repeated out-of-compliance incidents by the earthwork contractor.

Based upon the literature and archives search, field surveys, and compliance documentation for the BSEP, the applicant has proposed monitoring and mitigation measures to be followed during the construction of the project. Energy Commission staff believes that the facility can be designed and constructed to minimize the effect of geologic hazards and impacts to potential paleontological resources at the site during project design life.

Operation Impacts and Mitigation

Operation of the proposed solar generating facility should not have any adverse impact on geologic, mineralogic, or paleontological resources.

CUMULATIVE IMPACTS AND MITIGATION

The proposed BSEP is situated in a seismically active geologic environment. Strong ground shaking potential must be mitigated through foundation and structural design as required by the CBC (2007). Compressible soils and areas within and near building footprints which may undergo subsidence due to tension cracking and fissuring must be mitigated in accordance with a design-level project geotechnical investigation and proposed Conditions of Certification **GEO-1**, **GEN-1, GEN-5, and CIVIL-1** under **Facility Design**. Paleontological resources have been documented in the general area of the project and in sediments similar to those that are present on the site. However, to date, none have been found during field studies of the BSEP site. The potential impacts to paleontological resources due to construction activities would be mitigated as required by proposed Conditions of Certification **PAL-1 to PAL-7**.

Staff believes that the potential for significant adverse impacts to the proposed project from geologic hazards, during the project's design life, is low, and that the potential for cumulative impacts to geologic, mineralogic, and paleontological resources is very low.

Based upon the literature and archives search, field surveys, and compliance documentation for the planned BSEP project, the applicant proposes monitoring and mitigation measures for construction of the BSEP, and staff agrees with the applicant that the project can be designed and constructed to minimize the effects of geologic hazards at the site and that impacts to fossils encountered during construction would be mitigated to levels of insignificance.

The proposed conditions of certification allow the Energy Commission CPM and the applicant to adopt a compliance monitoring scheme ensuring compliance with applicable LORS for geologic hazards and geologic, mineralogic, and paleontological resources.

FACILITY CLOSURE

Facility closure activities are not expected to impact geologic, paleontological, or mineralogic resources since no such resources are known to exist at the project location. In addition, the decommissioning and closure of the project should not negatively affect geologic, mineralogic, or paleontological resources since the majority of the ground disturbed during plant decommissioning and closure would have been already disturbed, and mitigated as required, during construction and operation of the project.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff has not received any agency or public comments regarding geologic hazards, mineral resources, or paleontology at this time.

CONCLUSIONS

The applicant will easily be able to comply with applicable LORS, provided that the proposed Conditions of Certification are adopted and followed. The design and

construction of the project should have no adverse impact with respect to geologic, mineralogic, and paleontological resources. Staff proposes to ensure compliance with applicable LORS through the adoption of the proposed conditions of certification listed below.

PROPOSED CONDITIONS OF CERTIFICATION

General conditions of certification with respect to engineering geology are proposed under Conditions of Certification **GEO-1**, below, and **GEN-1, GEN-5, and CIVIL-1** in the **Facility Design** section. Proposed paleontological conditions of certification follow. It is staff's opinion that the likelihood of encountering paleontological resources is low at the plant site. Staff will consider reducing monitoring intensity, at the recommendation of the project paleontological resource specialist, following examination of sufficient, representative deep excavations.

GEO-1 The project owner shall have all trenching for underground utilities located within 500 feet of a known active or potentially active fault examined by a licensed geologist. The faults to be examined are:

- Garlock Fault East
- Garlock Fault West
- Randsburg-Mojave Fault
- Muroc Fault.

In addition, the foundation excavations for occupied structures, the turbine-generators, and steam generator shall be similarly examined. The purpose of the examination will be to verify the absence or presence of splay or fissures related to the major fault systems in the areas described. Fissures and/or fault splays, if present, may require mitigation in accordance with supplementary recommendations from the project geotechnical and structural engineers.

Verification: The geologist shall submit, to the CPM, appropriate, brief field reports describing and documenting his/her findings and interpretation. Any recommendations for mitigation developed by the geologist, geotechnical or structural engineers must also be submitted for review.

PAL-1 The project owner shall provide the compliance project manager (CPM) with the resume and qualifications of its paleontological resource specialist (PRS) for review and approval. If the approved PRS is replaced prior to completion of project mitigation and submittal of the Paleontological Resources Report, the project owner shall obtain CPM approval of the replacement PRS. The project owner shall keep resumes on file for qualified paleontological resource monitors (PRMs). If a PRM is replaced, the resume of the replacement PRM shall also be provided to the CPM.

The PRS resume shall include the names and phone numbers of references. The resume shall also demonstrate to the satisfaction of the CPM the appropriate education and experience to accomplish the required paleontological resource tasks.

As determined by the CPM, the PRS shall meet the minimum qualifications for a vertebrate paleontologist as described in the Society of Vertebrate Paleontology (SVP) guidelines of 1995. The experience of the PRS shall include the following:

1. Institutional affiliations, appropriate credentials, and college degree;

2. Ability to recognize and collect fossils in the field;

3. Local geological and biostratigraphic expertise;

4. Proficiency in identifying vertebrate and invertebrate fossils; and

5. At least three years of paleontological resource mitigation and field experience in California and at least one year of experience leading paleontological resource mitigation and field activities.

The project owner shall ensure that the PRS obtains qualified paleontological resource monitors to monitor as he or she deems necessary on the project. Paleontological resource monitors (PRMs) shall have the equivalent of the following qualifications:

- BS or BA degree in geology or paleontology and one year of experience monitoring in California; or
- AS or AA in geology, paleontology, or biology and four years' experience monitoring in California; or
- Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in California.

Verification:

1. At least 60 days prior to the start of ground disturbance, the project owner shall submit a resume and statement of availability of its designated PRS for on-site work.

2. At least 20 days prior to ground disturbance, the PRS or project owner shall provide a letter with resumes naming anticipated monitors for the project, stating that the identified monitors meet the minimum qualifications for paleontological resource monitoring required by the condition. If additional monitors are obtained during the project, the PRS shall provide additional letters and resumes to the CPM. The letter shall be provided to the CPM no later than one week prior to the monitor's beginning on-site duties.

3. Prior to the termination or release of a PRS, the project owner shall submit the resume of the proposed new PRS to the CPM for review and approval.

PAL-2 The project owner shall provide to the PRS and the CPM, for approval, maps and drawings showing the footprint of the power plant, construction lay-down areas, and all related facilities. Maps shall identify all areas of the project where ground disturbance is anticipated. If the PRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the PRS and CPM. The site grading plan and plan and profile drawings for the utility lines would be acceptable for this purpose. The plan drawings should show the location, depth, and extent of all ground disturbances and be at a scale between 1 inch = 40 feet and 1 inch = 100 feet. If the footprint of the project or its linear facilities changes, the project owner shall provide maps and drawings reflecting those changes to the PRS and CPM.

If construction of the project proceeds in phases, maps and drawings may be submitted prior to the start of each phase. A letter identifying the proposed schedule of each project phase shall be provided to the PRS and CPM. Before work commences on affected phases, the project owner shall notify the PRS and CPM of any construction phase scheduling changes.

At a minimum, the project owner shall ensure that the PRS or PRM consults weekly with the project superintendent or construction field manager to confirm area(s) to be worked the following week and until ground disturbance is completed.

Verification:

1. At least 30 days prior to the start of ground disturbance, the project owner shall provide the maps and drawings to the PRS and CPM.

2. If there are changes to the footprint of the project, revised maps and drawings shall be provided to the PRS and CPM at least 15 days prior to the start of ground disturbance.

3. If there are changes to the scheduling of the construction phases, the project owner shall submit a letter to the CPM within 5 days of identifying the changes.

PAL-3 The project owner shall ensure that the PRS prepares, and the project owner submits to the CPM for review and approval, a paleontological resources monitoring and mitigation plan (PRMMP) to identify general and specific measures to minimize potential impacts to significant paleontological resources. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for monitoring, collecting, and sampling activities and may be modified with CPM approval. This document shall be used as the basis of discussion when on-site decisions or changes are proposed. Copies of the PRMMP shall reside with the PRS, each monitor, the project owner's on-site manager, and the CPM.

The PRMMP shall be developed in accordance with the guidelines of the Society of Vertebrate Paleontology (SVP 1995) and shall include, but not be limited, to the following:

1. Assurance that the performance and sequence of project-related tasks, such as any literature searches, pre-construction surveys, worker environmental training, fieldwork, flagging or staking, construction monitoring, mapping and data recovery, fossil preparation and collection, identification and inventory, preparation of final reports, and transmittal of materials for curation will be performed according to PRMMP procedures;

2. Identification of the person(s) expected to assist with each of the tasks identified within the PRMMP and the Conditions of Certification;

3. A thorough discussion of the anticipated geologic units expected to be encountered, the location and depth of the units relative to the project when known, and the known sensitivity of those units based on the occurrence of fossils either in that unit or in correlative units;

4. An explanation of why, how, and how much sampling is expected to take place and in what units. Include descriptions of different sampling procedures that shall be used for fine-grained and coarse-grained units;

5. A discussion of the locations of where the monitoring of project construction activities is deemed necessary, and a proposed plan for monitoring and sampling;

6. A discussion of procedures to be followed in the event of a significant fossil discovery, halting construction, resuming construction, and how notifications will be performed;

7. A discussion of equipment and supplies necessary for collection of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits;

8. Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum, which meet the Society of Vertebrate Paleontology's standards and requirements for the curation of paleontological resources;

9. Identification of the institution that has agreed to receive data and fossil materials collected, requirements or specifications for materials delivered for curation and how they will be met, and the name and phone number of the contact person at the institution; and

10. A copy of the paleontological Conditions of Certification.

Verification: At least 30 days prior to ground disturbance, the project owner shall provide a copy of the PRMMP to the CPM. The PRMMP shall include an affidavit of authorship by the PRS and acceptance of the PRMMP by the project owner evidenced by a signature.

PAL-4 Prior to ground disturbance and for the duration of construction activities involving ground disturbance, the project owner and the PRS shall prepare and conduct weekly CPM-approved training for the following workers: project managers, construction supervisors, foremen, and general workers involved with or who operate ground-disturbing equipment or tools. Workers shall not excavate in sensitive units prior to receiving CPM-approved worker training. Worker training shall consist of an initial in-person PRS training during the project kick off for those mentioned above. Following initial training, a CPM-approved video or in-person training may be used for new employees. The training program may be combined with other training programs prepared for cultural and biological resources, hazardous materials, or other areas of interest or concern. No ground disturbance shall occur prior to CPM approval of the Worker Environmental Awareness Program (WEAP), unless specifically approved by the CPM.

The WEAP shall address the possibility of encountering paleontological resources in the field, the sensitivity and importance of these resources, and legal obligations to preserve and protect those resources.

The training shall include:

1. A discussion of applicable laws and penalties under the law;
2. Good quality photographs or physical examples of vertebrate fossils for project sites containing units of high paleontological sensitivity;
3. Information that the PRS or PRM has the authority to halt or redirect construction in the event of a discovery or unanticipated impact to a paleontological resource;
4. Instruction that employees are to halt or redirect work in the vicinity of a find and to contact their supervisor and the PRS or PRM;
5. An informational brochure that identifies reporting procedures in the event of a discovery;
6. A WEAP certification of completion form signed by each worker indicating that he/she has received the training; and
7. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

Verification:

1. At least 30 days prior to ground disturbance, the project owner shall submit the proposed WEAP, including the brochure, with the set of reporting procedures for workers to follow.

2. At least 30 days prior to ground disturbance, the project owner shall submit the script and final video to the CPM for approval if the project owner is planning to use a video for interim training.

3. If the owner requests an alternate paleontological trainer, the resume and qualifications of the trainer shall be submitted to the CPM for review and approval prior to installation of an alternate trainer. Alternate trainers shall not conduct training prior to CPM authorization.

4. In the monthly compliance report (MCR), the project owner shall provide copies of the WEAP certification of completion forms with the names of those trained and the trainer or type of training (in-person or video) offered that month. The MCR shall also include a running total of all persons who have completed the training to date.

PAL-5 The project owner shall ensure that the PRS and PRM(s) monitor consistent with the PRMMP all construction-related grading, excavation, trenching, and augering in areas where potential fossil-bearing materials have been identified, both at the site and along any constructed linear facilities associated with the project. In the event that the PRS determines full-time monitoring is not necessary in locations that were identified as potentially fossil bearing in the PRMMP, the project owner shall notify and seek the concurrence of the CPM.

The project owner shall ensure that the PRS and PRM(s) have the authority to halt or redirect construction if paleontological resources are encountered. The project owner shall ensure that there is no interference with monitoring activities unless directed by the PRS. Monitoring activities shall be conducted as follows:

1. Any change of monitoring from the accepted schedule in the PRMMP shall be proposed in a letter or email from the PRS and the project owner to the CPM prior to the change in monitoring and will be included in the monthly compliance report. The letter or email shall include the justification for the change in monitoring and be submitted to the CPM for review and approval.

2. The project owner shall ensure that the PRM(s) keep a daily monitoring log of paleontological resource activities. The PRS may informally discuss paleontological resource monitoring and mitigation activities with the CPM at any time.

3. The project owner shall ensure that the PRS notifies the CPM within 24 hours of the occurrence of any incidents of non-compliance with any

paleontological resources Conditions of Certification. The PRS shall recommend corrective action to resolve the issues or achieve compliance with the Conditions of Certification.

4. For any significant paleontological resources encountered, either the project owner or the PRS shall notify the CPM within 24 hours, or Monday morning in the case of a weekend event, where construction has been halted because of a paleontological find.

The project owner shall ensure that the PRS prepares a summary of monitoring and other paleontological activities placed in the monthly compliance reports. The summary will include the name(s) of PRS or PRM(s) active during the month; general descriptions of training and monitored construction activities; and general locations of excavations, grading, and other activities. A section of the report shall include the geologic units or subunits encountered, descriptions of samplings within each unit, and a list of identified fossils. A final section of the report will address any issues or concerns about the project relating to paleontological monitoring, including any incidents of non-compliance or any changes to the monitoring plan that have been approved by the CPM. If no monitoring took place during the month, the report shall include an explanation in the summary as to why monitoring was not conducted.

Verification: The project owner shall ensure that the PRS submits the summary of monitoring and paleontological activities in the MCR. When feasible, the CPM shall be notified 10 days in advance of any proposed changes in monitoring different from the plan identified in the PRMMP. If there is any unforeseen change in monitoring, the notice shall be given as soon as possible prior to implementation of the change.

PAL-6 The project owner, through the designated PRS, shall ensure that all components of the PRMMP are adequately performed including collection of fossil materials, preparation of fossil materials for analysis, analysis of fossils, identification and inventory of fossils, the preparation of fossils for curation, and the delivery for curation of all significant paleontological resource materials encountered and collected during project construction.

Verification: The project owner shall maintain in his/her compliance file copies of signed contracts or agreements with the designated PRS and other qualified research specialists. The project owner shall maintain these files for a period of three years after project completion and approval of the CPM-approved paleontological resource report (see Condition of Certification **PAL-7**). The project owner shall be responsible for paying any curation fees charged by the museum for fossils collected and curated as a result of paleontological mitigation. A copy of the letter of transmittal submitting the fossils to the curating institution shall be provided to the CPM.

PAL-7 The project owner shall ensure preparation of a Paleontological Resources Report (PRR) by the designated PRS. The PRR shall be prepared following

completion of the ground-disturbing activities. The PRR shall include an analysis of the collected fossil materials and related information and submit it to the CPM for review and approval.

The report shall include, but is not limited to, a description and inventory of recovered fossil materials; a map showing the location of paleontological resources encountered; determinations of sensitivity and significance; and a statement by the PRS that project impacts to paleontological resources have been mitigated below the level of significance.

Verification: Within 90 days after completion of ground-disturbing activities, including landscaping, the project owner shall submit the PRR under confidential cover to the CPM.

Certification of Completion
Worker Environmental Awareness Program
Beacon Solar Energy Project (08-AFC-2)

This is to certify these individuals have completed a mandatory California Energy Commission-approved Worker Environmental Awareness Program (WEAP). The WEAP includes pertinent information on cultural, paleontological, and biological resources for all personnel (that is, construction supervisors, crews, and plant operators) working on site or at related facilities. By signing below, the participant indicates that he/she understands and shall abide by the guidelines set forth in the program materials. Include this completed form in the Monthly Compliance Report.

No.	Employee Name	Title/Company	Signature
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Cultural Trainer: _____ Signature:_____ Date: ___/___/____

PaleoTrainer: _____ Signature:_____ Date: ___/___/____

Biological Trainer: _____Signature:_____ Date:___/___/__

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POWER PLANT EFFICIENCY

Testimony of Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

The Beacon Solar Energy Project (BSEP), if constructed and operated as proposed, would generate 250 megawatts (MW) (nominal net output) of electricity. The BSEP would be a solar thermal power plant proposed on an approximately 2,012-acre site in eastern Kern County, California. The project would use the concentrated parabolic trough solar thermal technology to produce electrical power using a steam turbine generator fed from a solar steam generator. The BSEP would use solar energy to generate most of its capacity. Fossil fuel would be used only to reduce startup time and to keep the temperature of the heat transfer fluid above its relatively high freezing point. Propane would be used during startup to generate approximately 25 MW of electricity for 30-60 minutes per day for an estimated total of 4,500 megawatt hours (MWH) per year. Once the plant commences generation of electricity for delivery to the electrical grid, the use of the propane-fired auxiliary boilers ceases and they are held in stand-by mode until auxiliary heat is again required for startup or heat transfer fluid freeze protection. Compared to the project's expected overall production rate of approximately 600,000 MWH per year, and compared to a typical fossil fuel-fired power plant of equal capacity, the amount of the annual power production from fossil fuel is insignificant.

The project would decrease reliance on fossil fuel, and would increase reliance on renewable energy resources. It would not create significant adverse effects on fossil fuel energy supplies or resources, would not require additional sources of energy supply, and would not consume fossil fuel energy in a wasteful of inefficient manner. No efficiency standards apply to this project. Staff therefore concludes that this project would present no significant adverse impacts on fossil fuel energy resources.

The BSEP, if constructed and operated as proposed, would occupy approximately five acres per MW of power output, a figure about half that of some other solar power technologies.

INTRODUCTION

FOSSIL FUEL USE EFFICIENCY

One of the responsibilities of the California Energy Commission (Energy Commission) is to make findings on whether the energy use by a power plant, including the proposed BSEP, would result in significant adverse impacts on the environment, as defined in the California Environmental Quality Act (CEQA). If the Energy Commission finds that the BSEP's energy consumption creates a significant adverse impact, it must further determine if feasible mitigation measures could eliminate or minimize that impact. In this analysis, staff addresses the inefficient and unnecessary consumption of energy.

In order to support the Energy Commission's findings, this analysis will:

- examine whether the facility would likely present any adverse impacts upon energy resources;
- examine whether these adverse impacts are significant; and if so,
- examine whether feasible mitigation measures or alternatives could eliminate those adverse impacts or reduce them to a level of insignificance.

SOLAR LAND USE EFFICIENCY

Solar thermal power plants typically consume much less fossil fuel (usually in the form of natural gas) than other types of thermal power plants. Therefore, common measures of power plant efficiency such as those described above are less meaningful. Solar power plants do occupy vast tracts of land, so the focus for these types of facilities shifts from fuel efficiency to land use efficiency. To analyze the land use efficiency of a solar facility staff utilizes the following approach.

Solar thermal power plants convert the sun's energy into electricity in three basic steps:

- Mirrors and/or collectors capture the sun's rays.
- This solar energy is converted into heat.
- This heat is converted into electricity, typically in a heat engine such as a steam turbine generator or a Stirling Engine-powered generator.

The effectiveness of each of these steps depends on the specific technology employed; the product of these three steps determines the power plant's overall solar efficiency. The greater the project's solar efficiency, the less land the plant must occupy to produce a given power output.

The most significant environmental impacts caused by solar power plants result from occupying large expanses of land. Even in a desert environment, disturbing and shading hundreds or thousands of acres of land can impact environmental resources. The extent of these impacts is likely in direct proportion to the number of acres affected. For this reason, staff will evaluate the land use efficiency of proposed solar power plant projects. This efficiency will be expressed in terms of power produced, or MW per acre, and in terms of energy produced, or MW-hours per acre-year. Specifically:

- Power-based solar land use efficiency is calculated by dividing the maximum net power output in MW by the total number of acres impacted by the power plant, including roads and electrical switchyards and substations.
- Energy-based solar land use efficiency is calculated by dividing the annual net electrical energy production in MW-hours per year by the total number of acres impacted by the power plant. Since different solar technologies consume differing quantities of fossil fuel for morning warm-up, cloudy weather output leveling and heat transfer fluid freeze protection (and some consume no fossil fuel at all), this effect will be accounted for. Specifically, fossil fuel consumption will be backed out by reducing the plant's net energy output by the amount of energy that could have been produced by consuming the project's annual fuel consumption in a modern

combined cycle power plant. (See **Efficiency Appendix A**, immediately following.) This reduced energy output will then be divided by acres impacted.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

No federal, state, or local/county laws, ordinances, regulations, and standards (LORS) apply to the efficiency of this project.

SETTING

The applicant proposes to build and operate the BSEP, a solar thermal power plant producing a total of 250 MW (nominal net output) and employing the concentrated parabolic trough solar thermal technology. The project would consist of arrays of parabolic mirrors, solar steam generator heat exchangers, one steam turbine generator, and a wet cooling tower (BS 2008a, AFC §§1.1, 2.1, 2.5).

The project's power cycle would be based on a steam cycle (also known as the Rankine cycle) (BS 2008a, AFC §2.5.2).The solar steam generator heat exchangers would receive heated heat transfer fluid from the solar thermal equipment comprised of arrays of parabolic mirrors that collect energy from the sun. The heated heat transfer fluid would be used to generate steam in the heat exchangers. This steam would then expand through the steam turbine generator to produce electrical power.

The project would utilize two auxiliary boilers fueled by propane to reduce startup time and to keep the temperature of the heat transfer fluid above its relatively high freezing point (54 degrees Fahrenheit [°F]). Except during startup, the project would not use fossil fuel to generate electricity.

ASSESSMENT OF IMPACTS — FOSSIL FUEL ENERGY USE

METHOD AND THRESHOLD FOR DETERMINING THE SIGNIFICANCE OF FOSSIL FUEL ENERGY RESOURCES

CEQA guidelines state that the environmental analysis "…shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy" (Title 14 CCR §15126.4[a][1]). Appendix F of the guidelines further suggests consideration of such factors as the project's energy requirements and energy use efficiency; its effects on local and regional energy supplies and energy resources; its requirements for additional energy supply capacity; its compliance with existing energy standards; and any alternatives that could reduce the wasteful, inefficient, and unnecessary consumption of energy (Title 14, CCR §15000 et seq., Appendix F).

The inefficient and unnecessary consumption of energy, in the form of non-renewable fuels such as natural gas, propane and oil, constitutes an adverse environmental impact. An adverse impact can be considered significant if it results in:

- adverse effects on local and regional energy supplies and energy resources;
- a requirement for additional energy supply capacity;
- noncompliance with existing energy standards; or
- the wasteful, inefficient, and unnecessary consumption of fuel or energy.

PROJECT ENERGY REQUIREMENTS AND ENERGY USE EFFICIENCY

The BSEP would consume insignificant amounts of fossil fuel for power generation. It would consume fossil fuel only to reduce startup time and to keep the temperature of the heat transfer fluid above its relatively high freezing point.

The project would burn propane at a nominal rate of approximately 410,000 gallons per year (DB 2009r, §2.2.1). Compared to a typical fossil fuel-fired power plant of equal capacity, and compared to the relatively considerable resources of fossil fuel in California (see below in **ADVERSE EFFECTS ON ENERGY SUPPLIES AND RESOURCES**), this rate is not significant. Propane is a relatively efficient form of fossil fuel, more efficient than natural gas and fuel oil.

The applicant estimates an average overall steam cycle efficiency of 35% for the BSEP (BS 2008a, AFC Figure 2-7). There are currently no legal or industry standards for measuring the efficiency of solar thermal power plants (CEC 2008d). Therefore, staff compares the steam cycle efficiency of the BSEP to the average efficiency of the typical modern steam turbines currently available in the market. The efficiency figures for these turbines range from 35% to 40%. The project's thermal efficiency of 35% is comparable to this industry figure.

Therefore, staff considers the impact of the project's fuel consumption on energy supplies and energy efficiency to be less than significant.

ADVERSE EFFECTS ON ENERGY SUPPLIES AND RESOURCES

The applicant has described its sources of propane for the project (DB 2009r AFC §§2.2.1, BS 2009b). According to Suburban Propane and Paxair, two area suppliers, sufficient supplies of propane are expected to be available to the BSEP. Propane is normally created as a by-product of petroleum refining and from natural gas production. Petroleum products and natural gas (with California's access to natural gas resources from the Rocky Mountains, Canada and the southwest) represent considerable energy resources in California. Propane supplies in California amount to approximately 630 million gallons per year only from refineries. This is only about 60% of California's total propane supply. Compared to this figure, the 410,000 gallons per year needed for the BSEP is not significant. Therefore, it appears highly unlikely that the project would create a substantial increase in fossil fuel demand.

ADDITIONAL ENERGY SUPPLY REQUIREMENTS

There appears to be little likelihood that the BSEP would require additional supply (see above in **ADVERSE EFFECTS ON ENERGY SUPPLIES AND RESOURCES**).

COMPLIANCE WITH ENERGY STANDARDS

No standards apply to the efficiency of the BSEP or other non-cogeneration projects.

ALTERNATIVES TO REDUCE WASTEFUL, INEFFICIENT, AND UNNECESSARY ENERGY CONSUMPTION

Staff evaluates the project alternatives to determine if alternatives exist that could reduce the project's fuel use. The evaluation of alternatives to the project (that could reduce wasteful, inefficient, or unnecessary energy consumption) requires the examination of the project's energy consumption. Even though staff does not believe the project's fuel consumption would be significant, staff evaluates alternatives that could reduce or eliminate the use of fossil fuel.

Efficiency of Alternatives to the Project

The BSEP's objectives include the generation of electricity using the concentrated parabolic trough solar thermal technology (BS 2008a, AFC §2.2).

Alternative Generating Technologies

Alternative generating technologies for the BSEP are considered in the AFC (BS 2008a, AFC §§1.3, 4.6) and the section of this document entitled **Project Alternatives**. For purposes of this analysis, staff has evaluated fossil fuel use by other solar based technologies to compare efficiency.

Employing the photovoltaic (PV) technology would result in no consumption of fossil fuel (propane). From an energy resources perspective, the PV technology would be a viable alternative to the parabolic trough technology selected by the applicant. However, due to the BSEP's relatively low demand for fossil fuel, this alternative is only suggestive.

Given the project objectives, location, air pollution control requirements, and the commercial availability of the above technologies, staff agrees with the applicant that from an energy efficiency perspective the selected solar thermal technology is a feasible selection.

Staff, therefore, believes that the BSEP would not constitute a significant adverse impact on fossil fuel energy resources compared to feasible alternatives.

Alternatives to the Use of Propane for Freeze Protection

Propane would be used to fire two auxiliary boilers to create steam for the purpose of heat transfer fluid freeze protection, and for startup. Although propane would be used only for these purposes and the quantities of propane expected for the BSEP would not likely constitute a significant impact on energy resources, staff suggests that the applicant consider exploring the following alternatives in order to reduce or eliminate the use of fossil fuel.

One alternative is thermal storage of heat for heat transfer fluid freeze protection. In this technology, freeze protection is routinely accomplished by circulating heat transfer fluid at a very low rate through the solar field using hot heat transfer fluid from the storage tank as a source. This results in consumption of smaller amounts of propane (or natural gas) as compared to a technology that lacks thermal storage. This storage technology is being proposed by a potential solar power plant project expected to be proposed in Kern County, California, by Solar Mellenium, LLC.—Sage Canyon Solar Power Plant.

Another alternative is what is being employed in AUSRA's Compact Linear Fresnel Reflector technology. In this technology, the sun's thermal energy is directly used to heat water within a series of specially coated stainless steel pipes to produce saturated steam. This steam is then used by the steam turbine to generate electricity. This eliminates the need for a heat transfer fluid. Throughout much of the year, no fuel is needed to keep the water temperature above its freezing point, because of the lower freezing temperature of water (32 °F) as compared to that of the heat transfer fluid chosen for the BSEP (54 °F).

ASSESSMENT OF IMPACTS — SOLAR LAND USE

The solar insolation falling on the earth's surface can be regarded as an energy resource. Since this energy is inexhaustible, its consumption does not present the concerns inherent in fossil fuel consumption. What is of concern, however, is the extent of land area required to capture this solar energy and convert it to electricity. Setting aside hundreds or thousands of acres of land for solar power generation removes it from alternative uses. Constructing buildings and solar collector foundations can disturb environmental resources.

To evaluate the BSEP, staff tabulates the land use efficiency of the project (described above) and compares it to similar measures for other solar power plant projects that have passed through, or are passing through, the Energy Commission's siting process.

METHOD AND THRESHOLD FOR DETERMINING THE SIGNIFICANCE OF SOLAR LAND USE ENERGY RESOURCES

Energy Commission staff proposes to compare the land use of a solar power plant project to that of other solar projects in the Energy Commission's siting process. It has not been determined how great a difference in land use would constitute a significant difference; staff proposes to compare the five solar projects currently in the process.

As this is written, there are currently five solar power plant projects in the Energy Commission siting process. These projects' power and energy output, and the extent of the land occupied by them, are summarized in **Efficiency Table 1**, below. The solar land use efficiency for a typical fossil fuel-fired (natural gas-fired) combined cycle power plant is shown only for comparison. (There are no propane-fired combined cycle power plants to use for comparison. It is noted that propane is more efficient than natural gas.)

ADVERSE EFFECTS ON LAND USE

While the Energy Commission customarily requires full mitigation for such impacts, such mitigation is generally regarded as less effective in protecting resources than avoiding the impact entirely. A solar power project that occupies twice as much land as another project holds the potential to produce twice the environmental impacts.

PROJECT LAND USE

The BSEP would produce power at the rate of 250 MW net, and would generate energy at the rate of 600,000 MW-hours net per year, while occupying approximately 1,321 acres (the portion of the 2,012-acre site encompassing the solar field, the power block, the evaporation ponds, and the administration buildings[1]) (BS 2008a, AFC §§2.3, Figure 2-4). Staff calculates power-based land use efficiency thus:

Power-based efficiency: 250 MW ÷ 1,321 acres = **0.19 MW/acre** or **5.3 acres/MW**

Staff calculates energy-based land use efficiency thus:

Energy-based efficiency: 600,000 MWh/year ÷ 1,321 acres = **454 MWh/acre-year**

As seen in **Efficiency Table 1**, the BSEP, employing the linear parabolic trough technology, is roughly twice as efficient in use of land as the Ivanpah SEGS project, which employs BrightSource power tower technology, the Stirling Energy Systems Solar One project, and the Stirling Energy Systems Solar Two project; and is roughly 32% less efficient than the Carrizo Energy Solar Farm project in use of land, which employs the AUSRA Compact Linear Fresnel Reflector technology.

Efficiency Table 1 — Solar Land Use Efficiency

Project	Generating Capacity (MW net)	Annual Energy Production (MWh net)	Annual Fuel Consumption (MMBtu LHV)	Footprint (Acres)	Land Use Efficiency (Power-Based) (MW/acre)	Land Use Efficiency (Energy – Based) (MWh/acre-year)	
						Total	Solar Only[2]
Beacon Solar (08-AFC-2)	250	600,000	36,000	1,321	0.19	454	450
Carrizo Energy (07-AFC-8)	177	375,000	0	640	0.28	586	586
Ivanpah SEGS (07-AFC-5)	400	960,000	432,432	3,744	0.11	256	238
SES Solar One (08-AFC-13)	850	1,840,000	0	8,200	0.11	224	224
SES Solar Two (08-AFC-5)	750	1,620,000	0	6,500	0.12	249	249
Avenal Energy (08-AFC-1)[3]	600	3,023,388	24,792,786	25	24.0	120,936	N/A

[1] 1,266 + 55 = 1,321
Solar field plus power block = 1,266 acres

Staff's estimate of the footprint encompassing the evaporation ponds and administration buildings = 55 acres (DB 2009r, AFC Figure 3). The remainder of the 2,012 acres is for purposes other than power generation or power plant operation.

[2] Net energy output is reduced by natural gas-fired combined cycle proxy energy output; see **Efficiency Appendix A**.

[3] Example natural gas-fired combined cycle plant.

ALTERNATIVES TO REDUCE SOLAR LAND USE IMPACTS

Building and operating a typical fossil fuel-fired combined cycle power plant would yield much greater land use efficiency than any solar power plant; see **Efficiency Table 1**. However, this would not achieve the basic project objective, to generate electricity from the renewable energy of the sun.

Building a solar power plant employing a different technology, such as the BrightSource power tower technology of the Ivanpah SEGS project or the Stirling Engine technology of the SES Solar projects, would almost halve the solar land use efficiency of the BSEP. Employing the AUSRA Compact Linear Fresnel Reflector technology would increase the land use efficiency. The AUSRA technology, however, is relatively new while the the concentrated parabolic trough solar thermal technology proposed to be employed in the BSEP has been employed for over 20 years at the nearby Solar Electric Generating System facilities in the Mojave Desert (BS 2008a, AFC §§1.3, 2.5.3.1).

Alternative Heat Rejection System

The applicant proposes to employ a wet cooling system (an evaporative cooling tower) as the means for rejecting power cycle heat from the steam turbine (BS 2008a, AFC §§1.1, 1.3, 2.5.1, 2.5.2). An alternative heat rejection system would utilize an air-cooled condenser.

The local climate in the project area is characterized by high temperatures and low relative humidity (low wet-bulb temperature). In low temperatures and high relative humidity (low dry-bulb temperature), the air-cooled condenser performs slighly more efficiently than the evaporative cooling tower. In high temperatures and low relative humidity, typical of the project area, the evaporative cooling tower performs slightly more efficiently than the air-cooled condenser. However, such an improvement may be less significant compared to the adverse environmental impacts of wet cooling over dry cooling, such as those identified in the **Soil and Water Resources** section of this document.

CUMULATIVE IMPACTS

There are no nearby power plant projects or other projects consuming large amounts of fossil fuel that hold the potential for cumulative energy consumption impacts when aggregated with the project.

Staff believes that the construction and operation of the project would not create indirect impacts (in the form of additional fuel consumption) that would not have otherwise occurred without this project. Because the BSEP would consume significantly less fossil fuel than a typical fossil fuel-fired power plant, it should compete favorably in the California power market and replace fossil fuel burning power plants. The project would therefore cause a positive impact on the cumulative amount of fossil fuel consumed for power generation.

NOTEWORTHY PUBLIC BENEFITS

The BSEP would employ an advanced solar thermal technology. Solar energy is renewable and unlimited. The project would have a less than significant adverse impact on nonrenewable energy resources. Consequently, the project would help in reducing California's dependence on fossil fuel-fired power plants.

PUBLIC AND AGENCY COMMENTS

Staff did not receive any public or agency comments in the area of Power Plant Efficiency.

APPLICANT COMMENTS

Staff received the following comment from the applicant. Below is also staff's response to this comment.

Comment: It was noted in the PSA that the project boilers would be used only at startup. The applicant requests clarification that the boilers would also be used to keep the temperature of the heat transfer fluid above its freezing point.

Staff's Response: Staff has noted, in several places in the PSA, that the boilers would be used at startup as well as to keep the fluid temperature above its freezing point. No change is necessary.

CONCLUSIONS AND RECOMMENDATIONS

FOSSIL FUEL ENERGY USE

The BSEP, if constructed and operated as proposed, would use solar energy to generate most of its capacity, consuming insignificant amounts of fossil fuel for power production. Although propane would be used only to reduce startup time and to keep the temperature of the heat transfer fluid above its relatively high freezing point, staff suggests that the applicant consider exploring alternatives that can reduce or eliminate the use of fossil fuel, such as the thermal storage technology proposed by Solar Mellenium or replacing the heat transfer fluid with water as in AUSRA's Compact Linear Fresnel Reflector technology.

The project would decrease reliance on fossil fuel, and would increase reliance on renewable energy resources. It would not create significant adverse effects on energy supplies or resources, would not require additional sources of energy supply, and would not consume energy in a wasteful or inefficient manner. No energy standards apply to this project. Staff therefore concludes that this project would present no significant adverse impacts on energy resources.

No cumulative impacts on energy resources are likely. Facility closure would not likely present significant impacts on electric system efficiency.

LAND USE

The BSEP, if constructed and operated as proposed, would occupy approximately five acres per MW of power output, a figure about half that of some other solar power technologies. Employing a more land-intensive solar technology, such as the BrightSource power tower technology or Stirling Engine technology, would almost halve the land use efficiency. Staff believes the BSEP represents one of the most land use-efficient solar technologies currently available.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed.

REFERENCES

BS 2008a – FPL Energy/M. O'Sullivan (tn 45646). Submittal of the Application for Certification for the Beacon Solar Energy Project, dated 03/13/08. Submitted to CEC/Docket Unit on 03/14/08.

BS 2009b—Applicant's Responses to Air Quality Questions from July 1, 2009 Workshop. Submitted to Docket Unit on 7/21/09.

CEC 2008d – Report of Conversation between Steve Baker (CEC staff, Power Plant Siting Division) and Golam Kibrya (CEC staff, Energy Resource and Development Division). February 22, 2008.

DB 2009r – Downey Brand/S. Rowlands (tn 52116). Applicant Project Design Refinements, dated 6/22/09. Submitted to CEC/Docket Unit on 6/22/09.

TSF 2008 – Conditional Use Permit for the Topaz Solar Farm. Submitted to San Luis Obsispo County on July 18, 2008.

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Efficiency Appendix A
Solar Power Plant Efficiency Calculation
Gas-Fired Proxy

In calculating the efficiency of a solar power plant, it is desired to subtract the effect of natural gas burned for morning startup, cloudy weather augmentation and Therminol freeze protection. As a proxy, we will use an average efficiency based on several recent baseload combined cycle power plant projects in the Energy Commission siting process. Baseload combined cycles were chosen because their intended dispatch most nearly mirrors the intended dispatch of solar plants, that is, operate at full load in a position high on the dispatch authority's loading order.

The most recent such projects are:

Colusa Generating Station (06-AFC-9)
- Nominal 660 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 666.3 MW @ 52.5% LHV
- Efficiency with duct burners off: 519.4 MW @ 55.3% LHV
- Efficiency (average of these two): **53.9% LHV**

San Gabriel Generating Station (07-AFC-2)
- Nominal 696 MW 2-on-1 Combined Cycle with Siemens 5000F CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 695.8 MW @ 52.1% LHV
- Efficiency with duct burners off: 556.9 MW @ 55.1% LHV
- Efficiency (average of these two): **53.6% LHV**

KRCD Community Power Plant (07-AFC-7)
- Nominal 565 MW 2-on-1 Combined Cycle with GE or Siemens F-class CGTs
- Evaporative cooling, evaporative or fogging inlet air cooling
- Efficiency with GE CGTs: 497 MW @ 54.6% LHV
- Efficiency with Siemens CGTs: 565 MW @ 56.1% LHV
- Efficiency (average of these two): **55.4% LHV**

Avenal Energy (08-AFC-1)
- Nominal 600 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, inlet air chillers
- Efficiency with duct burners on: 600.0 MW @ 50.5% LHV
- Efficiency with duct burners off: 506.5 MW @ 53.4% LHV
- Efficiency (average of these two): **52.0% LHV**

Average of these four power plants: **53.7% LHV**

POWER PLANT RELIABILITY

Testimony of Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

The applicant predicts an equivalent availability factor of 96 percent, which staff believes is achievable. (The availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability.) Based on a review of the proposal, with the exception of the source of water supply currently selected by the applicant (see the **Soil and Water Resources** section of this document), staff concludes that the Beacon Solar Energy Project (BSEP) would be built and would operate in a manner consistent with industry norms for reliable operation. No conditions of certification are proposed.

INTRODUCTION

In this analysis, California Energy Commission (Energy Commission) staff addresses the reliability issues of the BSEP project to determine if the power plant is likely to be built in accordance with typical industry norms for reliable power generation. Staff uses this norm as a benchmark because it ensures that the resulting project would not be likely to degrade the overall reliability of the electric system it serves (see the "Setting" subsection, below).

The scope of this power plant reliability analysis covers:

- equipment availability;
- plant maintainability;
- fuel and water availability; and
- power plant reliability in relation to natural hazards.

Staff examined the project design criteria to determine if the project is likely to be built in accordance with typical industry norms for reliable power generation. While the applicant has predicted an equivalent availability factor of 96 percent for the BSEP (see below), staff uses typical industry norms as the benchmark, rather than the applicant's projection, to evaluate the project's reliability.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

No federal, state, or local/county laws, ordinances, regulations, or standards (LORS) apply to the reliability of this project.

SETTING

In the restructured competitive electric power industry, the responsibility for maintaining system reliability falls largely to the state's control area operators, such as the California Independent System Operator (California ISO), that purchase, dispatch, and sell electric

power throughout the state. Determining how the California ISO and other control area operators would ensure system reliability has been an ongoing effort. Protocols have been developed and put in place that allow sufficient reliability to be maintained under the competitive market system. “Must-run” power purchase agreements and “participating generator” agreements are two mechanisms that have been employed to ensure an adequate supply of reliable power.

In September 2005, California AB 380 (Núñez, Chapter 367, Statutes of 2005) became law. This modification to the Public Utilities Code requires the California Public Utilities Commission to consult with the California ISO to establish resource adequacy requirements for all load-serving entities (basically, publicly and privately owned utility companies). These requirements include maintaining a minimum reserve margin (extra generating capacity to serve in times of equipment failure or unexpected demand) and maintaining sufficient local generating resources to satisfy the load-serving entity’s peak demand and operating reserve requirements.

In order to fulfill this mandate, the California ISO has begun to establish specific criteria for each load-serving entity under its jurisdiction. These criteria guide each load-serving entity in deciding how much generating capacity and ancillary services to build or purchase, after which the load-serving entity issues power purchase agreements to satisfy these needs.

The California ISO’s mechanisms to ensure adequate power plant reliability apparently were devised under the assumption that the individual power plants that compete to sell power into the system will each exhibit a level of reliability similar to that of power plants of past decades. However, there has been valid cause to believe that, under free market competition, financial pressures on power plant owners to minimize capital outlays and maintenance expenditures may act to reduce the reliability of many power plants, both existing and newly constructed (McGraw-Hill 1994). It is possible that, if significant numbers of power plants were to exhibit individual reliability sufficiently lower than this historical level, the assumptions used by California ISO to ensure system reliability would prove invalid, with potentially disappointing results. Accordingly, staff has recommended that power plant owners continue to build and operate their projects to the level of reliability to which all in the industry are accustomed.

As part of its plan to provide needed reliability, the applicant proposes to operate the 250-megawatt (MW) (net power output) BSEP, a solar thermal power plant facility employing advanced solar power technology. This project, using renewable solar energy, would provide dependable power to the grid, generally during the hours of peak power consumption by the interconnecting utility(s). This project would help serve the need for renewable energy in California, as all its generated electricity would be produced by a reliable source of energy that is available during the hot summer afternoons, when power is needed most.

The project is expected to achieve an equivalent availability factor in the range of 96 percent. The project is anticipated to operate at an annual capacity factor of approximately 26.5 percent (BS 2008a, AFC §2.5.2).

ASSESSMENT OF IMPACTS

METHOD FOR DETERMINING RELIABILITY

The Energy Commission must make findings as to how a project is designed, sited, and operated in order to ensure its safe and reliable operation (Title 20, CCR §1752[c]). Staff takes the approach that a project is acceptable if it does not degrade the reliability of the utility system to which it is connected. This is likely the case if a project is at least as reliable as other power plants on that system.

The availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability. Measures of power plant reliability are based upon both the plant's actual ability to generate power when it is considered to be available and upon starting failures and unplanned (or forced) outages. For practical purposes, reliability can be considered a combination of these two industry measures, making a reliable power plant one that is available when called upon to operate. Throughout its intended 30-year life, the BSEP is expected to operate reliably (BS 2008a, AFC §2.5.3). Power plant systems must be able to operate for extended periods without shutting down for maintenance or repairs. Achieving this reliability requires adequate levels of equipment availability, plant maintainability with scheduled maintenance outages, fuel and water availability, and resistance to natural hazards. Staff examines these factors for a project and compares them to industry norms. If the factors compare favorably for this project, staff will then conclude that the BSEP would be as reliable as other power plants on the electric system and would not degrade system reliability.

EQUIPMENT AVAILABILITY

Equipment availability would be ensured by adoption of appropriate quality assurance/quality control (QA/QC) programs during the design, procurement, construction, and operation of the plant and by providing for the adequate maintenance and repair of the equipment and systems discussed below.

Quality Control Program

The applicant describes a QA/QC program (BS 2008a, AFC §2.5.3) that is typical of the power industry. Equipment would be purchased from qualified suppliers based on technical and commercial evaluations. Suppliers' personnel, production capability, past performance, QA programs, and quality history would be evaluated. The project owner would perform receipt inspections, test components, and administer independent testing contracts. Staff expects that implementation of this program would result in standard reliability of design and construction. To ensure this implementation, staff has proposed appropriate conditions of certification in the section of this document entitled **Facility Design**.

PLANT MAINTAINABILITY

Equipment Redundancy

The project, as proposed in the AFC, would be able to operate only when the sun is shining. Maintenance or repairs could be done when the plant is shut down at night.

This would help to enhance the project's reliability. Also, the applicant proposes to provide redundant pieces of equipment for those that are most likely to require service or repair. This redundancy would allow service or repair to be done during sunny days when the plant is in operation, if required.

Major plant systems are designed with adequate redundancy to ensure their continued operation if equipment fails.

Maintenance Program

Equipment manufacturers provide maintenance recommendations for their products, and the applicant would base the project's maintenance program on those recommendations (BS 2008a, AFC §2.5). The program would encompass both preventive and predictive maintenance techniques. Maintenance outages would probably be planned for periods of low electricity demand. Staff expects that the project would be adequately maintained to ensure an acceptable level of reliability.

FUEL AND WATER AVAILABILITY

The long-term availability of fuel and of water for cooling or process use is necessary to ensure the reliability of any power plant. The need for reliable sources of fuel and water is obvious; lacking long-term availability of either source, the service life of the plant could be curtailed, threatening both the power supply and the economic viability of the plant.

Fuel Availability

The BSEP would consume insignificant amounts of propane for power generation. The sole consumption of propane would be to reduce startup time and to keep the temperature of the heat transfer fluid above its freezing point.

Propane would be delivered to the BSEP site by trucks and would be stored onsite. According to Suburban Propane and Paxair, two area suppliers, sufficient supplies of propane are expected to be available to the BSEP (BS 2009b). Staff believes that there will be adequate fuel supply to meet the project's needs.

Water Supply Reliability

The BSEP has proposed to use well water for domestic and industrial water needs, including steam cycle makeup, mirror washing, service water and fire protection water. According to the **Soil and Water Resources** section of this document, the proposed use of onsite groundwater for power plant cooling is in conflict with the State Water Board and Energy Commission policies. Therefore, staff cannot conclude that this source of water supply is a reliable source of water for the project.

Rosamond Community Services District (RCSD) has proposed, and has submitted a letter expressing its willingness, to provide the BSEP with 1,456 acre-feet per year of Title 22 tertiary treated reclaimed water during the life of the BSEP (RCSD 2009a). The quantity and quality of this water appear to be adequate for the BSEP. Therefore, staff considers this to be a reliable alternative.

Also, the City of California City has recently proposed, and has submitted a letter expressing its willingness, to provide the BSEP with treated wastewater in adequate quantities for the project's water needs (CofC 2009c). Therefore, staff considers this to be a reliable alternative.

For further discussion of water supply, see the **Soil and Water Resources** section of this document.

POWER PLANT RELIABILITY IN RELATION TO NATURAL HAZARDS

Natural forces can threaten the reliable operation of a power plant. Tsunamis (tidal waves) and seiches (waves in inland bodies of water) are not likely to present hazards for this project, but seismic shaking (earthquakes) and flooding could present credible threats to the project's reliable operation (BS 2008a, AFC §§1.2, 2.5.6.6).

Seismic Shaking

The site lies within Seismic Zone 4 (BS 2008a, AFC §1.2); see the "Faulting and Seismicity" portion of the **Geology and Paleontology** section of this document. The project will be designed and constructed to the latest applicable LORS (BS 2008a, AFC Appendix C). Compliance with current seismic design LORS represents an upgrading of performance during seismic shaking compared to older facilities since these LORS have been continually upgraded. Because it would be built to the latest seismic design LORS, this project would likely perform at least as well as, and perhaps better than, existing plants in the electric power system. Staff has proposed conditions of certification to ensure this; see the section of this document entitled **Facility Design**. In light of the general historical performance of California power plants and the electrical system in seismic events, staff has no special concerns with the power plant's functional reliability during earthquakes.

Flooding

The project site elevation ranges from approximately 2,050 to 2,260 feet above mean sea level. According to the Federal Emergency Management Agency, a portion of the site lies within the 100-year flood plain (BS 2008a, AFC §§2.5.6.6, 5.17.2.9). In the PSA, staff concluded that the diversion channel intending to reroute flood flows around the project site, as proposed by the applicant in the AFC, did not seem adequate for anticipated flows. Recently, the applicant has proposed to design and build a new diversion channel to relocate two linear miles of Pine Creek Wash in order to control storm water flow in and around the project site (DB 2009r, §2.1.1). This proposal, if built, would eliminate staff's concerns with power plant reliability due to flooding. For further discussion, see **Soil and Water Resources** and **Geology and Paleontology**.

COMPARISON WITH EXISTING FACILITIES

The North American Electric Reliability Corporation (NERC) maintains industry statistics for availability factors (as well as other related reliability data). The NERC regularly polls North American utility companies on their project reliability through its Generating Availability Data System and periodically summarizes and publishes those statistics on the Internet at <http://www.nerc.com>. Because no statistics are available for solar power plants, staff compares the project's availability factor to the average availability

factor of fossil fuel-fired units. Also because the project's total net power output would be 250 MW, staff uses the NERC statistics for 200–299 MW units. The NERC reported an availability factor of 86.01 percent as the generating unit average for the years 2002 through 2006 for fossil fuel units of 200-299 MW (NERC 2007).

The concentrated parabolic trough solar thermal technology is not new. This technology has been employed for over 20 years at the nearby Solar Electric Generating System facilities in the Mojave Desert (BS 2008a, AFC §§1.3, 2.5.3.1). Staff believes that the parabolic trough technology is likely to exhibit the projected reliability.

The project would use multi-pressure condensing steam turbine technology. Steam turbines incorporating this technology have been on the market for many years now and are expected to exhibit typically high availability. Also, because solar-generated steam is cleaner than burnt fossil fuel, the BSEP steam cycle units would likely require less frequent maintenance than units that burn fossil fuel. Therefore, the applicant's expectation of an annual availability factor of 96 percent (BS 2008a, AFC §2.5.2) appears reasonable when compared with the NERC figures throughout North America (see above). In fact, these machines might well be expected to outperform the fleet of various turbines (mostly older and smaller) that make up NERC statistics. Additionally, the project, as proposed, would be able to operate only when the sun is shining. Maintenance or repairs could be done when the plant is shut down at night.

The applicant's estimate of plant availability, therefore, appears to be realistic. Stated procedures for assuring the design, procurement, and construction of a reliable power plant appear to be consistent with industry norms, and staff believes they are likely to ultimately produce an adequately reliable plant.

NOTEWORTHY PROJECT BENEFITS

This project would help serve the need for renewable energy in California, as most of the electricity generated would be produced by a reliable source of energy that is available during the hot summer afternoons, when power is needed most.

PUBLIC AND AGENCY COMMENTS

Staff did not receive any public or agency comments in the area of Power Plant Reliability.

CONCLUSION

The applicant predicts an equivalent availability factor of 96 percent, which staff believes is achievable. Based on a review of the proposal, with the exception of the source of water supply currently selected by the applicant (see the **Soil and Water Resources** section of this document), staff concludes that the plant would be built and operated in a manner consistent with industry norms for reliable operation. No conditions of certification are proposed.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed.

REFERENCES

BS 2008a—FPL Energy/M. O'Sullivan (tn 45646). Submittal of the Application for Certification for the Beacon Solar Energy Project, dated 03/13/08. Submitted to CEC/Docket Unit on 03/14/08.

BS 2009b—Applicant's Responses to Air Quality Questions from July 1, 2009 Workshop. Submitted to Docket Unit on 7/21/09.

CofC 2009c—City of California/M. Bevins (tn 52865). City of California's Proposal to Provide Treated Wastewater to Beacon Solar, dated 8/13/09. Submitted to CEC/Docket Unit on 8/13/09.

DB 2009r—Downey Brand/S. Rowlands (tn 52116). Applicant Project Design Refinements, dated 6/22/09. Submitted to CEC/Docket Unit on 6/22/09.

McGraw-Hill 1994—McGraw-Hill Energy Information Services Group. 1994. *Operational Experience in Competitive Electric Generation*. Executive Report.

NERC 2007—North American Electric Reliability Corporation. 2007. *2002–2006 Generating Availability Report*.

PUB 2009a—Member of the Public/J. Musick (tn 52860). Mineral and Water Rights Reservation Arciero and Rudnick. Submitted to CEC/Docket Unit on 08/12/09.

RCSD 2009a—Rosamond Community Services District (tn 52318). Tertiary Water Service Letter of Intent for the Beacon Solar Energy Project, dated 8/14/09. Submitted to CEC/Docket Unit on 8/31/09.

TRANSMISSION SYSTEM ENGINEERING

Testimony of Sudath Arachchige and Mark Hesters

SUMMARY OF CONCLUSIONS

The proposed Beacon Solar Energy Project (BSEP) outlet lines and termination are acceptable and would comply with all applicable laws, ordinances, regulations, and standards (LORS). The analysis of project transmission lines and equipment, both from the power plant up to the point of interconnection with the existing transmission network as well as upgrades beyond the interconnection that are attributable to the project have been evaluated by staff.

- The modification of the existing Barren Ridge switch yard would occur within the fence line of the existing Los Angeles Department of Water and Power (LADWP) switchyard and would not trigger CEQA (California Environmental Quality Act).
- The applicant should request a Facility Study (FS) to be performed by the LADWP to determine the cost estimates and work scope for interconnection facilities and the transmission network upgrades of the LADWP system.

INTRODUCTION

STAFF ANALYSIS

This transmission system engineering (TSE) analysis examines whether this project's proposed interconnection conforms to all LORS required for safe and reliable electric power transmission. Additionally, under CEQA, the Energy Commission must conduct an environmental review of the "whole of the action," which may include facilities not licensed by the Energy Commission (Title 14, California Code of Regulations §15378). The Energy Commission must therefore identify the system impacts and necessary new or modified transmission facilities downstream of the proposed interconnection that are required for interconnection and that represent the whole of the action.

Commission staff relies upon the responsible interconnecting authority for analysis of impacts on the transmission grid, as well as for the identification and approval of new or modified facilities required downstream from the proposed interconnection for mitigation purposes.

LADWP'S ROLE

LADWP is responsible for ensuring electric system reliability in its service territory for proposed transmission modifications. For the BSEP project, LADWP performed the System Impact Study used to determine whether or not the proposed transmission modifications conform to reliability standards. Because the BSEP project would be connected to the LADWP controlled Municipal utility grid via the Barren Ridge 230kV switching station, the LADWP's role is to review and approve the SIS and its conclusions.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

- California Public Utilities Commission (CPUC) General Order 95 (GO-95), *Rules for Overhead Electric Line Construction*, sets forth uniform requirements for the construction of overhead lines. Compliance with this order ensures both adequate service and the safety of both the public and the people who build, maintain, and operate overhead electric lines.
- CPUC General Order 128 (GO-128), *Rules for Construction of Underground Electric Supply and Communications Systems*, sets forth uniform requirements and minimum standards for underground supply systems to ensure adequate service and the safety of both the public and the people who build, maintain, and operate underground electric lines.
- The National Electric Safety Code, 1999, provides electrical, mechanical, civil, and structural requirements for overhead electric line construction and operation.
- The combined NERC/WECC (North American Electric Reliability Corporation/Western Electricity Coordinating Council) planning standards provide system performance standards for assessing the reliability of the interconnected transmission system. These standards require continuity of service as their first priority and the preservation of interconnected operation as their second. Some aspects of NERC/WECC standards are either more stringent or more specific than the either agency's standards alone. These standards are designed to ensure that transmission systems can withstand both forced and maintenance outage system contingencies while operating reliably within equipment and electric system thermal, voltage, and stability limits. These standards include reliability criteria for system adequacy and security, system modeling data requirements, system protection and control, and system restoration. Analysis of the WECC system is based to a large degree on Section I.A of WECC standards, *NERC and WECC Planning Standards with Table I and WECC Disturbance-Performance Table,* and on Section I.D, *NERC and WECC Standards for Voltage Support and Reactive Power.* These standards require that power flows and stability simulations verify defined performance levels. Performance levels are defined by specifying allowable variations in thermal loading, voltage and frequency, and loss of load that may occur during various disturbances. Performance levels range from no significant adverse effects inside and outside a system area during a minor disturbance (such as the loss of load from a single transmission element) to a catastrophic loss level designed to prevent system cascading and the subsequent blackout of islanded areas and millions of consumers during a major transmission disturbance (such as the loss of multiple 500-kV lines along a common right-of- way, and/or of multiple large generators). While the controlled loss of generation or system separation is permitted under certain specific circumstances, this sort of major uncontrolled loss is not permitted (WECC, 2002).
- NERC's reliability standards for North America's electric transmission system spell out the national policies, standards, principles, and guidelines that ensure the adequacy and security of the nation's transmission system. These reliability standards provide for system performance levels under both normal and contingency conditions. While these standards are similar to the combined NERC/WECC standards, certain aspects of the combined standards are either more

stringent or more specific than the NERC performance standards alone. NERC's reliability standards apply to both interconnected system operations and to individual service areas (NERC, 2006).

- LADWP planning standards also provide the standards and guidelines that ensure the adequacy, security, and reliability of the state's member grid facilities. These standards also incorporate the combined NERC/WECC and NERC standards. These standards are also similar to the NERC/WECC or NERC standards for transmission system contingency performance. However, the LADWP standards also provide additional requirements that are not found in either the WECC/NERC or NERC standards. The LADWP standards apply to all participating transmission owners interconnecting to the LADWP controlled grid. They also apply to non-member facilities that impact the LADWP grid through their interconnections with adjacent control grids (LADWP, SIS).

PROJECT DESCRIPTION

The proposed BSEP site is located approximately one mile to the north of LADWP's Barren Ridge 230kV switching station site and will consist of a 250MW steam turbine generator. The steam for the prime mover will be created by utilizing collected solar energy, through a heat-exchanger. The proposed generating plant will consist of one 330 MVA Steam turbine generating unit for a total net output of 250MW. The project's planned operational date is summer of 2011.The generator auxiliary load would be 30MW, resulting in a maximum net output of 250 MW at an 85 percent power factor. Generating unit would be connected to the low side of its dedicated 18/230 kV generator step-up (GSU) transformer through 18kV, 1200-ampere SF6 circuit breakers. The step-up transformer for the steam turbine generating unit would be rated at 18/230 kV and 200/266/332 megavolt ampere (MVA) at 55 centigrade. The 230-kV side of step-up transformer would be connected through 1200A, SF6 circuit breaker to the existing Barren Ridge switching station via the selected 230kV transmission line options. The applicant has proposed to utilize the existing bus work within the breaker-and- a-half Barren Ridge switching station to interconnect the BSEP plant. The modification of the existing Barren Ridge switch yard would consist of two new 3000A, 230kV circuit breakers, 230-115 kV capacitor controlled voltage transformers and four 230kV, 3000 A disconnect switches. (BSEP project, 2008b section 2.0 pages 2-29 to 2-32 and Figure 2-4,2-10,2-15, 2-16).

SWITCHYARD AND INTERCONNECTION FACILITIES

The project will interconnect to the LADWP owned Barren Ridge switching station as the primary point of interconnection.

- The Barren Ridge interconnection would require approximately 3.5 miles of overhead 230kV transmission line, approximately 1.6 miles of which would be within the plant site boundary. The line would exit a pull off structure within a new project switchyard in the plant side power block and head northerly. It will follow the project access road for approximately 1.2 miles on monopole steel concrete

structures, turning southwest to cross the existing Union Pacific (UP) rail line and SR- 14. After crossing SR-14 the line will continue in a southwesterly direction for approximately 0.3 mile until it reaches the Barren Ridge switching station.

The proposed 230kV overhead single circuit would be built with 795 kcmil per phase ACSR conductors and routed through the 230kV, 36 new steel/concrete mono-poles to interconnect plant to the existing Barren Ridge substation. The proposed overhead generator tie line is rated to carry the full capacity of the BSEP project. The 230kV poles are expected to average about 79 feet in height, with a span length expected to average approximately 500 feet. (BSEP project, 2008b section 2.0 pages 2.29, 2.32 and Figure 2-4, 2-10).The proposed transmission line is the first point of interconnection and will be permitted by the CEC, and a general level of environmental review is required for the Energy Commission's CEQA process.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The proposed BSEP project would deliver energy to the 230kV LADWP grid; hence LADWP municipal utility is responsible for ensuring grid reliability. This entity determines the transmission system impacts of the proposed project and any mitigation measures needed to ensure system conformance with utility reliability criteria, NERC planning standards, WECC reliability criteria. System impact and facilities studies are used to determine the impacts of the proposed project on the transmission grid. Staff relies on these studies and any review conducted by the LADWP to determine the effect of the project on the transmission grid and to identify any necessary downstream facilities or indirect project impacts required to bring the transmission network into compliance with applicable reliability standards. System impact and facilities studies analyze the grid both with and without the proposed project, under conditions specified in the planning standards and reliability criteria. The standards and criteria define the assumptions used in the study and establish the thresholds through which grid reliability is determined. The studies analyze the impact of the project for the proposed first year of operation, and are based on a forecast of loads, generation, and transmission. Load forecasts are developed by the interconnected utility. Generation and transmission forecasts are established by an interconnection queue. The studies focus on thermal overloads, voltage deviations, system stability (excessive oscillations in generators and transmission system, voltage collapse, loss of loads, or cascading outages), and short circuit duties. If the studies show that the interconnection of the project causes the grid to be out of compliance with reliability standards, then the study will identify mitigation alternatives or ways in which the grid could be brought into compliance with reliability standards.

When a project connects to the LADWP-controlled grid, both the studies and mitigation alternatives must be reviewed and approved by the LADWP. If the interconnecting utility determines that the only feasible mitigation includes transmission modifications or additions requiring CEQA review, the Energy Commission must analyze those modifications or additions according to CEQA requirements.

Scope of the LADWP system study

The LADWP performed an Interconnection System Impact Study (SIS) of the Beacon Solar Energy Project (BSEP), as requested by Florida Power & Light Company (FPL) Energy, LLC. The study included power flow, sensitivity, and short circuit studies, and transient and post-transient analyses (LADWP, 2008a, system impact study). The study modeled the proposed project for a net output of 250 MW. The base case system representation includes all the proposed upgrades in the LADWP area and any generator and transmission interconnection requests that are currently in LADWP's interconnection application queue ahead of the project. These conditions reflect the most critical expected loading condition for the transmission system in LADWP's area. In addition, the bulk power study evaluated conditions with dispatch of generation outside of the LAWDP service territory and electrical system in a manner that maximized loadings in the LADWP Main System area. The detailed study assumptions are described in the study. The power flow studies were conducted with and without BSEP connected to LADWP's grid at the Barren Ridge, using 2011 heavy summer peak and 2011 light autumn base cases. The power flow study assessed the project's impact on thermal loading of the transmission lines and equipment. Transient and post-transient studies were conducted for BSEP project using the 2011 heavy summer peak base case to determine whether the project would create instability in the system following certain selected outages. Short circuit studies were conducted to determine if BSEP would overstress existing substation facilities.

LADWP Power Flow Study Results

Heavy Summer Conditions:

Steady-state analysis of both primary and alternate point of interconnection cases reveals no thermal overload in the pre and post project system, except for the loss of both Rinaldi-Tarzana lines (N-2), which results in the overload of the Northridge-Tarzana line. However, this overload is resolved with partial load shed at Tarzana as an interim mitigation procedure. In addition, to address a long-term solution for this overload, LADWP is planning to upgrade the conductor of the impacted line with higher capacity.

Light Autumn Conditions:

No steady-state violations and no thermal overloads were found for all contingencies in the Pre and Post project system with either the primary point of interconnection or the alternate point of interconnection.

LADWP Transient Study Results

The Transient study was conducted for the critical single and double contingencies affecting the area listed in the page 8 of the LADWP SIS. The three-phase faults with normal clearing are studied for single contingencies; single -line-to-ground faults with delayed clearing are studied for double contingencies. All outage cases were evaluated with the assumption that existing Special Protection Schemes (SPS) or Remedial Action Schemes (RAS) would operate as designed where required. Transient stability study indicates there would be no system performance issues caused by the BSEP project for primary point of interconnection.

LADWP Post-Transient Study Results

NERC/WECC planning standards require that the system maintain post-transient voltage stability when either critical path transfers or area loads increase by 5 percent for category ”B” contingencies, and 2.5 percent for category ”C” contingencies. Post-transient studies conducted for similar or larger generators in the area concluded that voltage remains stable under both N-1 and N-2 contingencies. All outage cases were evaluated with the assumption that existing SPS or RAS would operate as designed where required. The studies determined that the system remained stable under both single and double contingency outage conditions and the addition of the BSEP project for primary point of interconnection.

LADWP Short Circuit Study Results

Short circuit studies were performed to determine the degree to which the addition of BSEP project increases fault duties at LADWP’s substations, adjacent utility substations, and the other 230-kV, and 500-kV busses within the study area. The busses at which faults were simulated, the maximum three-phase and single-line-to-ground fault currents at these busses both with and without the project, and information on the breaker duties at each location are summarized in the Short Circuit Study Results tables (3 Phase to Ground and Single Line to Ground) of the System Impact Study Report (BSEP, 2008b, SIS, tables 3 to 10, Pages 16 to 19). The BSEP interconnection increases both three-phase and single-phase duties at several stations along the Inyo-Rinaldi line. These increased duties do not exceed the planned interrupting duty of 15KA of all Barren Ridge switching station circuit breakers. At the point of interconnection, two circuit breakers and four disconnect switches are required at the positions E31 and E32 of the Barren Ridge switching station. The continuous rating of the new circuit breakers and disconnect switches should be 3000A at the 230kV nominal voltage. The interruptible rating of the breakers should match with the existing level of 15kA.

The applicant should request a Facility Study to be performed by the LADWP to determine the cost estimates and work scope for interconnection facilities and the transmission network upgrades of the LADWP system.

COMPLIANCE WITH LORS

The study indicates that the project interconnection would comply with NERC/WECC planning standards and LADWP reliability criteria. The applicant will design, build, and operate the proposed 230-kV overhead single circuits.

Staff concludes that, assuming the proposed conditions of certification are met, the project would likely meet the requirements and standards of all applicable LORS.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency or public comments related to the TSE discipline have been received.

CONCLUSIONS AND RECOMMENDATIONS

The proposed Beacon Solar Energy Project (BSEP) outlet lines and termination are acceptable and would comply with all applicable laws, ordinances, regulations, and standards (LORS). The analysis of project transmission lines and equipment, both from the power plant up to the point of interconnection with the existing transmission network as well as upgrades beyond the interconnection that are attributable to the project have been evaluated by staff.

- The modification of the existing Barren Ridge switch yard would occur within the fence line of the existing Los Angeles Department of Water and Power (LADWP) switchyard and would not trigger CEQA (California Environmental Quality Act).
- The applicant should request a Facility Study to be performed by the LADWP to determine the cost estimates and work scope for interconnection facilities and the transmission network upgrades of the LADWP system.

RECOMMENDATIONS

If the Energy Commission approves this project, staff recommends that the following conditions of certification be met to ensure both system reliability and conformance with LORS.

CONDITIONS OF CERTIFICATION FOR TSE

TSE-1 The project owner shall furnish to the Compliance Project Manager (CPM) and to the Chief Building Official (CBO) a schedule of transmission facility design submittals, a Master Drawing List, a Master Specifications List, and a Major Equipment and Structure List. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide designated packages to the CPM when requested.

Verification: At least 60 days prior to the start of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit the schedule, a Master Drawing List, and a Master Specifications List to the

CBO and to the CPM. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment (see a list of major equipment in **Table 1: Major Equipment List** below). Additions and deletions shall be made to the table only with CPM and CBO approval. The project owner shall provide schedule updates in the Monthly Compliance Report.

TRANSMISSION SYSTEM ENGINEERING Table 1
Major Equipment List

Breakers
Step-Up Transformer
Switchyard
Busses
Surge Arrestors
Disconnects
Take Off Facilities
Electrical Control Building
Switchyard Control Building
Transmission Pole/Tower
Grounding System

TSE-2 Prior to the start of construction, the project owner shall assign an electrical engineer and at least one of each of the following to the project: A) a civil engineer; B) a geotechnical engineer or a civil engineer experienced and knowledgeable in the practice of soils engineering; C) a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; or D) a mechanical engineer. (Business and Professions Code Sections 6704 et seq, require state registration to practice as a civil engineer or structural engineer in California.

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (e.g., proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California-registered electrical engineer. The civil, geotechnical or civil, and design engineer assigned in conformance with Facility Design condition **GEN-5**, may be responsible for design and review of the TSE facilities.

The project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all engineers assigned to the project. If any one of the designated engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer. This engineer shall be authorized to halt

earthwork and to require changes if site conditions are unsafe or do not conform with predicted conditions used as a basis for design of earthwork or foundations.

The electrical engineer shall:

1. Be responsible for the electrical design of the power plant switchyard, outlet and termination facilities; and

2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days prior to the start of rough grading (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all the responsible engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the engineers within five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.

TSE-3 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend corrective action (California Building Code, 1998, Chapter 1, Section 108.4, Approval Required; Chapter 17, Section 1701.3, Duties and Responsibilities of the Special Inspector; Appendix Chapter 33, Section 3317.7, Notification of Noncompliance). The discrepancy documentation shall become a controlled document and shall be submitted to the CBO for review and approval and shall reference this condition of certification.

Verification: The project owner shall submit a copy of the CBO's approval or disapproval of any corrective action taken to resolve a discrepancy to the CPM within 15 days of receipt. If disapproved, the project owner shall advise the CPM, within five days, the reason for disapproval, and the revised corrective action required obtaining the CBO's approval.

TSE-4 For the power plant switchyard, outlet line, and termination, the project owner shall not begin any increment of construction until plans for that increment have been approved by the CBO. These plans, together with design changes and design change notices, shall remain on the site for one year after completion of construction. The project owner shall request that the CBO

inspect the installation to ensure compliance with the requirements of applicable LORS. The following activities shall be reported in the Monthly Compliance Report:

1. Receipt or delay of major electrical equipment;

2. Testing or energization of major electrical equipment; and

3. The number of electrical drawings approved, submitted for approval, and still to be submitted.

Verification: At least 30 days prior to the start of each increment of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval the final design plans, specifications, and calculations for equipment and systems of the power plant switchyard, outlet line, and termination, including a copy of the signed and stamped statement from the responsible electrical engineer attesting to compliance with the applicable LORS, and send the CPM a copy of the transmittal letter in the next Monthly Compliance Report.

TSE-5 The project owner shall ensure that the design, construction, and operation of the proposed transmission facilities will conform to all applicable LORS, including the requirements listed below. The project owner shall submit the required number of copies of the design drawings and calculations as determined by the CBO.

1. The BSEP project will be interconnected to the LADWP grid via 230kV, 795kcmil ACSR overhead conductors, single circuit generator tie line.

2. The power plant outlet line shall meet or exceed the electrical, mechanical, civil, and structural requirements of CPUC General Order 95 and General Order 98 or National Electric Safety Code (NESC), Title 8 of the California Code and Regulations (Title 8), Articles 35, 36, and 37 of the “High Voltage Electric Safety Orders”, National Electric Code (NEC), and related industry standards.

3. Breakers and busses in the power plant switchyard and other switchyards, where applicable, shall be sized to comply with a short-circuit analysis.

4. Outlet line crossings and line parallels with transmission and distribution facilities shall be coordinated with the transmission line owner and comply with the owner’s standards.

5. The project conductors shall be sized to accommodate the full output from the project.

6. Termination facilities shall comply with applicable LADWP Utility interconnection standards.

7. The project owner shall provide to the CPM:
    a. The final Detailed Facility Study (DFS) including a description of facility upgrades, operational mitigation measures, and/or Special Protection System (SPS) sequencing and timing if applicable,
    b. Executed project owner and LADWP Facility Interconnection Agreement.

Verification: At least 60 days prior to the start of construction of transmission facilities (or a lessor number of days mutually agree to by the project owner and CBO), the project owner shall submit to the CBO for approval:

1. Design drawings, specifications, and calculations conforming with CPUC General Order 95 and General Order 98 or NESC; Title 8, California Code of Regulations, Articles 35, 36, and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards for the poles/towers, foundations, anchor bolts, conductors, grounding systems, and major switchyard equipment.

2. For each element of the transmission facilities identified above, the submittal package to the CBO shall contain the design criteria, a discussion of the calculation method(s), a sample calculation based on "worst-case conditions,"[1] and a statement signed and sealed by the registered engineer in responsible charge, or other acceptable alternative verification, that the transmission element(s) will conform with CPUC General Order 95 or NESC; Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards.

3. Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements **TSE-5** 1) through 5) above.

4. The final Detailed Facility Study, including a description of facility upgrades, operational mitigation measures, and/or SPS sequencing and timing if applicable, shall be provided concurrently to the CPM.

TSE-6 The project owner shall provide the following Notice to the LADWP prior to synchronizing the facility with the LADWP transmission system:

1. At least one week prior to synchronizing the facility with the grid for testing, provide the LADWP a letter stating the proposed date of synchronization; and

2. At least one business day prior to synchronizing the facility with the grid for testing, provide telephone notification to the LADWP Outage Coordination Department.

[1] Worst-case conditions for the foundations would include for instance, a dead-end or angle pole.

Verification: The project owner shall provide copies of the LADWP letter to the CPM when it is sent to the LADWP one week prior to initial synchronization with the grid. A report of the conversation with the LADWP shall be provided electronically to the CPM one day before synchronizing the facility with the LADWP transmission system for the first time.

TSE-7 The project owner shall be responsible for the inspection of the transmission facilities during and after project construction, and any subsequent CPM and CBO approved changes thereto, to ensure conformance with CPUC GO-95 or NESC; Title 8, CCR, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; applicable interconnection standards; NEC; and related industry standards. In case of non-conformance, the project owner shall inform the CPM and CBO in writing, within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after first synchronization of the project, the project owner shall transmit to the CPM and CBO:

1. "As built" engineering description(s) and one-line drawings of the electrical portion of the facilities signed and sealed by the registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95 or NESC; Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; applicable interconnection standards; NEC; and related industry standards, and these conditions shall be provided concurrently.

2. An "as built" engineering description of the mechanical, structural, and civil portion of the transmission facilities signed and sealed by the registered engineer in responsible charge or acceptable alternative verification. "As built" drawings of the electrical, mechanical, structural, and civil portion of the transmission facilities shall be maintained at the power plant and made available, if requested, for CPM audit as set forth in the "Compliance Monitoring Plan."

3. A summary of inspections of the completed transmission facilities, and identification of any nonconforming work and corrective actions taken, signed and sealed by the registered engineer in charge

REFERENCES

California ISO (California Independent System Operator). 1998a. Cal-ISO Tariff Scheduling Protocol. Posted April 1998, Amendments 1,4,5,6, and 7 incorporated.

California ISO (California Independent System Operator). 1998b. Cal-ISO Dispatch Protocol. Posted April 1998.

California ISO (California Independent System Operator). 2002a. Cal-ISO Grid Planning Standards. February 2002.

BSEP (Beacon Solar Energy Project). 2008a. Los Angeles Department of Water and Power (System Impact Study) submitted to the California Energy Commission.

BSEP (Beacon Solar Energy Project). 2007b. Beacon Solar, LLC, BSEP Application for Certification. Submitted to the California Energy Commission.

NERC/WECC (North American Reliability Council/Western Electricity Coordinating Council). 2002. NERC/WECC Planning Standards. August 2002.

DEFINITION OF TERMS

AAC — All aluminum conductor

ACSR — Aluminum conductor steel-reinforced

ACSS — Aluminum conductor steel-supported

Ampacity — Current-carrying capacity, expressed in amperes, of a conductor at specified ambient conditions, at which damage to the conductor is nonexistent or deemed acceptable based on economic, safety, and reliability considerations.

Ampere — The unit of current flowing in a conductor.

Bundled — Two wires, 18 inches apart.

Bus — Conductors that serve as a common connection for two or more circuits.

Conductor — The part of the transmission line (the wire) that carries the current.

Congestion management – A scheduling protocol, which provides that dispatched generation and transmission loading (imports) will not violate criteria.

Emergency overload – See “Single Contingency.” This is also called an L-1.

Kcmil or KCM – Thousand circular mil. A unit of the conductor’s cross sectional area When divided by 1,273, the area in square inches is obtained.

Kilovolt (kV) — A unit of potential difference, or voltage, between two conductors of a circuit, or between a conductor and the ground.

Loop — An electrical cul de sac. A transmission configuration that interrupts an existing circuit, diverts it to another connection, and returns it back to the interrupted circuit, thus forming a loop or cul de sac.

Megavar — One megavolt ampere reactive.

Megavars — Mega-volt-Ampere-Reactive. One million Volt-Ampere-Reactive. Reactive power is generally associated with the reactive nature of motor loads that must be fed by generation units in the system.

Megavolt ampere (MVA) – A unit of apparent power. It equals the product of the line voltage in kilovolts, current in amperes, and the square root of 3, divided by 1,000.

Megawatt (MW) – A unit of power equivalent to 1,341 horsepower.

Normal operation/normal overload – The condition arrived at when all customers receive the power they are entitled to, without interruption and at steady voltage, and with no element of the transmission system loaded beyond its continuous rating.

N-1 condition – See “single contingency.”

Outlet – Transmission facilities (circuit, transformer, circuit breaker, etc.) linking generation facilities to the main grid.

Power flow analysis – A forward-looking computer simulation of essentially all generation and transmission system facilities that identifies overloaded circuits, transformers, and other equipment and system voltage levels.

Reactive power – Generally associated with the reactive nature of motor loads that must be fed by generation units in the system. An adequate supply of reactive power is required to maintain voltage levels in the system.

Remedial action scheme (RAS) – An automatic control provision, which, for instance, will trip a selected generating unit upon a circuit overload.

SF6 (sulfur hexafluoride) – An insulating medium.

Single contingency – Also known as “emergency” or “N-1 condition,” the occurrence when one major transmission element (circuit, transformer, circuit breaker, etc.) or one generator is out of service.

Solid dielectric cable – Copper or aluminum conductors that are insulated by solid polyethylene type insulation and covered by a metallic shield and outer polyethylene jacket.

Switchyard An integral part of a power plant and used as an outlet for one or more electric generators.

Thermal rating – See “ampacity.”

TSE Transmission system engineering.

Tap A transmission configuration creating an interconnection through a sort single circuit to a small or medium sized load or a generator. The new single circuit line is inserted into an existing circuit by utilizing breakers at existing terminals of the circuit, rather than installing breakers at the interconnection in a new switchyard.

Undercrossing – A transmission configuration where a transmission line crosses below the conductors of another transmission line, generally at 90 degrees.

Underbuild A transmission or distribution configuration where a transmission or distribution circuit is attached to a transmission tower or pole below (under) the principle transmission line conductors.

ALTERNATIVES

Testimony of Eric K. Solorio, Michael N. DiFilippo and John S. Maulbetsch

SUMMARY OF CONCLUSIONS

Staff has concluded that, as proposed, the Beacon Solar Energy Project (BSEP) will have significant adverse impacts to biological resources, cultural resources, and visual resources. The project can avoid and or reduce some of these significant environmental impacts, and utilize water resources in a manner consistent with state policies by implementing any one of staff's proposed project alternatives, including utilizing tertiary treated wastewater for power plant cooling or incorporating an air cooled condenser ("dry cooling").

Although staff concluded the "no project' alternative is not a reasonable alternative to the proposed project, staff concluded there are at least four feasible project alternatives that are reasonable alternatives to the proposed BSEP. Each of the four alternatives is a reasonable alternative to the proposed BSEP because each alternative could reduce the BSEP's consumption of potable water by up to 97%. The first alternative would utilize the proven technology of dry cooling which does not require the use of water in the cooling process. The second alternative would utilize tertiary treated wastewater obtained from the Rosamond Community Services District. The third alternative would utilize tertiary treated wastewater from the city of California City. The fourth alternative would utilize photovoltaic (PV) solar panels for power generation, as PV panels do not require a cooling system or the related water use.

Both PV panels and dry cooling have the added benefit of not only eliminating 97% of the water use but also eliminating the need for evaporation ponds which are a source of concern to staff, the California Department of Fish and Game and the United States Fish and Wildlife Service (see the **Biological Resources** section for discussion of evaporation ponds). Staff has concluded that utilizing either PV technology or tertiary treated wastewater or dry cooling could avoid and or reduce the proposed project's significant environmental impacts. Staff's conclusion is that each of the separate alternatives is reasonable, technically feasible and economically feasible to incorporate.

INTRODUCTION

In this section staff evaluated potential alternatives to the construction and operation of the proposed Beacon Solar Energy Project (BSEP). Staff conducted the alternatives analysis in accordance with state environmental laws by providing an analysis of reasonable alternatives that are capable of reducing or avoiding any adverse impacts of the proposed project. Staff also evaluated project alternatives that would utilize non-potable water for power plant cooling.

This Alternatives analysis and the Final Staff Assessment, as a whole, are produced as part of the evidentiary record which is considered by the Energy Commission when the Commission decides whether or not to approve the proposed BSEP or require modifications to the proposal. The decision making process takes into account various

laws, ordinances, regulations, standards, state resource conservation policies, Commission policies, the *California Environmental Quality Act (CEQA), and the Warren-Alquist Act (Public Resources Code Section 25500 et seq.).*

DETERMINING THE SCOPE OF THE ALTERNATIVES ANALYSIS

The Guidelines for Implementation of the California Environmental Quality Act, Title 14, California Code of Regulations, section 15126.6(a) and(b), provide direction for scoping the alternatives analysis by requiring an evaluation of alternatives based upon the comparative merits of "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 but would avoid or substantially lessen any of the significant effects of the project"; "…even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly".

"The fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible. What is required is evidence that the additional costs or lost profitability are sufficiently severe as to render it impractical to proceed with the project." (*Citizens of Goleta Valley v. Board of Supervisors*, 197 Cal.App.3d at p. 1181, 243 Cal.Rptr. 339, italics added.)

The range of alternatives required to be evaluated is governed by the "rule of reason" which requires consideration only of those alternatives necessary to permit a reasoned choice. Potentially feasible alternatives are selected and discussed to foster informed decision making and public participation. The *California Environmental Quality Act* (CEQA) guidelines state that an environmental document does not have to consider an alternative where the effect cannot be reasonably ascertained and whose implementation is remote and speculative (Cal. Code Regs., tit. 14, §15126.6[f][3]). To prepare the alternatives analysis, staff used the methodology summarized below:

- Establish the basic project objectives to use as screening criteria for project alternatives.
- Identify the proposed project's significant adverse environmental impacts.
- Identify different types of alternatives to the project that could avoid or lessen the projects significant impacts, such as:
    - Sources of non-potable water for use in power plant cooling and processes.
    - Alternative project sites.
    - Alternative energy generation technologies.
    - Alternative equipment and processes that can be incorporated into the proposed project.
    - The "No Project" alternative.

- Evaluate and determine whether any of the alternatives would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the environmental impacts of the proposed project.
- Summarize which alternatives, if any, can feasibly avoid or reduce the proposed project's environmental impacts.

Sources of Non-Potable Water as Alternative to Using Fresh Water

In scoping the Alternatives analysis, staff also considered the project's need to comply with several Laws, Ordinances, Regulations and Standards (LORS), specifically, Article X, Section 2 of the California Constitution and California Water Code Section 13551. Staff also considered the need for the BSEP to comply with several state policies, specifically, State Water Resources Control Board (SWRCB) Resolution No. 75-58, and Resolution No. 09-11, and the 2003 Integrated Energy Policy Report (IEPR). Both, the LORS and the state policies address the importance of avoiding the use of fresh water for industrial processes (including power plant cooling) when sources of "non-potable" water is reasonably available. As such, this Alternatives analysis also evaluates the feasibility of the BSEP using non-potable water for power plant cooling.

BASIC OBJECTIVES OF THE PROJECT

After reviewing the BSEP Application for Certification (08-AFC-2), staff has determined the four basic objectives of the Beacon Solar Energy Project (BSEP) to be as follows:

1. To construct, operate and maintain an efficient, economic, reliable, safe and environmentally sound solar-powered generating facility that will help achieve: (i) the State of California's renewable energy objectives mandated by Senate Bill 1078 (California Renewable Portfolio Standard Program) and accelerated by Senate Bill 107, (ii) Assembly Bill 32 (California Global Warming Solutions Act of 2006), and (iii) other local mandates adopted by the State's municipal electric utilities to meet the requirements for the long term, wholesale purchase of renewable electric energy for distribution to their customers.

2. To develop a site with an excellent solar resource.

3. To develop a previously disturbed site with close proximity to transmission infrastructure in order to minimize environmental impacts.

4. To interconnect directly to the Los Angeles Department of Water and Power (LADWP) electrical transmission system.

Staff eliminated applicant's fifth project objective as described on page 2-2, in the Application for Certification, "*To develop a site with available water resources to allow wet cooling in order to optimize power generation efficiency and reduce Project cost.*" Staff eliminated this project objective as a screening criterion because the ground water at the project site is potable and therefore the objective to use potable water for power plant cooling, especially in a desert environment, is inconsistent with state policies, as generally described in the table below:

Alternatives Table 1
Laws, Ordinances, Regulations, and Standards (LORS), and State Water Use Policies Affecting Power Plants

LORS	Purpose
California Constitution, Article X, Section 2	This section **requires that the water resources of the State be put to beneficial use to the fullest extent possible** and states that the waste, unreasonable use or unreasonable method of use of water is prohibited.
California Water Code Section 13551	Requires the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such water is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.
State Water Resources Control Board (SWRCB) Resolution No. 09-11	State Water Resources Control Board Resolution 09-11 **encourages and promotes use of recycled water to replace the use of potable water for non-potable purposes**. The policy supports the sustainable use of surface water and groundwater and encourages the use of recycled water where this water is not being put to other beneficial uses. The policy provides for a streamlined permitting process for recycled water use with local Regional Water Quality Control Boards.
Warren-Alquist, State Energy Resources Conservation and Development Act, California Public Resources Code 25008	"**It is further the policy of the state and the intent of the Legislature to promote all feasible means of…water conservation…**"

POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE PROJECT

In analyzing the Beacon Solar Energy Project (BSEP) staff identified potentially significant adverse impacts to biological resources, cultural resources and visual resources. This analysis evaluates the feasibility of incorporating potential alternatives that can avoid and or lessen impacts to some of these resource areas.

If the BSEP is approved as currently proposed, staff estimates that construction and operation of the project would consume more than 50,000 acre feet of high quality fresh water, equating to more than 20 billion gallons, during the 30-year life of the project. The water would be pumped from on-site wells, drawing approximately 8,080 acre feet during construction and an additional 1,400 acre/feet per year for operations, from an aquifer already in overdraft condition. The aquifer has taken approximately 25 years to recharge half of the level of drawdown that occurred at the project site, from prior intensive agriculture activities that ceased in the mid 1980s (BS 2008a, p. 1-10). Staff's independent analysis indicates that approximately 70% of this "recharge" is actually due to water migrating within the basin and not necessarily due to new inflow from precipitation. See the **SOIL AND WATER RESOURCES** section. The BSEP would reduce the annual rate of groundwater recharge (BS 2008a, p. 1-11).

Impacts to biological resources, from the proposed BSEP project would result from mass grading more than 7 million cubic yards of soil covering more than 2,000 acres. The grading activities include removal of approximately 430 acres of vegetation that provides cover, foraging, and breeding habitat for wildlife. Impacts to biological resources also include the loss of approximately 60 acres of desert wash scrub habitat and 16.0 acres of jurisdictional waters of the state. Additionally, the construction of 6 acres of evaporation ponds to receive highly concentrated brine discharge could have a significant adverse impact on migratory birds, water fowl and wildlife as well as potentially increase predation of protected species. Please see the **BIOLOGICAL RESOURCES** section.

Staff also concluded that because there are known cultural resources on site, the mass grading of more than 7 million cubic yards of soil would have significant direct impacts on surface and subsurface prehistoric archaeological resources. Please see the **CULTURAL RESOURCES** section.

The introduction of the project would change the existing physical setting of the Fremont Valley floor from a moderately disturbed desert floor landscape to a highly human-altered landscape. This change principally would be caused by two square miles of the project site being covered with parabolic trough solar collectors. In addition, the introduction of the radiance from the parabolic trough arrays during operation would be prominent from elevated locations. Staff concluded the project would cause significant adverse impacts to visual resources from two sensitive view points. These significant adverse impacts would be unmitigatable. Please see the **VISUAL RESOURCES** section.

IDENTIFY, SCREEN AND EVALUATE PROJECT ALTERNATIVES

The range of project alternatives considered in this analysis includes an alternative site, an alternative generation technology, alternative water treatment equipment, and sources of tertiary treated wastewater for power plant cooling.

ALTERNATIVE PROJECT SITES

The applicant provided a general discussion (BS 2008a, pp. 4.5-7) of alternative ***areas*** to site the proposed project. Although the proposed BSEP site is previously disturbed and in close proximity to transmission lines, the proposed site is bisected by designated waters of the state (Pine Tree Creek) which applicant proposes to relocate one-half mile to the east. An alternative site that has been previously disturbed by agriculture activities and does not contain any waters of the state, could potentially avoid impacts to several environmental resource areas.

Antelope Area

Staff conducted a windshield survey of the Antelope area which generally consists of previously disturbed lands. As shown on **Alternatives Figure 1**, the Antelope area has reasonable access to infrastructure. There appears to be potential project sites surrounding the Neenach substation. Staff concluded that the area south of Rosamond Boulevard appears to be absent of any waters of the state and/or waters of the US.

However, the majority of large parcels appear to be designated as “farmlands of statewide importance” by the Farmland Mapping and Monitoring Program (FMMP). The FMMP produces maps and statistical data used for analyzing impacts on California’s agricultural resources. Agricultural land is rated according to soil quality and irrigation status; the best quality land is called Prime Farmland. The maps are updated every two years with the use of a computer mapping system, aerial imagery, public review, and field reconnaissance. Because this alternative would create a different type of impact to limited farmland resources, staff concludes a similar 2,000 acre project sited in the immediate Antelope area is not a viable alternative site to the proposed project.

ALTERNATIVE ELECTRICITY GENERATION TECHNOLOGIES

The second component of the Alternatives analysis is to consider project alternatives to the proposed electricity generation technology. Staff considered fossil fuel based energy generation such as simple-cycle and combined-cycle, natural gas-fired power plants but ruled them out as alternatives because of their more significant impacts to air quality and failure to meet most of the project objectives. Because staff considers five alternatives to be a “reasonable range” of project alternatives, staff therefore limited its analysis of alternative generating technologies to photovoltaic technology because the use of PV solar panels would meet most of the project objectives.

Photovoltaic Technologies (PV)

Photovoltaic technologies (PV) are considered the primary competitor with solar thermal technologies because both applications convert solar energy into electricity. The reliability of PV technology is equivalent to that of solar thermal technology due to the same dependence on solar incidence necessary to allow the collection of solar radiation. In considering PV technology as an alternative to the BSEP, staff finds cost advantages and environmental advantages of utilizing PV applications compared to solar trough thermal technology.

Although both PV applications and the proposed BSEP would have similar impacts to land resources and vegetation that provides cover, foraging and breeding habitat for wildlife, staff concludes that a PV application could avoid substantial impacts to biological resources and cultural resources that could otherwise result from the proposed BSEP. These impacts can be avoided because PV applications do not require power plant cooling systems and related evaporation ponds to discharge spent cooling water to, as reflected in the BSEP proposal. Because PV applications can avoid using evaporation ponds, the use of PV technology can also avoid significant impacts to cultural and biological resources associated with the excavation and operation of these ponds. Please see **Biological Resources** and **Cultural Resources** sections.

The proposed BSEP would require approximately 1,400 acre feet of potable water annually for use in a wet cooling system. The only water consumption that PV applications require would be for biannual washing of the PV panels which is far less than the need to regularly wash the solar troughs proposed by the BSEP (BCV 2009a and BS 2008a, Figure 2-13).

Economic Feasibility of Photovoltaic (PV) Technology on a “Cost per Watt” Basis

Due to the increasing market demand for solar technology applications, there has been substantial progress in reducing the cost per watt of PV technologies, to the point where PV technology is affordable, scalable and has a low environmental impact on a life-cycle basis. There are two cost components that make PV technology cost competitive with solar thermal technology. The first component is the installed cost per watt. Staff identified a utility scale PV project being developed by Sempra Generation, a subsidiary of San Diego-based Sempra Energy. The project is a 10 MW plant recently constructed in Boulder City, Nevada. According to Michael Allman, President of Sempra Generation, PV technology is more cost effective than solar thermal trough technology. Mr. Allman states "*We looked at both concentrated solar power and photovoltaic and it was our belief that photovoltaic was the least expensive electricity to develop from solar power.*" (BCV 2009a). Staff also contacted the company Applied Materials, an international manufacturer of equipment that manufactures thin film PV solar panels (CEC 2009j). Steve Stokowski, Solar Sales Manager of Applied Materials, estimated the installed cost of thin film PV technology at approximately $3.90 per watt. This cost appears to be equivalent to the BSEP project cost (BS 2008a). Based on these two market reference points, staff concludes that the cost of PV technology is equivalent to the installed cost per watt of solar trough thermal technology, as proposed by BSEP.

The second cost advantage of PV is the significantly reduced operating costs. Solar thermal electricity generating facilities have far greater staffing requirements than PV electricity generating facilities. The proposed BSEP facility would require 66 full time workers to operate and maintain the facility compared with a PV facility that can operate with a staff of 13 people (1 Person per 20 MW) (BS 2008a, BCV 2009a, and CEC 2009i). The lower operating costs of PV applications results in more free cash available for debt servicing, which is a key determinate (debt service coverage ratio) for lenders when considering project financing. Staff finds there are cost advantages from utilizing PV technology in place of solar thermal technology, as proposed by BSEP. Because PV technologies have a less than or equivalent cost per watt to develop, as compared with solar thermal technologies, and PV technologies have much lower operating costs, staff concludes that PV technology is an economically feasible alternative to solar thermal technology.

Market Based Approach to Economic Feasibility of Photovoltaic (PV) Technology

Staff next applied a market based approach to determine if the broader market of energy generators (developers) considered PV technology to be cost competitive with solar thermal technology. Staff researched the US Department of Interior, Bureau of Land Management (BLM) website at http://www.blm.gov/ca/st/en/prog/energy/solar.html and found a list (BLM Applications Table) of utility scale PV projects proposed to be developed by the private sector (BLM 2009a). The scope of these PV projects can be described as 23 projects covering more than 150,000 acres with capacity to produce more than 14,500 megawatts of electricity.

In addition to the projects proposed to be developed on BLM lands, staff researched PV projects at the Solar Energy Industries Association at http://www.seia.org. Staff found that the parent company of BSEP, Florida Power & Light (FPL) has several PV projects under development in Florida (SEIA 2009a). Considering the breadth of proposed PV

projects on BLM lands, and applicant's PV projects in Florida, the overall market (and applicant) has determined that PV technology is economically viable and competitive with solar thermal technology.

Staff concludes that generating 250 MW of electricity using PV technology has cost advantages, financing advantages, reduces potable water consumption by up to 97 percent, could avoid significant impacts to cultural resources by avoiding the need for excavation of evaporation ponds, and could avoid impacts to biological resources by eliminating the need for excavation of evaporation ponds that can be toxic to wildlife. Staff finds PV technology to be economically feasible and a reasonable alternative to the proposed BSEP.

ALTERNATIVE COOLING TECHNOLOGY; AND SOURCES OF NON-POTABLE WATER

The project proponent, Beacon Solar LLC, a subsidiary of NextEra Energy Resources, has proposed a wet cooling system using *potable* water, on the basis that using non-potable water or dry cooling technology would "…create a significant cost disadvantage..." and rejects these reasonable alternatives as being "…economically unsound" (BS 2008a, pp. 1-4, 4-15). Currently, the proposed BSEP is the only solar thermal project engaged in the Energy Commission's licensing process that has proposed to use potable water for wet cooling. Because installing a water line to convey recycled water or constructing a dry cooling system are both logistically and technically feasible as demonstrated by their respective industries over the past 30 years, staff focuses the remainder of this analysis on the economic feasibility of using *non-potable* water for wet cooling or in the alternative using dry cooling technology.

Air Cooled Condenser (ACC) Also Known As "Dry Cooling"

In a power plant application, a "dry cooling" system can be used in place of a "wet cooling" system to accomplish power plant cooling needs. The similarities are that both cooling systems utilize fans to cool the steam that drives the main turbine. The difference between wet cooling and dry cooling is: a wet cooling tower applies water to the outside of the condenser while simultaneously using fans to evaporate the water. This evaporation provides approximately a 5% to 7% more efficient cooling process (see **Appendix B**). The efficiency "loss" associated with using a dry cooling system, as compared to a wet cooling system, is the basis for applicant's assertion that dry cooling is not economically feasible.

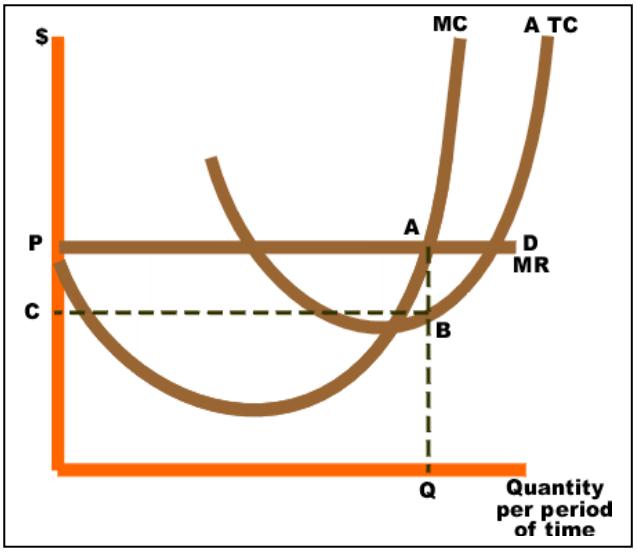
In order to offset the efficiency loss of using dry cooling, the applicant proposed expanding the solar field and related equipment by approximately 12%. Staff finds this approach to be practical and implementable. See **Alternatives Figure 3** that illustrates an expanded solar field. In **APPENDIX A**, staff established capital equipment costs and annual operating costs for the BSEP to utilize a dry cooling system with an expanded solar field. In **APPENDIX B,** staff independently verified the dry cooling alternative, as it was presented in the AFC. However, when considering the economic feasibility of dry cooling with an expanded solar field, staff concludes that the AFC did not account for the additional revenues that would be generated by the increased capacity derived from the expanded solar field.

Applying the Marginal Cost – Marginal Revenue Model to Profit Maximization

In **APPENDIX B** staff analyzed the average hourly and monthly ambient temperatures to determine when the efficiency losses occur under the dry cooling scenario. Those losses are primarily restricted to the hottest times of the year, from May through September. Next staff calculated the additional power generated during times when the efficiency loss was ***not*** a factor, generally from October through April. During these "off season" times, the project benefitted from the expanded solar field by utilizing the idle capacity in the power plant and related infrastructure. Staff found that utilizing this idle capacity generated a significant amount of additional revenues.

Expanding the solar field comports with the general business practice[1] of increasing production (solar field capacity and related output) as long as marginal costs are less than marginal revenues. Profit maximization is reached when marginal costs equal marginal revenues, as illustrated by point "A" in the diagram[2] below. Applying the profit maximization model, it is apparent that the proposed BSEP (which uses wet cooling) has not optimized its production and related revenues. This becomes evident when considering that with dry cooling and an expanded solar field, the BSEP would generate 4% more energy than the proposed wet cooled project; would slightly exceed the internal rate of return for the wet cooled project; and would generate more than an additional $65 million in net revenues, as compared to the proposed wet cooled project.

Marginal Cost – Marginal Revenue Diagram



[1] Since total profit increases when marginal profit is positive and total profit decreases when marginal profit is negative, it must reach a maximum where marginal profit is zero - or where marginal cost equals marginal revenue. This is because the producer has collected positive profit up until the intersection of MR and MC (where zero profit is collected and any further production will result in negative marginal profit, because MC will be larger than MR). The intersection of marginal revenue (MR) with marginal cost (MC) is shown in the diagram as point A. If the industry is competitive (as is assumed in the diagram), the firm faces a demand curve (D) that is identical to its Marginal Revenue curve (MR), and this is a horizontal line at a price determined by industry supply and demand. Average total costs are represented by curve ATC. Total economic profits are represented by area P,A,B,C. The optimum quantity is ("Q").

[2] The diagram illustrates the mathematical relationship between marginal costs, marginal revenues and the resulting profit maximization. However, the diagram does NOT represent the exact linear functions of the BSEP costs, revenues and profit maximization.

Brackish Water

Appendix A describes alternative equipment and process configurations that would use brackish water from the vicinity of Koehn Dry Lake. **Appendix A** also evaluates the cost of using an air cooled condenser (ACC), also known as “dry cooling” technology. Although adding an additional cost to the project, each of the alternatives discussed in **Appendix A** would potentially provide a means for the BSEP to comply with LORS and state policies regarding the use of high quality fresh water.

Rosamond Community Services District (RCSD)

The Rosamond Community Services District (RCSD) has submitted to staff, a Letter of Intent to provide the BSEP with tertiary-treated water for BSEP’s planned process needs (RCSD 2009d). The District’s wastewater treatment plant produces enough effluent to meet the annual quantity of water demanded by the proposed BSEP cooling tower. All of the effluent is currently being disposed of in evaporation ponds. The RCSD is currently constructing wastewater treatment plant upgrades that include a tertiary level treatment facility. Upon completion of phases I and II, the wastewater treatment plant will have sufficient capacity to provide the tertiary-treated quality of water that is suitable for the proposed BSEP. The wastewater treatment plant upgrades will be completed prior to the planned operation of the BSEP.

In order for the RCSD to supply water to the proposed BSEP a 40-mile pipeline would be constructed, using public rights-of-way which have been selected by the RCSD, and are identified on the Kern County General Plan. See “Western Alternative”, **Alternatives Figure 2**. The RCSD has previously engaged in a separate and unrelated effort to provide tertiary-treated wastewater to Edwards Air Force Base (EAFB) by installing a 10-mile pipeline. EAFB completed an environmental review and approved installation of the pipeline which will have excess capacity that can also be used to deliver water for 10 miles of the total distance to the BSEP (EAFB 2009a). See “Eastern Alternative”, **Alternatives Figure 2.** In this overall FSA, staff has analyzed the environmental impacts of installing the pipeline along the Western Alternative route and identified mitigation measures to reduce any potential environmental impacts to less than significant.

Staff supports and recommends the RCSD project alternative because it would facilitate compliance with state water policy, effectively bring new water (which is otherwise being evaporated) into the Koehn sub-basin, and implementing this alternative would directly increase the project’s positive economic impact on the local community of Rosamond, California.

California City as a Source of Tertiary-Treated Wastewater

California City has also submitted a proposal to staff that would supply BSEP with tertiary-treated water for its planned process needs (CofC 2009c). California City has a different dynamic than the Rosamond Community Services District, in that California City has a tertiary treatment plant in operation but does not have the household sewer connections to generate the tertiary-treated effluent. As a result, California City’s

proposal is based largely upon the cost to connect the existing residents to the system and install a pipeline to the BSEP site. In summary, although California City requires a 15-mile pipeline as compared to RCSD's 40-mile pipeline (or 30-mile pipeline if the EAFB line is built first), the costs of the two alternatives are equivalent.

Staff is concerned that California City's proposal also includes a "return line" that would allow the BSEP to pump an undetermined amount of high quality, fresh groundwater and sell it to California City. See **Alternatives Figure 4**. As currently proposed, staff does not support this proposal because pumping an undetermined amount of groundwater from the BSEP site has the potential to significantly impact groundwater wells near the BSEP site. However, if as a Condition of Certification BSEP is prohibited from pumping site groundwater to sell or trade, then staff would support the California City recycled water pipeline alternative, as a feasible measure for the BSEP to comply with state water policy. California City Council has approved this modified alternative which excludes any purchase of groundwater from BSEP but still provides the BSEP with recycled wastewater to use for power plant cooling.

Staff has considered the potential environmental impacts arising from California City providing tertiary treated waste water to the BSEP and staff has recommended mitigation measures to reduce such impacts to less than significant levels, if the alternative is adopted. However, staff did not evaluate the environmental impacts associated with BSEP pumping an undetermined amount of high quality, fresh groundwater to sell to California City.

On June 25, 2009 the California City Council voted 5-0 to support RCSD's proposal to provide recycled water to the BSEP (CofC 2009b). California City has been fully supportive of the proposed Beacon Solar Energy Project and has submitted their proposal to provide recycled water, solely as a back-up plan to the RCSD proposal. The representatives of California City have stated in a public workshop and letters to staff that it is their preference for the BSEP to utilize water from RCSD rather than from California City because it effectively brings new water into the basin. Staff agrees that implementation of the RCSD alternative would allow California City the flexibility to use their reclaimed water for other beneficial purposes in the basin while allowing BSEP to make use of RCSD's tertiary-treated water that is otherwise being evaporated.

Profit Based Approach to Determine Economic Feasibility of Project Alternatives

Staff begins by considering a legal standard for establishing economic feasibility under CEQA. "The fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible. What is required is evidence that the additional costs or lost profitability are sufficiently severe as to render it impractical to proceed with the project." (*Citizens of Goleta Valley v. Board of Supervisors*, 197 Cal.App.3d at p. 1181, 243 Cal.Rptr. 339.)

Solar Energy Industry Benchmark for Profitability – Internal Rate of Return (IRR)

Staff's approach to evaluate the economic feasibility of each alternative began with first establishing reasonable benchmarks for the expected rate of return on investment, also known as the internal rate of return (IRR). Staff first considered the company eSolar, a

developer who plans to build large scale solar thermal power plants. eSolar is considered a solid market reference point because they have entered into power purchase agreements to sell their electricity in New Mexico and California. The company has signed a 20-year contract to provide Southern California Edison (SCE) the energy from a 245 megawatt solar thermal power plant. That project is nearly identical in size to the proposed 250 megawatt BSEP. According to Bill Gross, Chief Executive of eSolar, internal rates of return are expected to fall within the range of 11% to 14% for a "wet cooled" plant (GW 2009a) (GB 2009a). Considering that eSolar is developing projects of smaller scale and larger scale than the proposed BSEP staff concludes eSolar is a fair representative of the marketplace.

Staff next considered the international solar development company, Abengoa Solar. Abengoa has recently filed an Application for Certification with the Energy Commission to develop the Mojave Solar 1 project (09-AFC-5). The Mojave Solar 1 project is the same scale (250 MW) and utilizes the same solar trough technology as the BSEP. In their Application for Certification, Abengoa establishes their internal rate of return as 8%. Staff considers Abengoa to be a fair representative of the marketplace.

Although eSolar "expects" to generate an 11% to 14% internal rate of return (IRR), eSolar submitted a formal comment letter to staff emphasizing that this is an expectation and not a commitment (GB 2009a). Comparatively, Abengoa as a successful developer of solar energy projects has a much more competitive IRR of 8%. Staff believes that a median, industry benchmark for profitability will likely fall somewhere between the most competitive companies such as Abengoa Solar and the upper end of profitability such as the target rate of 14%, identified by eSolar. Staff therefore concludes that economic feasibility for solar energy power plants appears to be achieving an internal rate of return (annualized net profit margin) 11% or more.

Applying the Industry IRR Benchmark to Beacon Solar Energy Project

The next step in staff's analysis was to establish BSEP's internal rate of return (IRR) under different scenarios that accounted for the cost of each alternative. Staff therefore requested the baseline project cost data and revenue data from the BSEP proponent. The data was submitted to staff under an application for confidentiality which was granted by the Commission's Executive Director (DB 2009l). Staff then generated a feasibility study to estimate costs for several alternatives that each would utilize non-potable, brackish water from the general vicinity of Koehn Dry Lake. The feasibility study also evaluates the marginal cost of using dry cooling technology, see "ACC 40F ITD", **APPENDIX A**. Staff also conducted a detailed review of applicant's dry cooling and hybrid cooling study, see **APPENDIX B**. Additionally, staff obtained preliminary engineering and cost estimates for the Rosamond Community Services District's (RCSD) alternative and the California City alternative, as described above.

In **CONFIDENTIAL APPENDIX C,** staff provides a detailed project cost analysis of the various alternatives. The analysis utilizes the confidential revenue model submitted by applicant to staff. Staff created three separate revenue models reflecting the marginal project costs of the RCSD alternative, California City alternative and the Dry Cooling alternative, respectively. In the case of dry cooling, staff added the additional revenue from expanding the solar field, as proposed in the AFC. In all three scenarios, the

revenue models show that BSEP would surpass the benchmark internal rate of return (IRR) of 11%. Additionally, the applicant's revenue model shows that even without expanding the solar field, the BSEP would still meet or exceed the benchmark IRR. Due to the confidential nature of the revenue models, **CONFIDENTIAL APPENDIX C** will be presented to the Commission during an "in camera" hearing (closed door session) that will be part of the formal hearings on the BSEP (08-AFC-2) case.

It is also worth noting that a "residual value" of the BSEP was missing from the BSEP revenue model which would yield an IRR that is more than staff's estimate, therefore staff's estimate is conservative. The residual value component would reflect what the power plant was worth at the end of the 30 years. Because the revenue model assumes a cost for annual maintenance, the power plant would be fully maintained and operating at the end of 30 years (revenue model) and long after the debt financing was repaid. Therefore it could be sold for a lump sum or held for its continuing cash flow. The residual value is a significant factor that should have been included in the revenue model when establishing the complete project cash flow (DB 2009l). It follows that staff's estimate of value is understated and the project would likely reach an IRR above staff's estimate.

Market Based Approach to Economic Feasibility

Staff also took a broader approach to establish economic feasibility based upon the overall market (supply side) – solar power plant, development industry in California. Staff defined the market by solar thermal projects with capacity of 50 megawatts or more, constructed within the last 10 years in California or proposed to be built in California. **Alternatives Table 2** below provides a brief description of solar thermal projects being considered for certification by the Energy Commission. Each project proposes to use a cooling system that complies with state water policy and avoids adverse impacts to fresh water resources. Some of the projects listed below are identical in size to the BSEP. They are also proposed to be built in the same general area (climate) and therefore would have similar if not identical efficiency losses from using dry cooling. Although the nominal megawatt (MW) rating may appear larger for the Palen and Blythe projects, respectively, each project is actually divided into separate 250 MW power plants using the same technology as the BSEP.

Alternatives Table 2
Solar Thermal Projects with Cooling Systems Consistent with State Policy

Project	Capacity	Generation Technology	Cooling System
Ridgecrest Solar Power Project (09-AFC-9)	250 MW	Solar parabolic trough	Dry cooling (air-cooled condenser)
Blythe Solar Power Project (09-AFC-6)	1 GW (1,000 MW)	Solar parabolic trough	Dry cooling (air-cooled condenser)
Palen Solar Power Project (09-AFC-7)	500 MW	Solar parabolic trough	Dry cooling (air-cooled condenser)
Carrizo Energy Solar Farm (07-AFC-8)	177 MW	Compact Linear Fresnel Reflector solar thermal technology	Dry cooling (air-cooled condenser)
Ivanpah Solar Electric Generating System	400 MW	Power tower solar thermal technology	Dry cooling (air-cooled condenser)
San Joaquin Solar 1&2 Hybrid Project (08-AFC-12)	106 MW	Solar parabolic trough/biomass	Wet cooling using reclaimed water
Palmdale Hybrid Power Project (08-AFC-9)	570 MW	Solar parabolic trough and natural gas-fired combined cycle	Wet cooling using reclaimed water
Victorville 2 Hybrid Power Project (07-AFC-1) **APPROVED**	563 MW	Solar parabolic trough and natural gas-fired combined cycle	Wet cooling using reclaimed water

Staff also considered the company BrightSource Energy ("BrightSource"), as a market referent. BrightSource was considered for several reasons: 1.) they currently propose to develop the Ivanpah Solar Electric Generation System ("Ivanpah") which is a solar thermal project in a similar desert environment and Ivanpah will use dry cooling, 2.) BrightSource has entered into the world's largest power purchase agreement to sell Southern California Edison 1,300 megawatts of electricity from BrightSource's solar thermal projects (GW 2009 B), and 3.) the Ivanpah project consists of three power plants, two of which are 100 megawatts each and one that is 200 megawatts. These three plants are each smaller than the proposed BSEP project and therefore demonstrate the economic feasibility of dry cooling, on a scale smaller than the proposed BSEP.

BrightSource has demonstrated by its development proposals to supply SCE with 1,300 megawatts, that dry cooling is economically feasible (CEC 2009k). BrightSource also acknowledges that the efficiency loss of using dry cooling in place of wet cooling is "marginal" and therefore does not render a project infeasible (CEM 2009 A). More so, the proposed BSEP appears to be twice as efficient, on a megawatt per acre basis, than Ivanpah, see **Efficiency Table 1** in the **EFFICIENCY** section of this FSA.

Considering the facts above, staff concludes that solar thermal energy generators in the overall marketplace have established the economic feasibility of both: using dry cooling technology or in the alternative - reclaimed water in a wet cooling system. The economic feasibility of dry cooling technology is further demonstrated by the proposed use in smaller projects; projects of the same size; and projects using identical solar trough technology in the same desert environment, as compared to the proposed BSEP.

THE “NO PROJECT” ALTERNATIVE

CEQA Guidelines and Energy Commission regulations require consideration of the “No Project” alternative. The CEQA Guidelines state that “the purpose of describing and analyzing a No Project Alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project” (Cal. Code Regs., tit. 14 §15126.6[i]). Toward that end, the “No Project” analysis considers “existing conditions” and “what would be reasonably expected to occur in the foreseeable future if the project were not approved…” (§15126.6[e][2]).

In short, the site-specific and direct impacts associated with the power plant would not occur at this site if the project does not go forward. Selection of the “No Project” alternative would render all concerns about project impact moot. The “No Project” alternative would preclude any construction or operation and, thus, grading of the site or installation of new foundations, piping, or utility connections.

If the project were not built, off-takers of the renewable energy from BSEP would not benefit from the annual, solar power this project would provide. A primary benefit of the BSEP is that it would help achieve: the State of California objectives mandated by SB 1078 (California Renewable Portfolio Standard Program), and AB 32 (California Global Warming Solutions Act of 2006).

If the proposed project was not constructed then during peak demand periods, potential off-takers of the solar power may have to rely on existing, inefficient, older natural gas-fired power plants which are known to consume more fuel and emit more air pollutants per kilowatt-hour generated than the proposed BSEP.

In light of the California Renewable Portfolio Standard Program and the California Global Warming Solutions Act of 2006, in the absence of the proposed Beacon Solar Energy Project, other power plants with unknown technologies would likely be constructed in the region to supply the market demand for energy. As such, staff has concluded the “No Project” alternative would not be a reasonable alternative or a feasible alternative to the proposed project.

AGENCY AND PUBLIC COMMENTS

COMMENT

California Department of Fish and Game

In their June 19, 2008 comment letter on BSEP, the CDFG recommended avoiding impacts to state waters and requested that the applicant evaluate alternative site layouts that would avoid the desert washes (DFG 2008b).

STAFF RESPONSE

Staff believes the applicant need not locate the entire project on one side of the desert wash nor straddle the wash with the entire project utilizing one 250 megawatt (MW) power block. Instead applicant could avoid Pine Tree Creek entirely by constructing two half scale facilities: a 125 MW plant on each side of the desert wash (still achieving the desired 250 MW). Such a modification to the layout could provide increased efficiencies in land use while avoiding impacts to state waters. The efficiencies could be gained by

avoiding the substantial excavation costs of filling the existing 2-mile long channel and constructing a new longer diversion channel. Further cost savings could be realized by avoiding the requirement to provide mitigation lands, endowment funds and a management plan.

COMMENT
Scott Galati, Galati | Blek LLP, Legal Counsel for eSolar
In a letter dated June 4, 2009, Mr. Galati, on behalf of eSolar, commented on staff's Preliminary Staff Assessment (PSA). The PSA cited public statements made by Bill Gross, CEO of eSolar. The PSA cited Mr. Gross as stating internal rates of return (IRR) ***will be*** between 11% and 14%. Mr. Galati clarifies that Mr. Gross said the "internal rates of return were ***expected*** to be between 11 to 14 percent".

STAFF RESPONSE
Staff has made the correction which is reflected on pages 6-11 and 6-12, herein.

COMMENT
Scott Galati, Galati | Blek LLP, Legal Counsel for eSolar
In a letter dated June 4, 2009, Mr. Galati, on behalf of eSolar, commented on staff's Preliminary Staff Assessment (PSA). Mr. Galati states "*First, eSolar believes it is unreasonable to apply broad statements made by one company concerning its business strategy and how it calculates internal rates of return to other industry participants. Second, it is important to note that the rates of return noted by Mr. Gross were based upon wet cooling. Last the internal rates of return for any project must be balanced by the risk management strategy adopted by each industry participant. These risks are different for every project and are largely related to transmission interconnection, ability to access capital, financing costs, expectations of rates of return by company shareholders, risks of successful permitting, and the specific risks of a power purchase agreement. We believe it is imprudent for the CEC staff to dictate the reasonable internal rates of return on any applicant…" "We strongly urge the CEC to refrain from comparing internal rates of return between companies or technologies*".

STAFF RESPONSE
Staff respectfully disagrees with Mr. Galati's interpretation of a permitting Agency's responsibility to evaluate the economic feasibility of project alternatives that can avoid or lessen a project's environmental impacts in accordance with CEQA, and or allow the project to comply with state LORS and water use policies. An Agency ***may not*** simply accept at face value the project proponent's assertion regarding economic feasibility. (*Sierra Club v. County of Napa*, 121 Cal.App.4th at p. 1504, 19 Cal.Rptr.3d 1; see also *Laurel Heights*, p. 404, 253 Cal.Rptr. 426, 764 P.2d 278 [courts will not "countenance blind trust by the public"].)

Because staff must evaluate the economic feasibility of alternatives, staff must consider "[t]he fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible. *What is required is evidence* that the additional costs or lost profitability are sufficiently severe as to render it impractical to

proceed with the project." (*Citizens of Goleta Valley v. Board of Supervisors*, 197 Cal.App.3d at p. 1181, 243 Cal.Rptr. 339). Staff must therefore gather evidence of profitability, as established in the marketplace, to determine whether it is “practical to proceed with the project”.

Regarding “the unreasonableness…of applying how one company calculates an internal rate of return to another company”, staff replies that the method of calculating an internal rate of return (IRR) is not unique to any one company because an IRR is always calculated by the same equation*, as illustrated below:

$$\mathbf{NPV} = \sum_{n=0}^{N} \frac{C_n}{(1+r)^n} = 0$$

***Given a collection of pairs (time, cash flow) involved in a project, the internal rate of return follows from the net present value as a function of the rate of return. A rate of return for which this function is zero is an internal rate of return. Given the (period, cash flow) pairs (n, Cn) where n is a positive integer, the total number of periods N, and the net present value NPV, the internal rate of return is given by r.**

Regarding Mr. Galati’s description of various project risk factors being indicative of differing internal rates of return, staff replies that staff’s analysis began with a comparison of similar projects in the same industry (renewable energy) and more so in the same subsector (solar thermal energy). Staff then assumed that no project will be built unless all of the risks are fully mitigated to acceptable levels, as established by the financial markets. Therefore working under the assumption that projects in the same industry subsector are required to mitigate risks to the same levels in order to obtain debt financing from the same financial markets, the internal rates of return between these projects are absolutely comparable. In other words, a financial institution is not likely to fund a project that does not have a transmission interconnection or a power purchase agreement, regardless of the projected IRR or risk management strategy. As such, project risks will be mitigated to acceptable levels before the project is constructed. Therefore, the risk factors noted by Mr. Galati are only applicable to a developer in the ***permitting stage*** where less than 2% of the total project funding will be spent. The market forces require all developers to implement appropriate “risk management strategies” in the planning phase as well as the development phase, in order to arrive at the same point – project risks mitigated to acceptable levels, as determined by the financial debt markets, not necessarily by private investors projected IRRs.

Regarding Mr. Galati’s comment that “…it is imprudent for the CEC staff to dictate the reasonable internal rates of return on any applicant…”. Neither staff nor the Energy Commission is dictating profit margins to developers. By a close reading of the FSA it is apparent that staff has identified industry benchmarks to assess whether the project developer will “**meet or exceed**” the “**minimum**” profit threshold staff identified as the industry median level of profitability. Staff applied this threshold as screening criteria, in

order to determine whether or not “it is impractical to proceed with the project". Such an approach is supported by CEQA case law, as discussed in *Citizens of Goleta Valley v. Board of Supervisors*. Moreover, an Agency may not simply accept at face value the project proponent’s assertion regarding economic feasibility (*Sierra Club v. County of Napa*).

COMMENT
California Unions for Reliable Energy (“CURE”)
On April 30, 2009, as an Intervener in the BSEP (08-AFC-2) case, CURE, submitted written comments on the Preliminary Staff Assessment (PSA). The comments relevant to the Alternatives analysis were various arguments and calculations of internal rates of return supporting the use of dry cooling.

STAFF RESPONSE
Because the revenue models are confidential staff will not attempt to provide any calculations here, in response to the comments. More importantly, staff agrees with CURE’s comments that in fact dry cooling is economically feasible, as discussed in this **Alternatives** section.

CONCLUSIONS

ALTERNATIVE SITES

After evaluating the alternative project siting areas proposed by applicant, staff concludes the Antelope alternative site area would likely cause a significant impact to prime agricultural lands and thus in order to avoid impacting waters of the state the project proponent would create a much more significant impact to farmland resources, on an overall acreage basis. Staff therefore concludes this particular alternative site area is not a feasible alternative to the proposed BSEP.

ALTERNATIVE ELECTRICAL GENERATION TECHNOLOGIES

After evaluating the alternative electrical generation technologies and applying the screening criteria, staff has determined photovoltaic technology (PV) is a feasible alternative generation technology for the proposed BSEP because PV technology can reduce consumption of high quality fresh water by up to 97 percent, as compared with the proposed BSEP. The use of PV technology could also avoid the need to excavate evaporation ponds which could impact cultural resources. The evaporation ponds associated with the proposed BSEP also pose a threat to wildlife due to the toxicity of the wastewater and other factors. Staff concludes that utilizing PV solar panel technology could avoid or lessen certain environmental impacts from the proposed BSEP.

ALTERNATIVE COOLING TECHNOLOGY – AIR COOLED CONDENSER (“DRY COOLING”)

Staff concludes that utilizing a dry cooling system is a feasible project alternative to the proposed BSEP. Staff has reached this conclusion because the dry cooling alternative “…would feasibly attain most of the basic objectives of the project [and] would avoid or substantially lessen any of the significant effects of the project…even if these

alternatives would…be more costly", Title 14, California Code of Regulations, section 15126.6(a)(b). In fact, staff has concluded that utilizing dry cooling with an expanded solar field actually provides a slightly higher profit margin, as compared to the proposed wet cooled project. Staff also finds that even without expanding the solar field, the BSEP would still meet or exceed the benchmark internal rate of return.

SOURCES OF NON-POTABLE WATER FOR POWER PLANT COOLING

Staff concludes that using tertiary treated wastewater from either the Rosamond Community Services District (RCSD) or California City (with staff's condition) are both feasible project alternatives that would also increase the positive economic impact on the local communities. Staff supports and recommends the RCSD project alternative because it would facilitate compliance with state water policy. Staff also agrees with California City's assessment that the RCSD project alternative should be the preferred alternative because it effectively brings new water (which is otherwise being evaporated) into the sub-basin.

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APPENDIX A
FEASIBILITY STUDY OF WATER SUPPLIES AND COOLING SYSTEMS

Testimony of Michael N. DiFilippo

WATER SUPPLY & COOLING

The Beacon Solar Energy Project (BSEP) would utilize onsite groundwater for all plant needs including cooling and steam generator feedwater as well as potable uses. Cooling will be provided by a mechanical draft cooling tower. Plant wastewater (from all sources) would be sent to evaporation ponds for final disposal. No backup cooling water supply is planned for by the applicant although they offer to use future tertiary treated effluent from California City if it becomes available.

Staff has compared the environmental and economic merits of the proposed project with an alternate water supply and one cooling alternative as follows:

PROPOSED PROJECT

All BSEP water needs (including potable needs) will be met by groundwater pumped from wells on the plant site. There are 12 existing water supply wells that were previously used for farming at the site - four wells would be used to supply water for the project (two operating and two backup). The applicant projects water use as follows:

Water Use			
Water Use	Annualized Average Rate[1], gpm	Peak Rate[2], gpm	Estimated Annual Use, Acre Feet
Plant Operation	990	4,054	1,599
Potable Water	5	5	8

1. The estimated groundwater usage in gallons per minute is based on an average daily consumption.
2. The peak rate is the instantaneous maximum for summer usage.

Water uses would include cooling tower makeup, closed cooling system makeup, steam generator makeup, mirror washing, plant wash down (housekeeping and maintenance), dilution water for chemical feed systems, etc. Well water would also be used for potable uses - drinking, showers, sinks, and toilets. Well water would be stored on site in the Raw Water Tank. Most of the water would be treated using ion exchange (SAC-SBA) and stored in the Process Water Tank. Process water would be used for cooling tower makeup. A portion of the process water would be treated further for steam generator makeup and mirror washing utilizing portable demineralizers (these are regenerated offsite and generate no wastewater). Wastewater sources include cooling tower blowdown, steam generator blowdown, plant drains, water treatment waste streams, etc. Cooling tower blowdown and SAC-SBA neutralized wastewater would be sent to three 8.3 acre evaporation ponds. Steam generator blowdown and plant drains would be recycled to the cooling tower. The applicant claims that the ponds are sized to accommodate all solids residue generated throughout the life of the plant.

The treatment process selected by BSEP was driven by the PM10 requirements placed on the cooling tower (by the AQMD). The total dissolved solids (TDS) of the circulating water must be less than 1,600 mg/l to meet the PM10 limit. Also, BSEP plans to operate the cooling tower at 15 cycles of concentration (the ratio of feedwater flow to blowdown flow is 15) to minimize wastewater generation. This also means that the TDS of the makeup water (onsite wells) must be reduced to approximately 100 mg/l. BSEP proposes using SAC-SBA ion exchangers to accomplish this. SAC-SBA vessels contain ion exchange resin specifically designed to remove cations (positive ions) and anions (negative ions) from water. The SAC and SBA vessels have a fixed capacity to remove ions, and therefore, must be removed from service frequently and regenerated. This is accomplished by passing dilute sulfuric acid through the SAC vessel (strong acid cation) and dilute sodium hydroxide through the SBA vessel (strong base anion). Wastewater which can have very high or low pH would require neutralization prior to disposal.

In the applicant's water balance for typical annual conditions, they show a wastewater rate to the evaporation ponds of 471 gpm (Section 2, Figure 2-13). This consists primarily of cooling tower blowdown and wastewater from water treatment. They plan to operate at an annual 26.5% capacity factor (94% capacity factor during daylight periods). Adjusting wastewater flow to a 24-hour operating basis, flow to the evaporation ponds would be 125 gpm (471 gpm x 26.5%). All ponds would have to operate for the entire year to accommodate this flow. Stated another way, the evaporation rate from the ponds would have to be 97 inches per year. Evaporation pan data for this area is about 120 inches per year. Pan data is measure of ambient evaporation rate and is measured with a National Weather Service Class A pan (measuring 48" diameter x 10" deep). Past experience in sizing evaporation ponds (by author) was to adjust the Class A pan data by 40% to 45% for salinity and edge effects. This equates to an adjusted evaporation rate of approximately 66 to 72 inches. As ponds concentrate, high levels of salt inhibit evaporation. Additionally, the size, shape and depth of the pond also reduce evaporation. The ponds as sized are marginal and a fourth pond would likely be required. Also, if water use in the plant is greater than that described in the water balance (Figure 2), additional pond area would be required.

ALTERNATIVE WATER SUPPLY (BRACKISH WATER) AND TREATMENT PROCESSES

As a means of conserving high quality (potable) onsite groundwater, five treatment alternatives were evaluated utilizing offsite brackish water. Refer to the following table. All the alternatives would utilize well water from a brackish makeup source. The water is considered brackish because State Water Resources Control Board, Resolution 75-58 defines brackish waters as "all waters with a salinity range of 1,000 to 30,000 mg/l" and the water at Koehn Lake fits within those parameters. The aquifer is accessible at the southwest corner of Koehn Lake approximately 5 miles from the project site. It was assumed that four wells would be required to supply BSEP needs. In all of the alternatives well water would be transported to the site via a 12-inch or 14-inch pipeline (depending on water demand).

Offsite Brackish Water Alternatives					
	SAC-SBA	Makeup RO	Recovery RO	Evap/Crys	Evap Ponds
Alternative 1	X				X
Alternative 2	X		X		X
Alternative 3		X	X		X
Alternative 4	X			X	
Alternative 5		X	X	X	

All of the processes in the above table are well established commercial technologies.

SAC-SBA in Alternative 1 is the same ion exchange process proposed by BSEP.

Reverse osmosis (RO) would be used in two ways – as makeup treatment or in a wastewater recovery configuration. In alternatives 2 and 5, RO would be used to directly treat cooling tower makeup, steam generator makeup and mirror washing water. In Alternatives 2, 3 and 5, RO would be used to treat cooling tower blowdown to reduce overall wastewater volume either for disposal or as a pretreatment to an evaporator. RO is a technology that utilizes permeable membranes (under relatively high pressure) to repel salt and pass water. Most of the dissolved salts are repelled by the membrane surface (95% to 98% for most ions) allowing only water to pass through. RO must have highly filtered water with modified chemistry (usually pH adjustment) to operate successfully. In the alternatives utilizing RO, the water would be filtered by the use of microfiltration (MF). MF is also a membrane process that is commonly used with RO in difficult industrial or reuse applications.

Evaporator/Crystallizers in Alternatives 4 and 5 would be used to reduce wastewater volume to essentially zero volume. In the evaporator 90% to 95% of the water would be recovered. Brine from the evaporator would be sent to a crystallizer to further recover water. Waste from the crystallizer would be in the form of highly concentrated salt brines that would crystallize to solid form for offsite disposal. In Alternative 5, a recovery RO would be used to pre-concentrate the wastewater stream to the evaporator. Alternatives 4 and 5 would be the only treatment options requiring offsite disposal.

COMPARATIVE WATER CONSUMTION OF VARIOUS PROCESSES

Refer to the following table for a comparative summary of onsite water versus offsite brackish water for BSEP makeup. The analysis was based on typical summer conditions. Note the evaporation pond sizing for the BSEP proposed treatment. Staff calculated a pond size (utilizing the criteria discussed above) of 43.5 acres versus 25 acres in the BSEP project description.

Water Treatment Summary *Typical Summer Conditions Basis*						
		Offsite Wells - Koehn Lake Source Water				
	BSEP Onsite Wells SAC-SBA	Alternative 1 SAC-SBA	Alternative 2 SAC-SBA Recov RO	Alternative 3 MU RO Recov RO	Alternative 4 SAC-SBA Evap-Crys	Alternative 5 MU-Recov RO Evap-Crys
Water Demand - Instantaneous						
Onsite Wells Demand, gpm	4,038	5	5	5	5	5
Koehn Lake Water Demand, gpm	N/A	4,086	3,772	3,959	3,463	3,480
Total Wastewater, gpm	572	650	565	801	0	0
Water Demand - Annual Average Conditions						
Annual Capacity Factor	26.5%	26.5%	26.5%	26.5%	26.5%	26.5%
Onsite Wells Demand, gpm	1,070	5	5	5	5	5
Koehn Lake Water Demand, gpm	N/A	1,083	1,000	1,049	918	922
Onsite Wells Demand, AF/yr	1,726	8.1	8.1	8.1	8.1	8.1
Koehn Lake Water Demand, AF/yr	N/A	1,747	1,612	1,692	1,480	1,488
Total Wastewater, gpm	152	172	150	212	0	0
Evap Pond, acres[1]	43.5	49.4	42.9	60.8	0	0

Notes.....
1. BSEP project evap pond was sized based based on staff calculation.

The offsite well field at Koehn Lake would be the same for all of the alternatives (1 through 5). Each well was assumed to be 500 feet deep. The pipeline diameter for Alternatives 1 and 3 is 14 inches and 12 inches for Alternatives 2, 4 and 5. The size differences are a function of water demand for each alternative. For this analysis, the line was sized to operate 24 hours per day at half the water demand rate.

ALTERNATIVE 1

Alternative 1 utilizes “brackish” water from offsite wells for plant needs, e.g. cooling tower makeup, closed cooling system makeup, steam generator makeup, mirror washing, etc. Steam generator blowdown and plant drains would be recycled to the cooling tower. It is the same alternative proposed by BSEP. Well water from onsite wells would still be used for potable needs. Plant wastewater would be sent to an evaporation pond for final disposal. The evaporation ponds would be about 15 percent larger than the BSEP ponds because more wastewater would be generated by the SAC-SBA treating brackish water.

ALTERNATIVE 2

This alternative combines Alternative 1 (SAC-SBA) with a recovery RO to reduce the cooling tower blowdown portion of the wastewater stream. MF would be used as pretreatment for the recovery RO. The evaporation ponds would be slightly smaller than the BSEP ponds.

ALTERNATIVE 3

In this alternative offsite water would be treated with and RO prior to storage in the Process Water Tank (replacing SAC-SBA). A portion of cooling tower blowdown would also be recovered via RO prior to discharge to evaporation ponds. MF would be used as pretreatment for the makeup and recovery RO. Steam generator blowdown and plant drains would be recycled to the cooling tower. RO permeate would be recovered to the cooling tower. This alternative would generate more wastewater than Alternatives 1 or 2 and would require a significantly larger evaporation pond.

ALTERNATIVE 4

This alternative combines Alternative 1 (SAC-SBA) with an evaporator/crystallizer and would essentially eliminate a liquid waste stream. There would be no evaporation pond in this alternative. Crystallizer solid waste would require offsite disposal. Steam generator blowdown and plant drains would be recycled to the cooling tower. Cooling tower blowdown and SAC-SBA wastewater would be fed to the evaporator/crystallizer. Distillate from the evaporator/crystallizer would be recovered to the cooling tower.

ALTERNATIVE 5

This alternative combines Alternative 3 (makeup RO/recovery RO) with an evaporator/crystallizer and would essentially eliminate a liquid waste stream, i.e. there would be no evaporation pond in this alternative. Crystallizer solid waste would require offsite disposal. Steam generator blowdown and plant drains would be recycled to the cooling tower. Cooling tower blowdown and makeup RO wastewater (known as reject) would be fed to the evaporator/crystallizer. Distillate from the evaporator/crystallizer would be recovered to the cooling tower.

COST ANALYSIS

Refer to the following table for a cost analysis of BSEP onsite wells versus offsite brackish water. From a capital perspective Alternative 1 (SAC-SBA) and Alternative 2 (SAC-SBA with recovery RO) are the least costly of the offsite alternatives (i.e. at this level of evaluation they are too close to call). Alternative 3 is the least costly based on operating costs. Relative to the BSEP treatment, Alternatives 1 or 2 would cost an additional $12.0 to $12.5 million to install. Likewise, Alternative 3 (makeup & recovery RO) would cost $1 million more to operate relative to the BSEP base case. When the installed cost is capitalized (amortized at 7% for 20 years), Alternative 3 is the least costly of the five offsite alternatives. However, its annual cost would exceed BSEP costs by over $2.75 million per year.

Lastly, Alternatives 1, 2 or 3 achieve the goal of using non-potable quality water for project cooling. Given the budget level of analysis, the costs of these alternatives are quite close and should be considered equivalent.

Water Treatment Summary & Cost Analysis *Typical Summer Conditions Basis*						
		Offsite Wells - Koehn Lake Source Water				
	BSEP Onsite Wells SAC-SBA	Alternative 1 SAC-SBA	Alternative 2 SAC-SBA Recov RO	Alternative 3 MU RO Recov RO	Alternative 4 SAC-SBA Evap-Crys	Alternative 5 MU-Recov RO Evap-Crys
Equipment & Evap Pond Installed Cost						
SAC-SBA	$20,610,000	$20,610,000	$20,610,000	N/A	$20,610,000	N/A
MU-Recovery RO	N/A	N/A	$3,380,000	$23,840,000	N/A	$21,160,000
Evaporator Crystallizer	N/A	N/A	N/A	N/A	$33,750,000	$36,190,000
Common Tankage & Pumping	$11,140,000	$11,270,000	$10,520,000	$10,970,000	$9,770,000	$9,810,000
Water Treatment Subtotal	$31,750,000	$31,880,000	$34,510,000	$34,810,000	$64,130,000	$67,160,000
Evaporation Pond	$10,960,000	$12,460,000	$10,820,000	$15,340,000	N/A	N/A
Total Water & Wastewater	$42,710,000	$44,340,000	$45,330,000	$50,150,000	$64,130,000	$67,160,000
Pipeline from Koehn Lake						
4 Wells	N/A	$880,000	$880,000	$880,000	$880,000	$880,000
Pump Station	N/A	$3,080,000	$3,000,000	$3,050,000	$2,910,000	$2,910,000
5 Mile Carbon Steel Pipeline	N/A	$6,970,000	$5,580,000	$6,970,000	$5,580,000	$5,580,000
Total	N/A	$10,930,000	$9,460,000	$10,900,000	$9,370,000	$9,370,000
Total Installed Water Treatment Costs	$42,710,000	$55,270,000	$54,790,000	$61,050,000	$73,500,000	$76,530,000
	Base	$12,560,000	$12,080,000	$18,340,000	$30,790,000	$33,820,000
Total Annual Operating Costs	$1,215,000	$3,549,000	$3,453,000	$2,235,000	$5,202,000	$4,215,000
	Base	$2,334,000	$2,238,000	$1,020,000	$3,987,000	$3,000,000
Capitalized Equipment Costs[1]	$4,032,000	$5,218,000	$5,172,000	$5,763,000	$6,938,000	$7,224,000
	Base	$1,186,000	$1,140,000	$1,731,000	$2,906,000	$3,192,000
Annual Operating & Capital Cost	$5,247,000	$8,767,000	$8,625,000	$7,998,000	$12,140,000	$11,439,000
	Base	$3,520,000	$3,378,000	$2,751,000	$6,893,000	$6,192,000

Notes.....
1. Capitalized at 7% per year for 20 years.

DRY COOLING

BSEP evaluated three Air Cooled Condenser (ACC) dry cooling alternatives (refer to Worley Parsons report “FPLE Beacon Solar Energy Project Dry Cooling Evaluation”, dated February 1, 2008). The report evaluated three inlet temperature differences (ITD) scenarios (35 °F, 40 °F and 45 °F). Each ITD scenario yields a slightly different operating profile. For evaluation purposes, the 40 °F scenario was compared to wet cooling alternatives, i.e. the BSEP base case and Alternative 3 (offsite water, MU/Recovery RO). In the Worley Parsons study, the cost for solar arrays was increased to provide 250 MW (i.e. same as base case).

Refer to the following table. Note that the cooling system (cooling tower) costs remain the same for the base case and Alternative 3. After adjusting the costs for water treatment, the BSEP base case is the lowest estimated capital cost followed by Alternative 3 ($18.3 million difference) and dry cooling ($53.7 million difference). The annual operating costs were calculated by adding power for the wet and dry cooling system to the annual cost for water treatment. Other power costs (outside the cooling loop) were considered equivalent. The dry cooling alternative has the lowest operating costs by $403,000 when compared to the BSEP base case.

Cooling System Comparison Summary

Typical Summer Conditions Basis

	BSEP Base Case	Alternative 3 Offsite Wells MU/Recov RO	Alternative 6 Dry Cooling ACC 40F ITD
Cooling System			
Cooling Tower Cells	11		N/A
ACC Cells	N/A		40
Power Requirements			
Fan Power, HP	250		200
Circ Pump Power, HP	2509		N/A
Total Power, HP	5259		8000
Total Power, kw	3918		5960
Average Op Capacity	26.5%		26.5%
Power, kw-hr/year	9,096,000		13,836,000
Power Cost, $/year	$1,364,400	$1,364,400	$2,075,400
Cooling System Costs			
HTF Pumps	$3,000,000		$3,000,000
BFW Pumps	$2,300,000		$2,400,000
SG Heat Exchanger	$12,500,000		$14,100,000
Additional Solar Arrays[1] (installed)	Base		$53,000,000
Cooling Tower	$4,275,000		N/A
CT Basin	$1,500,000		N/A
Circ Water Pumps	$600,000		N/A
Surface Condenser	$3,500,000		N/A
Circ Water Piping	$1,300,000		N/A
Circ Water Piping Install	$520,000		N/A
ACC Equipment	N/A		$36,900,000
ACC Install	N/A		$11,500,000
Closed Cycle Aux Cooler	N/A		$450,000
Total Cooling System Cost	$29,495,000	$29,495,000	$121,350,000
Water Treatment Costs	$42,710,000	$61,050,000	$4,600,000
Total System Cost	$72,205,000	$90,545,000	$125,950,000
	Base	$18,340,000	$53,745,000
Annual Operating Costs			
Water Treatment	$1,215,000	$2,235,000	$101,000
Cooling System Power	$1,364,400	$1,364,400	$2,075,400
Total Operating Cost[2]	$2,579,400	$3,599,400	$2,176,400
	Base	$1,020,000	-$403,000
Capitalized Equipment Costs[3]	$6,820,000	$8,550,000	$11,890,000
	Base	$1,730,000	$5,070,000
Annual Operating & Capital Costs	$9,399,400	$12,149,400	$14,066,400
	Base	$2,750,000	$4,667,000

Notes.....

1. Costs extracted from Worley Parsons report, "FPLE - Beacon Solar Energy Project Dry Cooling Evaluation" dated February 1, 2008.
2. Water treatment costs plus cost for cooling system power. All other power costs were assumed to be equivalent.
3. Capitalized at 7% per year for 20 years.

EFFICIENCY LOSS CALCULATIONS

The Worley Parsons study determined that the net output for the 40 °F ITD ACC would be 7.50% less than that of the base case. The base case would include the BSEP proposed cooling configuration or Alternative 3 (offsite wells with makeup and recovery RO). At high ambient dry bulb temperatures (summer conditions), the ACC cannot cool as efficiently as wet cooling resulting in higher condenser backpressure and reduced turbine output. Refer to the following table for a comparison of annual net output for these alternatives. The difference in generating output is an indirect measure of ACC cooling efficiency relative to wet cooling.

Net Output Comparisons			
	BSEP Wet Cooling	Alternative 3 Offsite Wells MU/Recov RO	ACC 40° F ITD
Estimated Annual Output, MW-hr	602,527	602,527	557,365
Est Annual Output Difference, MW-hr	Base	Base	45,162
Pct Difference to Base	Base	Base	-7.50%

APPENDIX B
Review and Analysis of Alternative Cooling Systems

Testimony of John S. Maulbetsch

BACKGROUND AND OBJECTIVES

The Beacon Solar Power plant is a 250 MWe (net) parabolic trough solar plant to be located in Kern County, California, 4 miles north-northwest of California City, The developers have investigated the use of 7 alternative cooling system designs for meeting the main steam condenser and other auxiliary plant cooling loads. The alternatives include:

- Closed-cycle wet cooling with a surface steam condenser and a mechanical-draft wet cooling tower
- Three sizes of dry cooling each using a forced-draft air-cooled condenser
- Three hybrid (wet/dry) systems each with a different mix of wet and dry cooling using a surface condenser/wet cooling tower for the wet portion and an air-cooled condenser for the dry portion.

The basis for the sizing of the systems and a discussion of the comparative costs, performance and water consumption was reported in the “Dry Cooling Evaluation” report. [1]

This current study was undertaken with the general intent of providing an independent review of the approach, methodology and results of the cooling systems report [1] with the specific objectives of:

1. determining which of the three dry cooling systems appears to be economically preferred alternative among dry cooling systems
2. estimating the differential cost and annual performance of the dry and wet systems
3. estimating the size, configuration and water consumption of a hybrid system capable of providing the most comparable performance to the all wet system

The remainder of the report is organized as follows:

- Review of original cooling system design and selection
- Review effect of cooling system capability on plant performance
- Comparison of dry and wet systems
- Comparison of three alternative dry systems
- Estimating the size, cost and water consumption of the desired hybrid system

COOLING SYSTEM DESIGN AND SELECTION

All cooling systems were designed in conjunction with an appropriate turbine selection to deliver 280 MWe (gross) and 250 MWe (net) at design conditions.

WET COOLING

The wet cooling system is a closed-cycle system with a surface steam condenser of the shell-and-tube type and a mechanical-draft, counterflow wet cooling tower.

Ambient Conditions

Site elevation: 2,314 feet (above sea level)
Design wet bulb temperature: 68 °F (1% wet bulb)
Mean coincident dry bulb temperature: 95 °F

Cooling tower specifications:

Circulating water flow: 149,000 gpm (7.45×10^7 lb/hr)
Circulating water temperature drop: 20 °F
Approach temperature:[3] 9 °F
Heat load (calculated): 1.49×10^9 Btu/hr

Condenser specifications:

Circulating water flow: 149,000 gpm (lb/hr)
Range:[4] 20 °F
Terminal temperature difference (TTD):[5] 5 °F

Design operating point:

Condensing temperature: 102 °F (T_{cond} = wet bulb + approach + range + TTD)
Condensing pressure: 2.1 in Hga

DRY COOLING

The dry cooling system is a direct dry cooling system with the turbine exhaust steam condensed in the tubes of a forced-draft air-cooled condenser. The tubes are arranged in an A-frame configuration with the inlet steam duct at the top and a condensate collection pipe at the bottom. The outsides (air-sides) of the tubes are finned for enhanced air-side heat transfer.

[3] Approach = Wet bulb temperature – cold water temperature

[4] Range = Circulating water temperature rise in condenser = temperature drop in tower

[5] Terminal temperature difference (TTD) = Condensing temperature – hot water temperature

Ambient Conditions:

Site elevation: 2,314 feet (above sea level)
Design dry bulb temperature: 103.5 °F (0.4% dry bulb)
Mean coincident wet bulb temperature: 66 °F

Three different air-cooled condensers were considered with specified ITD's (Initial Temperature Difference's) of 35, 40 and 45 °F. For a given heat duty, a lower ITD represents a larger and more costly air-cooled condenser that a higher ITD. As noted in the WorleyParsons report (1) a 40 °F is a common selection for ACC's, often (but not always) representing a preferred trade-off between cost and performance. Specifications for the three ACC's are given below in Table 1.

Table 1: Dry Cooled System Specifications

Design Parameters	ACC Alternative Designs		
	A	B	C
Initial temperature difference (ITD)[6], °F	**35**	**40**	**45**
Condensing temperature, °F	**138.5**	**143.5**	**148.5**
Turbine exhaust pressure, in Hga	**5.67**	**6.44**	**7.30**
Steam flow, lb/hr	**1,848,207**	**1,884,259**	**1,919,791**
Steam enthalpy, Btu/lb	**1,045.8**	**1,054.6**	**1,063.6**
Heat load (calc.), Btu/hr	**1.74×10^9**	**1.78×10^9**	**1.82×10^9**

OPERATING PROFILE

An annual operating profile of site conditions (solar insolation, solar field output, thermal input to the power block, and net electrical power generated) is provided in Reference 1 for both a wet cooled and a dry cooled plant design. The dry cooled design uses the intermediate sized ACC (Case B; ITD = 40 °F). While the solar field profile does not represent the real annual variability in solar field output, this "synthetic" profile where all the several solar field efficiencies are held constant, was used in Reference 1 to simplify the analysis. It is considered appropriate since the cooling systems are compared at identical power block input conditions throughout the year and differences in net plant output are attributable solely to differences in cooling system capabilities and their variation with ambient conditions. These profiles will be used as the basis for comparisons in this study for the same reasons and to provide a consistent comparison to the results discussed in Reference 1.

Table 2 lists the site ambient conditions, the solar field output and the power block input for all operating hours of the year.

[6] Initial temperature difference (ITD) = Condensing temperature – ACC air inlet temperature

Table 2: Site Ambient Conditions and Solar Field Operating Profile

Day/Hour				Field Insolation	Field Output	Collector Output	Dry Bulb Temperature	Wet Bulb Temperature
No.	Month	Hour	Hrs/yr	W/m2	MWth	MWt	F	F
1	Jan	7	31	3.48	5.03	2.66	38.13	32.45
2	Jan	8	31	264	381.83	202.06	41.98	34.97
3	Jan	9	31	518.42	749.81	396.78	45.88	37.35
4	Jan	10	31	655.23	947.69	501.49	49.73	39.48
5	Jan	11	31	692.29	1001.29	529.86	52.81	41.16
6	Jan	12	31	722.55	1045.05	553.02	55.86	42.73
7	Jan	13	31	724.1	1047.30	554.20	58.94	44.15
8	Jan	14	31	716.58	1036.42	548.45	59.37	44.46
9	Jan	15	31	652.65	943.96	499.52	59.79	44.75
10	Jan	16	31	523.32	756.90	400.53	60.23	45.06
11	Jan	17	31	240.35	347.63	183.96	56.67	43.26
12	Jan	18	31	2.94	4.25	2.25	53.11	41.28
13	Feb	7	28	71.04	102.75	54.37	42.14	37.09
14	Feb	8	28	387.36	560.26	296.47	47.27	40.36
15	Feb	9	28	545.36	788.78	417.40	52.42	43.31
16	Feb	10	28	628.79	909.45	481.26	57.54	45.83
17	Feb	11	28	664.61	961.25	508.67	60.43	46.97
18	Feb	12	28	683.75	988.94	523.32	63.32	47.91
19	Feb	13	28	667.86	965.95	511.16	66.21	48.68
20	Feb	14	28	677.11	979.33	518.24	66.98	48.91
21	Feb	15	28	645.64	933.82	494.15	67.72	49.08
22	Feb	16	28	581.07	840.43	444.73	68.5	49.29
23	Feb	17	28	426.14	616.34	326.16	64.34	47.62
24	Feb	18	28	83.86	121.29	64.18	60.16	45.68
25	Mar	6	31	11.84	17.12	9.06	49.02	40.09
26	Mar	7	31	272.52	394.16	208.58	48.83	39.96
27	Mar	8	31	557.16	805.84	426.43	53.01	42.31
28	Mar	9	31	691.71	1000.45	529.41	57.24	44.46
29	Mar	10	31	737	1065.95	564.08	61.42	46.3
30	Mar	11	31	780.35	1128.65	597.26	63.94	47.26
31	Mar	12	31	768.19	1111.07	587.95	66.46	48.06
32	Mar	13	31	769.16	1112.47	588.69	68.98	48.78
33	Mar	14	31	744.13	1076.27	569.54	69.32	48.87
34	Mar	15	31	701.32	1014.35	536.77	69.59	48.97
35	Mar	16	31	624.19	902.79	477.74	69.93	49.05
36	Mar	17	31	510.52	738.39	390.74	67.07	48.12
37	Mar	18	31	204.84	296.27	156.78	64.22	47.1
38	Mar	19	31	0.71	1.03	0.54	61.32	45.87
39	Apr	6	30	155.03	224.23	118.66	54.93	45.08
40	Apr	7	30	510.9	738.94	391.03	55.38	45.43
41	Apr	8	30	681.33	985.44	521.47	59.68	47.36
42	Apr	9	30	797.87	1153.99	610.67	63.93	48.95
43	Apr	10	30	846.7	1224.62	648.04	68.23	50.15
44	Apr	11	30	871.17	1260.01	666.77	70.83	50.97
45	Apr	12	30	890.3	1287.68	681.41	73.38	51.64
46	Apr	13	30	846.13	1223.79	647.60	75.99	52.18
47	Apr	14	30	833.77	1205.92	638.14	76.39	52.32
48	Apr	15	30	814.17	1177.57	623.14	76.77	52.47
49	Apr	16	30	721.77	1043.93	552.42	77.18	52.62
50	Apr	17	30	653.43	945.08	500.12	74.4	51.91
51	Apr	18	30	429.07	620.58	328.40	71.62	50.99
52	Apr	19	30	37.07	53.62	28.37	68.79	49.99
53	May	5	31	15.16	21.93	11.60	58.85	48.9
54	May	6	31	296.74	429.19	227.12	60.86	50.2
55	May	7	31	549.94	795.40	420.91	64.84	52.18
56	May	8	31	676	977.73	517.39	69.88	54.21
57	May	9	31	735.74	1064.13	563.11	74.03	56.07
58	May	10	31	769.97	1113.64	589.31	77.71	57.01
59	May	11	31	805.97	1165.71	616.87	81.27	57.99
60	May	12	31	829.45	1199.67	634.84	83.64	58.19
61	May	13	31	822.61	1189.78	629.60	85.3	58.61
62	May	14	31	801.68	1159.50	613.58	86.52	58.38
63	May	15	31	756.32	1093.90	578.87	87.06	57.65
64	May	16	31	716.55	1036.38	548.43	86.42	57.61
65	May	17	31	642.87	929.81	492.03	84.19	56.68
66	May	18	31	457.06	661.07	349.82	81.41	55.95
67	May	19	31	108.35	156.71	82.93	77.35	54.62

Day/Hour				Field Insolation	Field Output	Collector Output	Dry Bulb Temperature	Wet Bulb Temperature
No.	Month	Hour	Hrs/yr	W/m2	MWth	MWt	F	F
68	June	5	30	40.57	58.68	31.05	72.1	55.33
69	June	6	30	408.7	591.12	312.81	73.21	55.94
70	June	7	30	642.3	928.99	491.60	74.29	56.58
71	June	8	30	749.87	1084.57	573.93	78.46	58.09
72	June	9	30	812.17	1174.68	621.61	82.66	59.38
73	June	10	30	837.43	1211.21	640.94	86.83	60.26
74	June	11	30	853.83	1234.93	653.50	89.31	60.95
75	June	12	30	859.43	1243.03	657.78	91.72	61.54
76	June	13	30	826.47	1195.36	632.56	94.2	62.02
77	June	14	30	842.2	1218.11	644.60	94.9	62.33
78	June	15	30	776.63	1123.27	594.41	95.58	62.63
79	June	16	30	747.53	1081.18	572.14	96.28	62.93
80	June	17	30	670.3	969.48	513.03	93.58	62.15
81	June	18	30	528.07	763.77	404.17	90.89	61.27
82	June	19	30	216.97	313.81	166.06	88.15	60.28
83	July	5	31	13.06	18.89	10.00	77.33	59.36
84	July	6	31	297.23	429.90	227.49	78.4	60.13
85	July	7	31	543.13	785.55	415.70	79.44	60.83
86	July	8	31	667.13	964.90	510.60	83.56	62.4
87	July	9	31	731.77	1058.39	560.08	87.64	63.67
88	July	10	31	782.48	1131.73	598.89	91.75	64.68
89	July	11	31	798.35	1154.69	611.03	94.61	65.65
90	July	12	31	806.58	1166.59	617.33	97.39	66.42
91	July	13	31	821.32	1187.91	628.61	100.24	67.17
92	July	14	31	801.81	1159.69	613.68	101.14	67.42
93	July	15	31	798.94	1155.54	611.49	102.07	67.64
94	July	16	31	749.29	1083.73	573.48	102.97	67.87
95	July	17	31	658.84	952.91	504.26	100.45	66.9
96	July	18	31	519.06	750.74	397.27	97.98	65.93
97	July	19	31	197.13	285.12	150.88	95.41	64.84
98	Aug	6	31	179.39	259.46	137.30	75.58	60
99	Aug	7	31	504.65	729.90	386.24	75.8	60.21
100	Aug	8	31	669.32	968.07	512.28	80.15	62.15
101	Aug	9	31	745.94	1078.88	570.92	84.53	63.82
102	Aug	10	31	809.35	1170.60	619.45	88.88	65.21
103	Aug	11	31	806.87	1167.01	617.55	91.49	65.82
104	Aug	12	31	828.9	1198.87	634.42	94.06	66.19
105	Aug	13	31	799.23	1155.96	611.71	96.67	66.51
106	Aug	14	31	784.87	1135.19	600.72	97.25	66.42
107	Aug	15	31	743.32	1075.09	568.92	97.85	66.45
108	Aug	16	31	663.42	959.53	507.76	98.43	66.33
109	Aug	17	31	569.52	823.72	435.89	96.23	65.49
110	Aug	18	31	403.45	583.53	308.79	93.98	64.56
111	Aug	19	31	73.61	106.47	56.34	91.74	63.62
112	Sep	6	30	81.27	117.54	62.20	65.82	54.5
113	Sep	7	30	487	704.37	372.74	69.02	56
114	Sep	8	30	683.77	988.97	523.34	74.17	57.97
115	Sep	9	30	785.43	1136.00	601.15	78.97	59.42
116	Sep	10	30	848.47	1227.18	649.39	83.09	60.99
117	Sep	11	30	850	1229.39	650.57	86.85	61.83
118	Sep	12	30	851.53	1231.60	651.74	89.76	62.49
119	Sep	13	30	819.9	1185.86	627.53	91.69	63.18
120	Sep	14	30	776.93	1123.71	594.64	92.81	63.73
121	Sep	15	30	734.17	1061.86	561.91	93	63.93
122	Sep	16	30	603.9	873.45	462.21	92.23	63.13
123	Sep	17	30	517.67	748.73	396.21	90.16	62.66
124	Sep	18	30	237.8	343.94	182.01	87.07	61.72
125	Sep	19	30	2.33	3.37	1.78	83.99	60.67
126	Oct	6	31	9.29	13.44	7.11	58.37	46.48
127	Oct	7	31	324.84	469.83	248.62	58.13	46.41
128	Oct	8	31	580.65	839.82	444.41	62.81	48.92
129	Oct	9	31	703.65	1017.72	538.55	67.49	51.13
130	Oct	10	31	763.13	1103.75	584.08	72.17	53.06
131	Oct	11	31	806.71	1166.78	617.43	74.99	54.07
132	Oct	12	31	776.52	1123.11	594.33	77.77	54.94
133	Oct	13	31	752.9	1088.95	576.25	80.58	55.67
134	Oct	14	31	756.71	1094.46	579.16	80.99	55.74
135	Oct	15	31	699.06	1011.08	535.04	81.4	55.74
136	Oct	16	31	596.45	862.67	456.51	81.81	55.81
137	Oct	17	31	343.26	496.47	262.72	78.12	54.43

Day/Hour				Field Insolation	Field Output	Collector Output	Dry Bulb Temperature	Wet Bulb Temperature
No.	Month	Hour	Hrs/yr	W/m2	MWth	MWt	F	F
139	Nov	7	30	118.5	171.39	90.70	45.77	38.29
140	Nov	8	30	496	717.39	379.62	50.17	41.02
141	Nov	9	30	672.53	972.71	514.73	54.56	43.5
142	Nov	10	30	739.03	1068.89	565.63	58.96	45.74
143	Nov	11	30	779.3	1127.13	596.45	62.18	47.2
144	Nov	12	30	775	1120.92	593.16	65.47	48.52
145	Nov	13	30	731.53	1058.04	559.89	68.69	49.63
146	Nov	14	30	668	966.16	511.27	69.03	49.8
147	Nov	15	30	567.33	820.55	434.22	69.36	50
148	Nov	16	30	461.37	667.30	353.12	69.7	50.17
149	Nov	17	30	107.33	155.24	82.15	65.73	48.25
150	Dec	7	31	24.26	35.09	18.57	41.12	34.84
151	Dec	8	31	347.81	503.05	266.20	44.05	36.78
152	Dec	9	31	550.81	796.66	421.57	46.99	38.59
153	Dec	10	31	650	940.12	497.49	49.92	40.33
154	Dec	11	31	690	997.98	528.11	52.8	41.82
155	Dec	12	31	682.52	987.16	522.38	55.74	43.22
156	Dec	13	31	681.48	985.65	521.58	58.62	44.43
157	Dec	14	31	661.06	956.12	505.96	58.84	44.5
158	Dec	15	31	568.1	821.67	434.81	59	44.52
159	Dec	16	31	409.23	591.89	313.21	59.23	44.59
160	Dec	17	31	109.32	158.11	83.67	56.5	43.22

ANALYSIS OF WET SYSTEM PERFORMANCE

To infer the effect of cooling system performance on plant efficiency and output it is necessary to understand the effect of steam flow and turbine exhaust pressure on turbine performance. The steam flow is determined primarily by the thermal energy delivered to the power block. The turbine exhaust pressure is determined by the steam flow, steam inlet conditions and the ambient conditions as they affect the cooling system performance.

These relationships are estimated from the information provided in Appendices H (for the wet-cooled plant) and G (for the dry cooled plant) in Reference 1.

TURBINE CHARACTERISTICS---WET COOLING DESIGN

Appendix H tabulates the net turbine output for each month and hour of day during that month. The net turbine output is the output available for export from the plant and is equal; to the gross turbine output minus the auxiliary load which is consumed in the plant. The plant auxiliary load is approximated based on the following assumptions: (2)

Auxiliary load at design plant output: 30 MWe
Auxiliary load at 25% design output: 15 MWe

The variation in auxiliary power is estimated with a linear relationship established by these two points.

Auxiliary power (MW) = 10. + 0.2 x % Design Load

Gross output, which is required to generate the basic turbine performance curves, is calculated as the net output plus the auxiliary load.

The wet cooling system rejects 1.49 x 10^9 Btu/hr (436.6 MW_{th}) at design conditions at a net electrical output of 250 MW (280 MW gross output) implying a power input to the power block at design conditions of 2.45 x 10^9 Btu/hr (716.6MW_{th}). Therefore, at the design turbine exhaust pressure of 2.1 in Hga, the steam cycle efficiency (gross) is 39.1%. (= 280 MWe/716.6 MWth). The corresponding net cycle efficiency is 34.9% which agrees well with the tabulated value of 34.7% in Table 5 of the WorleyParsons report. (1)

It will be assumed that the steam flow to the HP turbine inlet is proportional to the thermal input to the power block. Therefore, for each of the 160 operating conditions listed in Table 2, the steam flow as a percentage of the design steam flow can be determined.

The heat rejected at each condition is determined by the difference between the thermal input to the power block and the gross electrical generation. The circulating water flow is held constant. Therefore, to a reasonable approximation, the operating range and TTD are scaled from the design values to the operating point values proportionally to the heat rejected by the cooling system. Finally, using the CTI Toolkit [Ref. 3] published by the Cooling Technology Institute (CTI), the off-design condensing temperatures and pressures are calculable for each operating point.

Figure 1 (attached) displays the calculated efficiency for all the operating points vs. steam flow expressed as a percentage of the design steam flow. The slight variation in efficiency at a given steam flow is a result of the variation in turbine exhaust pressure resulting from the variation in ambient wet bulb temperature and its effect on the performance of the cooling tower. Figure 2 (attached) displays the effect of turbine exhaust pressure at constant steam flow. Each curve represents a narrow range of steam flow and illustrates the fall-off in efficiency with increasing turbine exhaust pressure. The family of curves indicates the fall-off in efficiency at constant exhaust pressure as the steam flow is reduced. The slight mismatch in the shape of the curves and their relative positions are due to slight imprecision in the tabulated data and the resulting effect on the curve fits.

TURBINE CHARACTERISTICS---DRY COOLING DESIGN

A similar analysis can be applied to the plant and turbine performance for a dry cooled design equipped with an ACC sized for a 40 °F ITD. However, this condition requires some additional explanation.

The ACC, when sized for the selected turbine and the required plant output, has the design specifications given in Table 1 under Case B and a heat duty of 1.74 x 10^9 Btu/hr or 520.6 MW_{th}. This combined with a turbine/generator output of 280 MW (gross) requires a thermal input to the power block of 800.6 MW_{th} and would yield a gross efficiency of 35.% and a corresponding net efficiency of 31.2%. This agrees well with the net efficiency of 31.1% tabulated in Table 5 of the WorleyParsons report. (1)

However, the "Summary" page at the beginning of Appendix H where the comparative performance of the dry cooled plant is presented lists a gross output of 251.7 MW_e, a net output of 223.4 MW_e and a corresponding net efficiency of 31.3% (35.3% gross efficiency). This implies a thermal input to the power block of 713.7 MW_{th} corresponding to within 0.4% of that calculated for the system with a wet cooling system. Therefore, the comparative performance tabulated in Appendix H is based on a thermal input from the base solar field originally sized for the plant equipped with a wet cooling system.

This apparent internal inconsistency is acknowledged in the text of p. 8 (1) where the comparative cooling system performance analyses are discussed. The report notes that

> ***"the FPLE[7] requirement that the facility should have 250 net MW regardless of the heat rejection system".***

and that, therefore,

> ***"it has been assumed (emphasis added) that there is sufficient solar thermal energy available from the field to generate the necessary steam flow for the alternate cooling system to meet 250 net MW".***

and further,

> ***"Because of the requirement to meet 250 net MW at the design point, the performance table below shows equal plant output for all the cooling options at this operating condition. The performance item that then distinguishes the cooling options is the steam cycle efficiency so that a lower efficiency translates to increased solar thermal energy needed for the steam cycle".***

Therefore, to meet the performance objectives as tabulated in Table 5 (1), an expanded solar field capable of delivering 800.6 MWth (or approximately 12% more input power than the 714 MWth available from the base field) is required.

The initial comparison of plant performance with dry cooling to plant performance with wet cooling will be made assuming the base field input of 714 MWth in order to be consistent with and comparable to the results tabulated in Appendix H or the WorleyParsons report with the following system design point.

Design gross output:	251.7 MW_e
Design net output:	223.4 MW_e
Design thermal input:	713.7 MW_{th}
Design efficiency (gross):	35.3%
Design efficiency (net):	31.3%

An important difference between the operation of dry cooled plants and wet cooled plants occurs at low turbine exhaust pressures. Wet cooled plants can operate at low turbine exhaust pressures as low as 0.5 to 1. in Hga. Dry cooled plants are normally

[7] FPL Energy

controlled to maintain the turbine exhaust pressure above 2. in Hga. This is a result of the fact that large ACC's are subject to some amount of air in-leakage which must be removed with air removal equipment such as air ejectors. At backpressures below 2 in Hga the air in-leakage becomes large and difficult to handle. Therefore, at conditions where the turbine exhaust pressure would fall below 2. in Hga (low steam flow and/or low ambient temperatures) some of the ACC fans are operated at half speed or shut down entirely to maintain the backpressure at 2. in Hga.

The ability to operate at low turbine exhaust pressures gives the wet cooled plants and additional efficiency advantage as shown in Figure 2. Also, as seen in that figure, the curves bend over and approach a maximum efficiency for any given steam flow as the backpressure drops below 1 in Hga.

The efficiency curves for the dry cooled turbine are shown in two parts. For turbine backpressures above 2 in Hga, Figure 3 (attached) shows cycle efficiency vs. turbine exhaust pressure for several narrow ranges of steam flow. Figure 4 (attached) shows the cycle efficiency vs. % of design steam flow for turbine exhaust pressure controlled to 2 in Hga.

COMPARISON OF WET AND DRY COOLED PLANTS

Figure 5 (attached) displays the comparative cycle efficiency between the wet cooled plant and the dry cooled plant. Three points are noteworthy. First, the turbine used with wet cooling is consistently more efficient over the entire range of operating conditions than the turbine used with dry cooling. Second, the variation (spread in the plotted points) at the higher flow rates is substantially greater for the dry cooled turbine than for the wet cooled turbine. This results from the greater variation in backpressure with ambient conditions for a dry cooled plant than for a wet cooled plant. This occurs because the seasonal and diurnal variation in dry bulb temperature is greater than the concurrent variation in wet bulb temperature with a correspondingly greater variation in turbine exhaust pressure. Finally, the increasing difference in cycle efficiencies at the lower flow rates is related to the reduction in condenser range and TTD at the lower heat duties which benefits the wet system and the decrease in Q/ITD at the lower back pressures which hurts the dry system.

Figure 6 (attached) displays the comparative net output for the two plants. The abscissa on this plot is divided into months. Within each month, the individual points are the output for a particular hour of an <u>average day</u> for that month. The points are for only those hours of the day during which the output of the solar field is sufficient to operate the plants…typically from early morning to late afternoon.

On the basis of this comparison which assumes the use of an ACC with a 40°F ITD and a constant solar field size and a synthetic solar field output model, the wet cooled plant delivers just over 8% more net electrical output than does the dry cooled plant. The annual net output totals (725,745 MWh for the wet cooled plant; 671,226 MWh for the dry cooled plant) are not representative of realistic operation because of the "synthetic" solar field output, but the ratios are indicative of the effect of the relative performance of the alternative cooling systems.

ADDITIONAL COMPARISONS

Two further comparisons are relevant. These are:

1. the effect of different size ACC's on plant performance.
2. the effect of expanding the solar field to meet the required net output of 250 MW_e at design conditions on the annual output.

EFFECT OF DIFFERENT SIZE ACC'S:

The choice of a larger (lower ITD) or smaller (higher ITD) ACC will affect the plant performance both at the design point and throughout the year by changing the turbine exhaust pressure achieved for any given combination of steam flow and ambient temperature.

The performance differences relative to the dry cooled plant with a 40°F ACC are estimated for both a larger (35°F ITD) and a smaller (45°F ITD) ACC. An important assumption made in this comparison is that the same turbine characteristics are used in all three cases. While this need not be the case in practice, it is consistent with other published studies on this subject and is also all that can be done in this study with the information available. It is not believed that it would have a significant effect on the comparisons.

The determination of efficiency for the 40°F ITD unit was straightforward since both the thermal input to the power block and the net power output were known from Appendix G (1). For the other two ACC's, the calculation is an iterative one since the thermal input is known but the power output and the heat duty on the ACC are not. The calculation begins with the assumption that the cycle efficiency and hence the heat duty on the ACC are the same as for the 40°F ITD case. For that assumed heat duty and the known ACC capability (Q/ITD) of the selected ACC, the ITD, condensing temperature, and condensing pressure can be calculated for each point. Assuming, as noted above, that the turbine characteristics are the same as for the 40°F ITD case, a cycle efficiency, net power output and ACC heat duty can be determined, all of which will differ from the 40°F ITD case. The calculations are then repeated using the new value for the ACC heat duty, and the process is repeated until the results converge. The final results of cycle efficiency and net output for each of the ACC's are shown for each operating hour of the year in Figure 7 (Cycle efficiency) and Figure 8 (Net output).

Figure 7 (attached) shows the cycle efficiencies for the three cases. Figure 8 (attached) displays the comparable net output profiles.

As can be seen the differences are quite small. The ordinate scale in Figure 8 (attached) is expanded compared to the similar plot in Figure 6 (attached) in order to make the differences even slightly visible. The more relevant comparison is among the total annual net outputs which are tabulated in Table 3.

Table 3: Comparative Annual Output with Different ACC's

Cooling System	Wet Cooled	Dry Cooled		
ITD		35	40	45
Annual Output, MWh	725,000	667,000	665,000	664,000
% of Wet Cooled Plant	Base	92.	91.7	91.6
Reduced Output	Base	58,000	60,000	61,000

EFFECT OF EXPANDED SOLAR FIELD

A suggested approach to compensating for the reduced cycle efficiency and plant output with dry cooling is to expand the solar field and some of the plant components to provide increased thermal input to the power block and increased steam flow to the turbine. The following considerations are relevant to making an appropriate comparison.

As noted previously, the existing (base) solar field in combination with a 40°F ITD ACC produces a gross plant output of 251.7 MW_e, a net plant output of 223.4 MW_e at the design ambient temperature of 103.5°F. This corresponds to a gross cycle efficiency of 35.3% and a net plant efficiency of 31.3% implying a thermal input to the power block of 714. MW_{th}. This further implies a heat duty to the ACC of 462 MW_{th} (1.58 x 10^9 Btu/hr) which is less than the 1.78 x 10^9 Btu per hour heat duty for which the 40°F ITD ACC was designed. Therefore the backpressure is well below the design value even at the design ambient temperature.

In comparison to the same solar field input to a thermal block equipped with the wet cooling system, the net output at design is reduced by 10.6% and the annual net output by 7.5%. However, these analyses are based on the performance of an ACC sized by the supplier for the full design heat duty of 1.78 x 10^9 Btu/hr (See Table 1) or 520.6 MW_{th} at a turbine backpressure of 6.44 in Hga at an ambient temperature of 103.5°F. A heat balance on the power block for this operating point requires a thermal input from the solar field of 800.6 MW_{th} or a 12% increase over the base solar field input of 715. MW_{th}.

Figure 9 (attached) shows the hourly plant net output with a solar field expanded by 12% compared to the base case determined previously and plotted in Figure 6. It should be noted that for several conditions, the net output exceeds the net design output. This results from the fact that the annual profile used in Appendix G (1) and in this study, includes periods of high insolation coincident with ambient temperatures well below the design level of 103.5°F. The increased capacity is then available to provide added plant output throughout the year.

Figure 10 (attached) shows the net output of the expanded solar field with the dry-cooled plant compared to the base solar field with the wet-cooled plant originally plotted in Figure 6. It is seen that the dry cooled plant output exceeds the wet cooled plant output in this comparison for nearly the entire year. They would be equal at the design point, but the design condition is never reached in this annual profile.

The assumed field expansion used in the WorleyParsons (1) report was a solar field cost increase of 13% which agrees well with the calculated 12% increase in thermal input necessary to meet the design requirements. (Table 3 of Reference 1).

Table 4 summarizes the annual net energy production in MWh for the several cases discussed.

Table 4: Comparison of Net Annual Outputs from Alternate Systems

System	Annual Net Output	Difference from Base, wet	% Difference
	MWH	MWh	%
Base field, wet cooled	725,436	0	0.0%
Base field, dry cooled	665,460	-59,976	-8.3%
12% expanded, dry cooling	755,512	30,076	4.1%

HYBRID COOLING

An alternative to either an all-wet or an all-dry cooling system is the hybrid system consisting of an air-cooled condenser operating in parallel with a conventional surface steam condenser paired with a wet cooling tower. The plant would operate using the dry portion alone for periods of low solar insolation or low ambient temperatures during which a sufficiently low turbine exhaust pressure can be maintained. At higher insolation levels or higher ambient temperatures, if the turbine exhaust pressure rises above desired levels, the wet system fans and circulating water pumps are turned on and a portion of the steam flow and heat duty diverts to the surface condenser. The system will equilibrate at a lower turbine exhaust pressure with the steam flow divided between the wet and dry portions of the cooling system in the proportion where both reach the same condensing pressure.

The design approach taken in the WorleyParsons report (1) was the following:

1. Three ACC's of different sizes were selected to carry the cooling loads consistent with plant net electrical outputs of 250, 200 and 150 MWe respectively while maintaining a turbine exhaust pressure of 2.97 in Hga at an ambient temperature of 71°F.

2. For each ACC, a wet cooling system was sized to have the cooling capability which, in conjunction with the corresponding ACC, would meet the plant cooling requirements consistent with a net electrical output of 250 MWe maintaining a turbine exhaust pressure of 5.1 in Hga at the design ambient conditions of an ambient temperature of 103.5°F and an ambient wet bulb temperature of 68°F.

The basis for the choice of the design criteria of backpressure and ambient conditions was not discussed in the report (1). However, based on the stated criteria, the operating points for the wet and dry portions and for the integrated hybrid cooling system are listed in Tables 5, 6 and 7.

Table 5: ACC Design Specifications

Quantity	Case		
	"250 MW"	"200 MW"	"150 MW"
Tamb, F	71	71	71
Steam flow, lb/hr	1,672,843	1,272,761	1,084,459
Steam enthalpy, Btu/lb	1,010	1,010	1,010
Condensate enthalpy, Btu/lb	83	83	83
Exhaust pressure, in Hga	2.97	2.97	2.97
Tcond, F	114.70	114.70	114.70
ITD, F	43.70	43.70	43.70
Heat duty, Btu/hr	1.551E+09	1.180E+09	1.006E+09
Q/ITD	3.55E+07	2.70E+07	2.30E+07

Table 6: Wet System Design Specifications

Quantity	Case		
	1	2	3
WBT, F	68	68	68
Water flow, gpm	41,768	63,811	74,039
HWT, F	110	110	110
CWT, F	85	85	85
TTD, F	24.5	24.5	24.5
Approach, F	17	17	17
Tcond, F	134.5	134.5	134.5
Exhaust pressure, in Hga	5.10	5.10	5.10
Heat duty, Btu/hr	5.221E+08	7.976E+08	9.255E+08

Table 7: Hybrid Cooling System Design Specifications

Quantity	Case		
	1	2	3
Dry heat duty, Btu/hr	1.134E+09	8.583E+08	7.304E+08
Wet heat duty, Btu/hr	5.221E+08	7.976E+08	9.255E+08
Total, Btu/hr	1.656E+09	1.656E+09	1.656E+09
Qrej, MWth	485.2	485.2	485.2
Gross output, Mwe	280.0	280.0	280.0
Power block input, MWth	765.2	765.2	765.2
Implied efficiency	36.59%	36.59%	36.59%
Net output, Mwe	250	250	250
Net efficiency	32.67%	32.67%	32.67%

The values for the hybrid system at design conditions can be used, as previously in the case of the all-dry system, to evaluate plant cycle efficiency. The total heat rejected is 1.656×10^9 Btu/hr (~MWh) for a gross electrical output of 280 MWe. This requires a thermal input to the power block of 765.2 MWth and implies a gross efficiency or 36.6% and a net efficiency of 32.7%. Two points are noteworthy:

1. The net efficiency compares well with that tabulated in Table 5 of the Worley Parsons report (1)

2. The thermal input for the solar field of 765.2 MWth (for Case 1) is approximately 7.2% greater than that from the base solar field at design conditions of 714. MWth. This corresponds well to the 7.6% increase in solar field cost indicated in Table 3 of the Worley Parsons report (1).

   The steam flow at design conditions for 280 MWe gross output is 1.78×10^6 lb/hr. The steam turbine to be used in conjunction with a hybrid cooling system will be similar in design and performance characteristics to the turbine used with dry cooling, since it must operate at elevated turbine exhaust pressures above 5. in Hga. Therefore, the turbine curves will be assumed to be the same as those of the turbine used in the dry cooling analysis. The cycle efficiency as a function of steam flow (expressed as a percentage of the design steam flow) and exhaust pressure will be the same as shown in Figures 3 and 4.

   The determination of the operating point and net power output for each of the 160 conditions used in Appendices G and H proceeds as follows:

   First, the turbine exhaust pressure achievable with the ACC alone is calculated using the same approach used in the previous section but using the ACC sized for the “250 MW” hybrid system. Since the operation of an ACC is controlled to maintain the condensing pressure at or above 2. in Hga, all conditions for which the ACC alone achieves a condensing pressure of 2. in Hga or lower, are “all dry” operating points with a condensing pressure of 2. in Hga. The cycle efficiency for these conditions is determined with the correlation shown in Figure 4 with the “% flow” calculated as the ratio of the actual thermal input to the design thermal input of 765.2 MWth. Of the 160 operating conditions, 67 result in all dry operation and are distributed throughout the year at times of low insolation and low ambient temperature. The points are plotted in Figure 11 (attached) as the thermal input to the power block vs. the ambient temperature for all points where the dry section alone achieves a condensing pressure of 2. in Hga or lower.. A rough boundary shows the combination of thermal input and ambient temperature below which no wet cooling is required to maintain 2 in Hga.

For the remaining points, some degree of wet cooling can be used to reduce the turbine exhaust pressure and increase the cycle efficiency. The split of the heat load between the dry and wet parts of the hybrid cooling system and the resulting turbine exhaust pressure, cycle efficiency and net plant output is determined through an iterative calculation as follows:

1. For a given condition, specified by the thermal input to the power block, the ambient temperature and the ambient wet bulb temperature and an <u>assumed</u> cycle efficiency,

the total heat load to the cooling system is determined. (The design value of the cycle efficiency is used as a starting point)

2. A split in the heat duty between the wet and dry sections is assumed. (The design value of the split is used as a starting point.)

3. A condensing pressure is then calculated for both the wet and dry sections individually.

   a. For the dry section…the ITD is determined assuming that Q/ITD is constant at the design value (See Table 5) for condensing pressures above 3.5 in Hga. For condensing pressures between 3.5 in Hga and 2. in Hga, a correction is applied to the Q/ITD. The ITD is calculated for the assumed heat duty and the condensing temperature is the sum of the ITD and the ambient temperature.

   b. For the wet section…the range, the TTD are scaled from the design values by the ratio of the heat duty to the design heat duty. The approach temperature is determined using the CTI Workbook (3) assuming tower and fill characteristics established using the design specifications. The condensing temperature is calculated from the sum of the wet bulb temperature, range, TTD and approach.

4. In general, the condensing pressures calculated for the two sections will differ. The split between the wet and dry heat duties is then adjusted until they are equal. This establishes the operating backpressure for the assumed total heat load. The calculated turbine exhaust pressure is used to calculate a new cycle efficiency.

5. The calculation is repeated using the new cycle efficiency and the iterations continued until the condensing pressure and the cycle efficiency converge, usually after two or three iterations.

If the resulting condensing pressure is 2. in Hga or lower, it is assumed that the wet cooling tower capability will be reduced by shutting off fans or reducing the circulating water flow until the pressure is raised to 2. in Hga for proper operation of the dry section ACC. The same adjustment could be made by modulating the dry portion but, in the interest of water conservation, the ACC will be maintained at full capability whenever possible. For these points, the condensing pressure is assumed to be 2. in Hga and the cycle efficiency is calculated on that basis using the correlation from Figure 4.

For all other points, the calculation proceeds to establish a balanced operating point where the condensing pressures in both the wet and dry sections are the same at which the cycle efficiency and net plant output are determined.

CONCLUSION AND SUMMARY OF COMPARISONS

Figure 12 (attached) shows the comparison of the plant output profiles for the wet cooled plant and the hybrid cooled plant with an expanded solar field. Table 5 summarizes the annual output for all systems analyzed including the hybrid system. The 0.4% output shortfall compared to the wet system is within the level of precision possible with the information available to this study and the performance of the two systems is essentially identical.

Table 5: Comparison of Annual Net Output from Plant with Alternative Cooling Systems

System	Annual Net Output	Difference from Base, wet	% Difference
	MWH	MWh	%
Base field, wet cooled	725,436	0	0.0%
Base field, dry cooled	665,460	-59,976	-8.3%
12% expanded, dry cooling	755,512	30,076	4.1%
7% expanded, hybrid cooling	722,000	-3,000	-0.4%

APPENDIX B, REFERENCES

FPLE – Beacon Solar Energy Project: Dry Cooling Evaluation, Prepared by WorleyParsons Group, Inc., Report No. FPLS-0-LI-450-0001 Rev B, February, 1, 2008.

Personal communication, J. Foster, July, 2009

CTI ToolKit, Cooling Technology Institute,

CONFIDENTIAL APPENDIX C

1. Revenue Model for Dry Cooling
   (Intentionally Omitted)

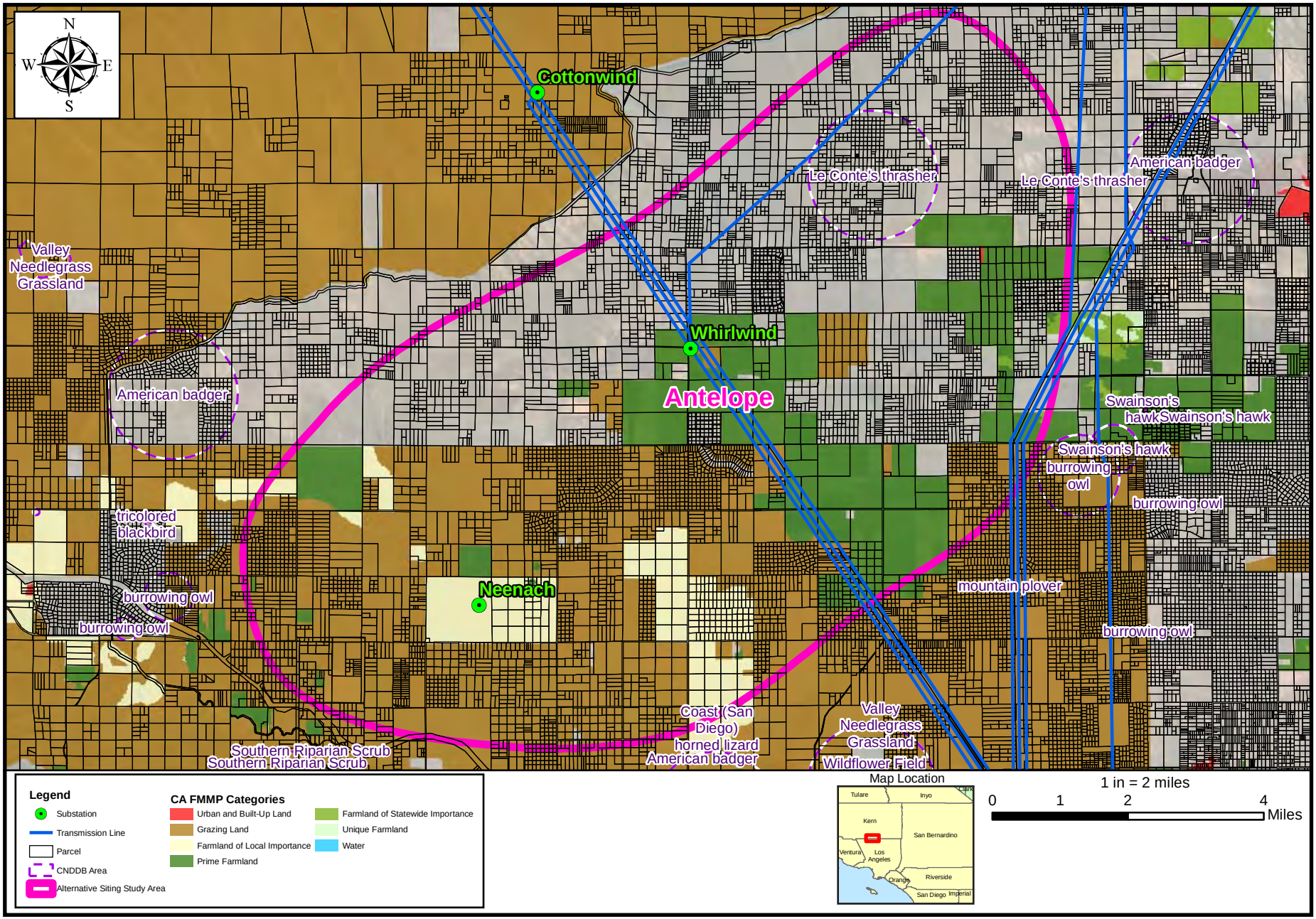
2. Revenue Model for Rosamond Community Services District Alternative
   (Intentionally Omitted)

3. Revenue Model for California City Alternative
   (Intentionally Omitted)

4. Confidential Appendix C, Figure 1 – Revenue and Internal Rate of Return (IRR) Summary Chart
   (Intentionally Omitted)

ALTERNATIVES - FIGURE 1

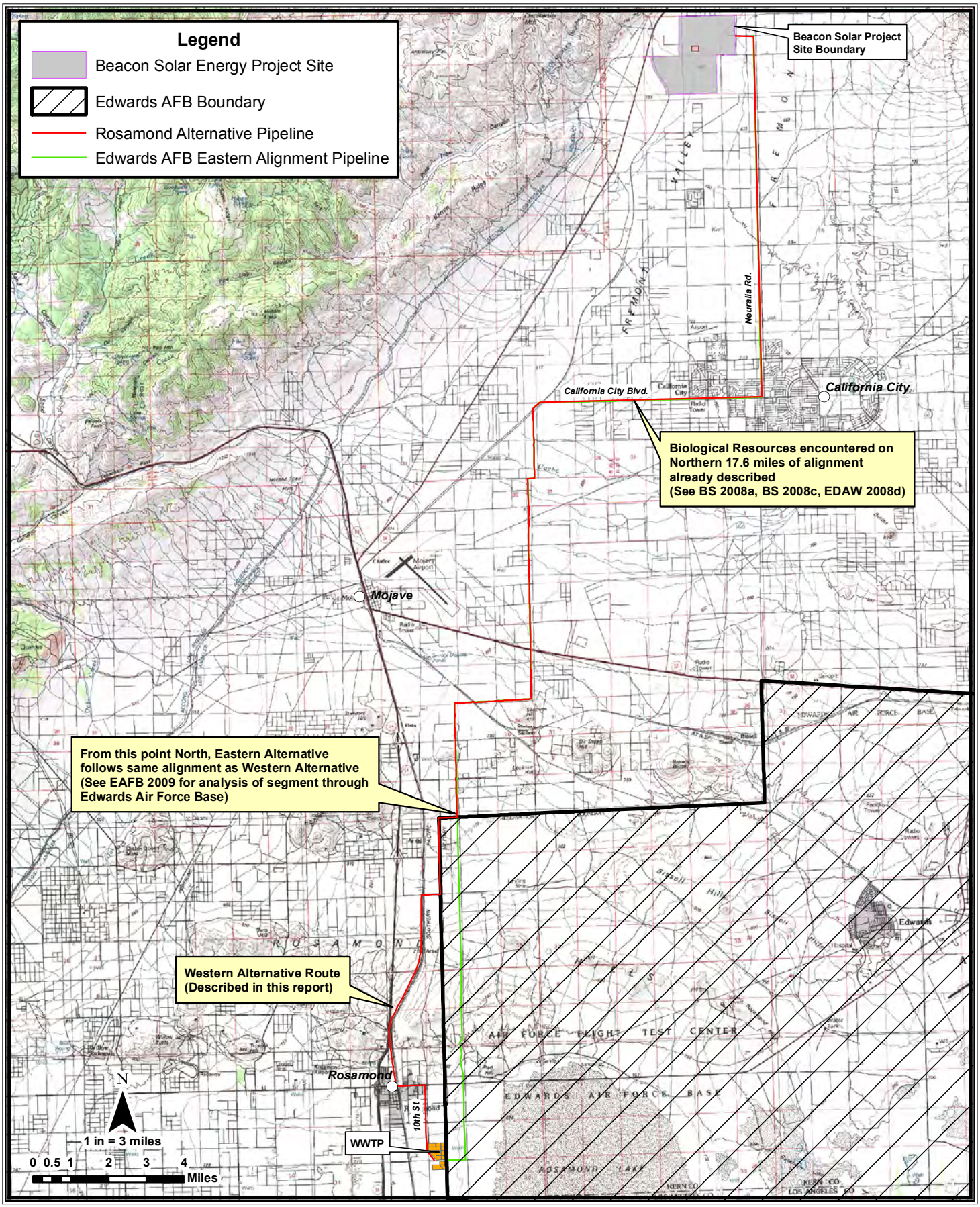
Beacon Solar Energy Project - Antelope Site Alternative



SOURCE: Pg. 6 of NER 2009a

ALTERNATIVES - FIGURE 2

Beacon Solar Energy Project - Vicinity Map

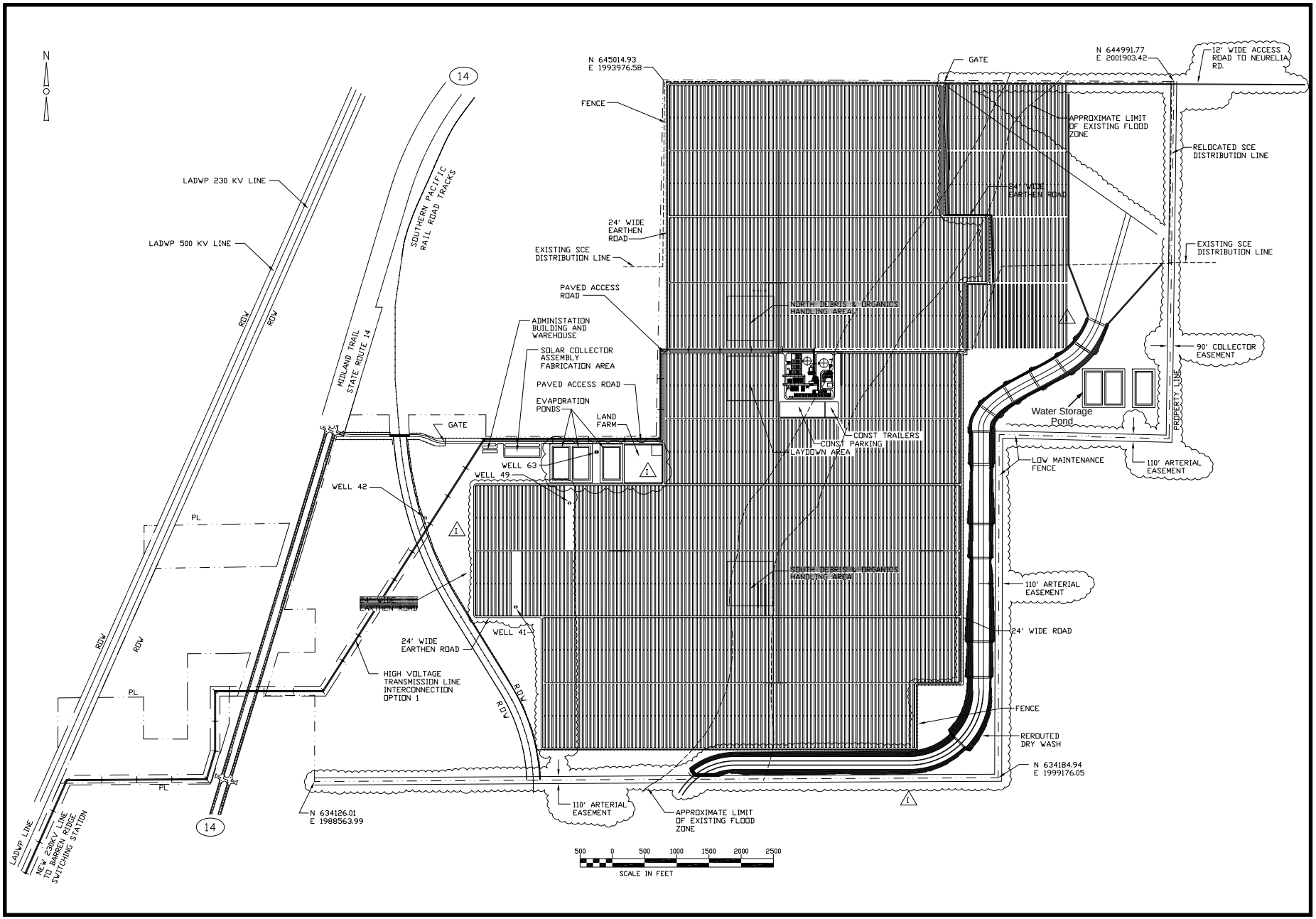


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: California Energy Commission - TOPO Map - 7. 5 minute USGS quadrangles: Rosamond, Soledad Mtn, Bissell, Sanborn and Mohave NE

ALTERNATIVES - FIGURE 3

Beacon Solar Energy Project - General Arrangement Site Plan as Modified by CEC Staff

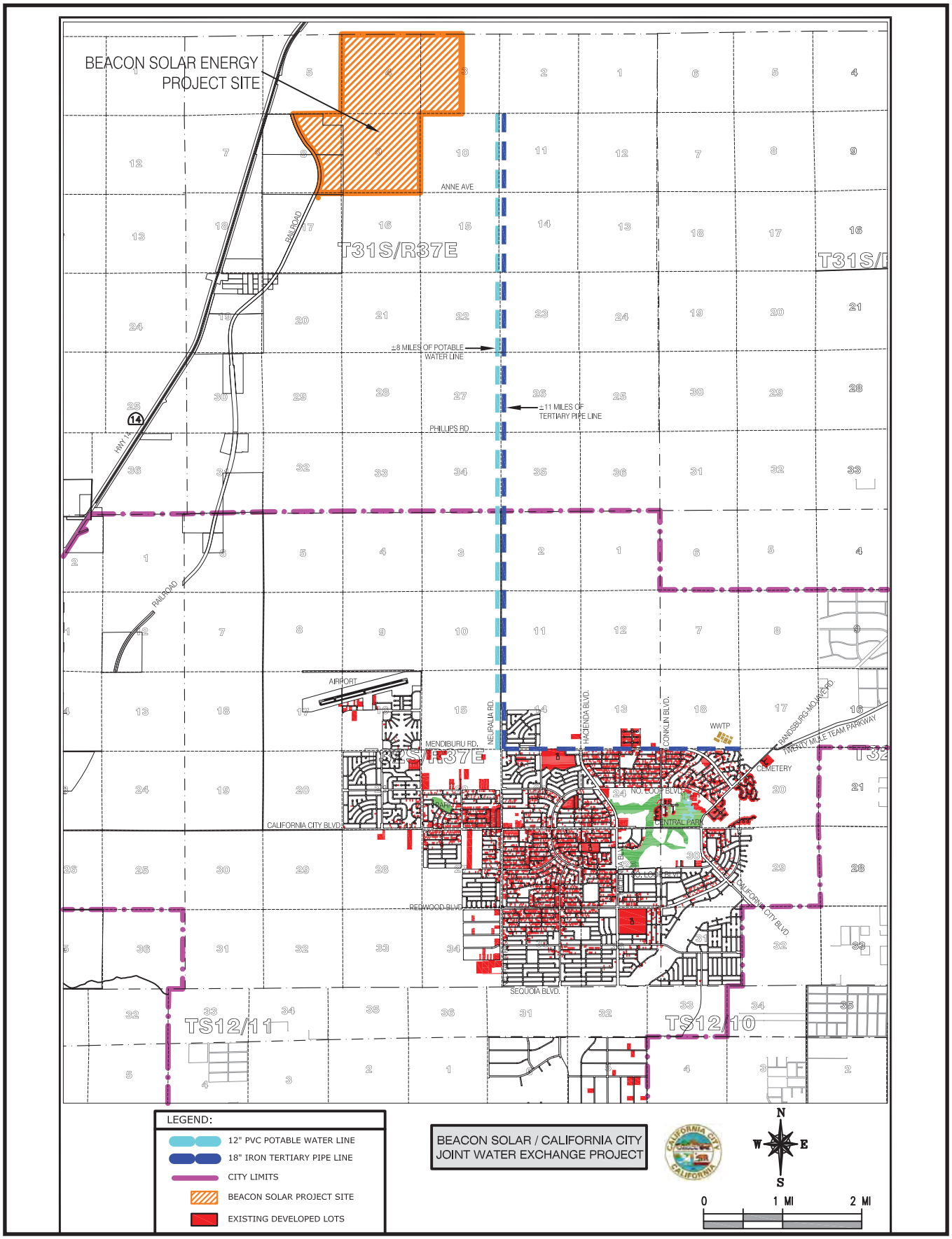


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: Staff has modified Applicant's Site Plan submitted in 2009 Applicant Project Design Refinements

ALTERNATIVES - FIGURE 4

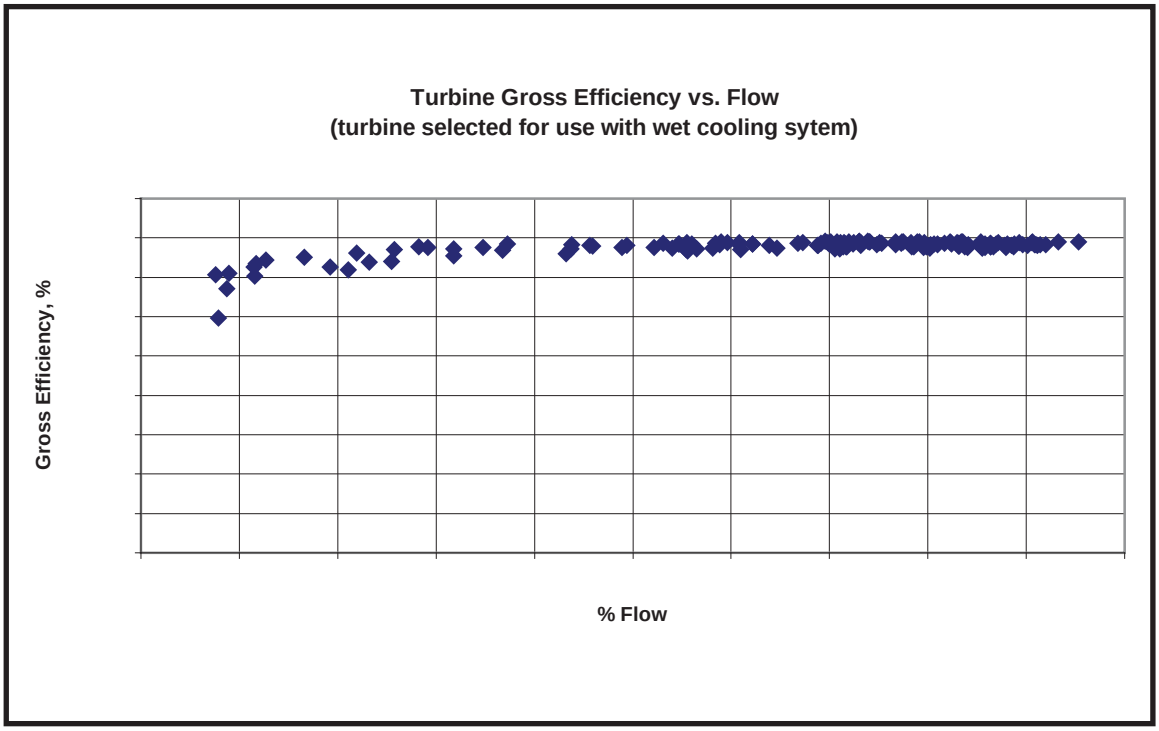
Beacon Solar Energy Project - California City Alternative



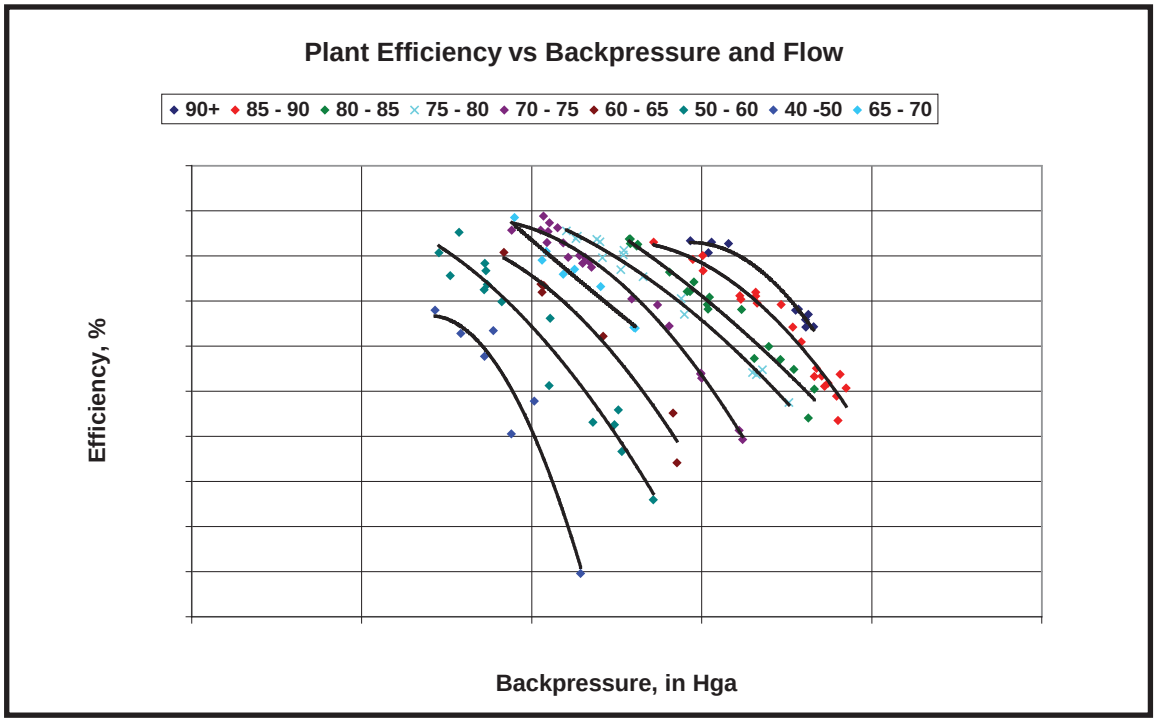
CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, SEPTEMBER 2009

SOURCE: City of California City, Public Works Department

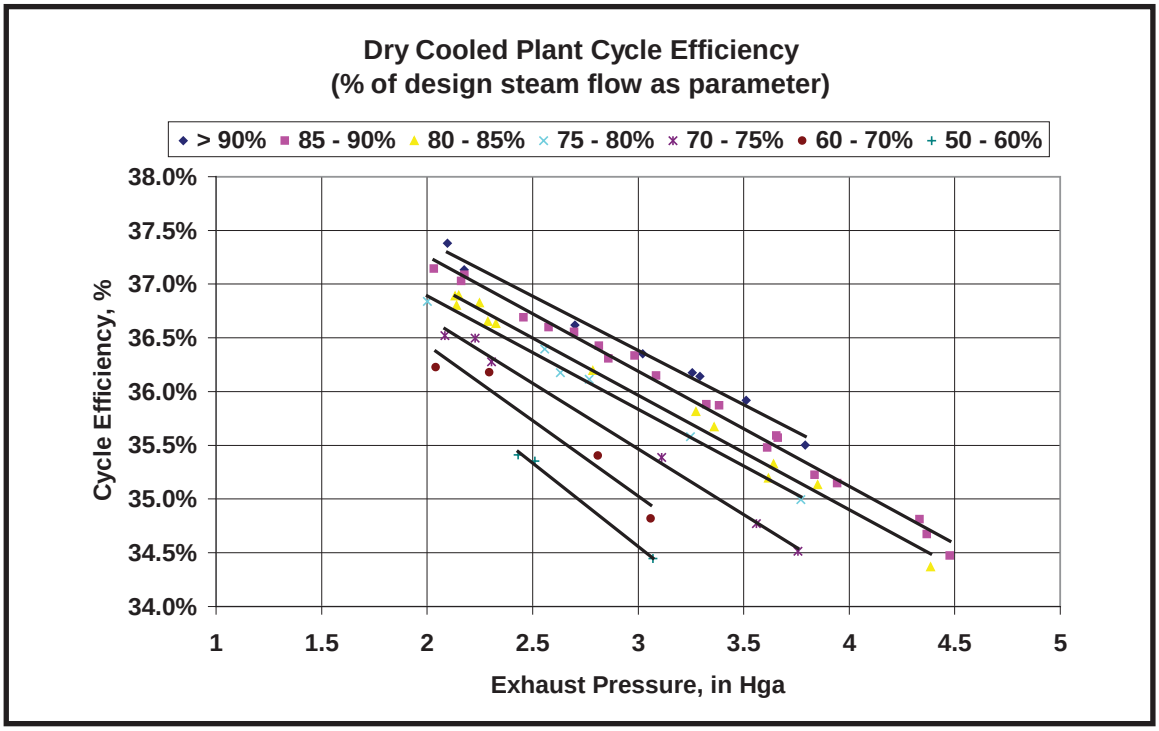
Variations in Gross Cycle Efficiency vs. Steam Flow (wet cooled turbine)



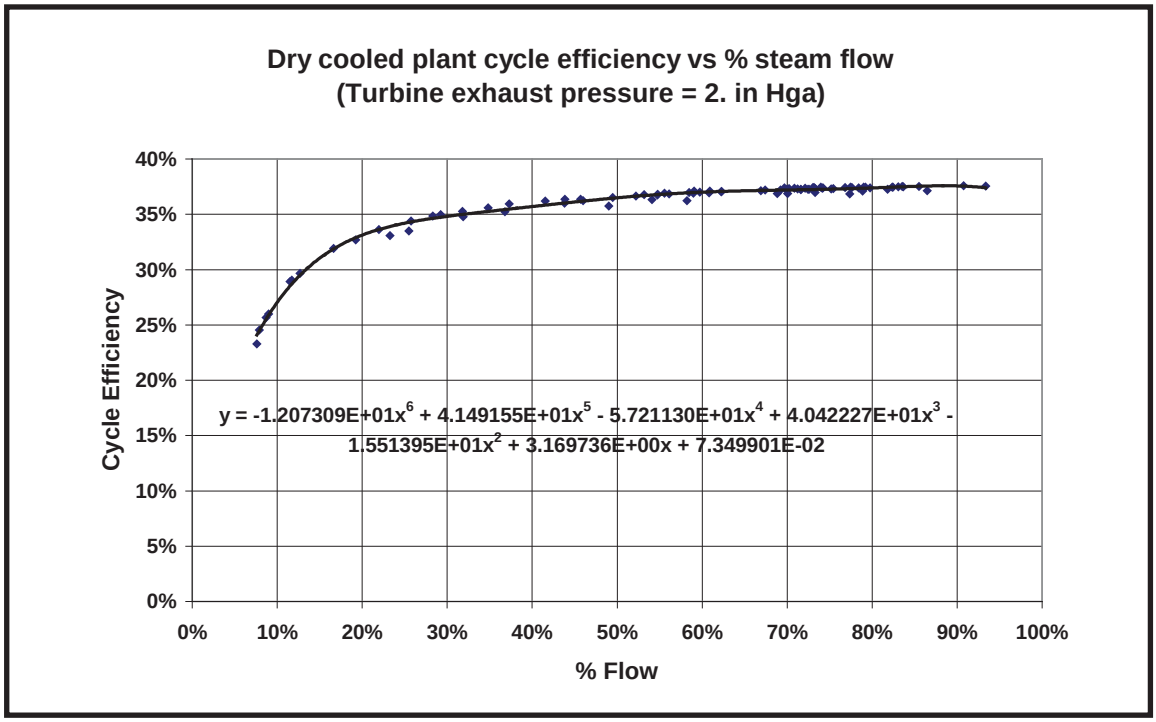
Variations in Gross Cycle Efficiency vs. Turbine Exhaust Pressure
(for different steam flow rates)



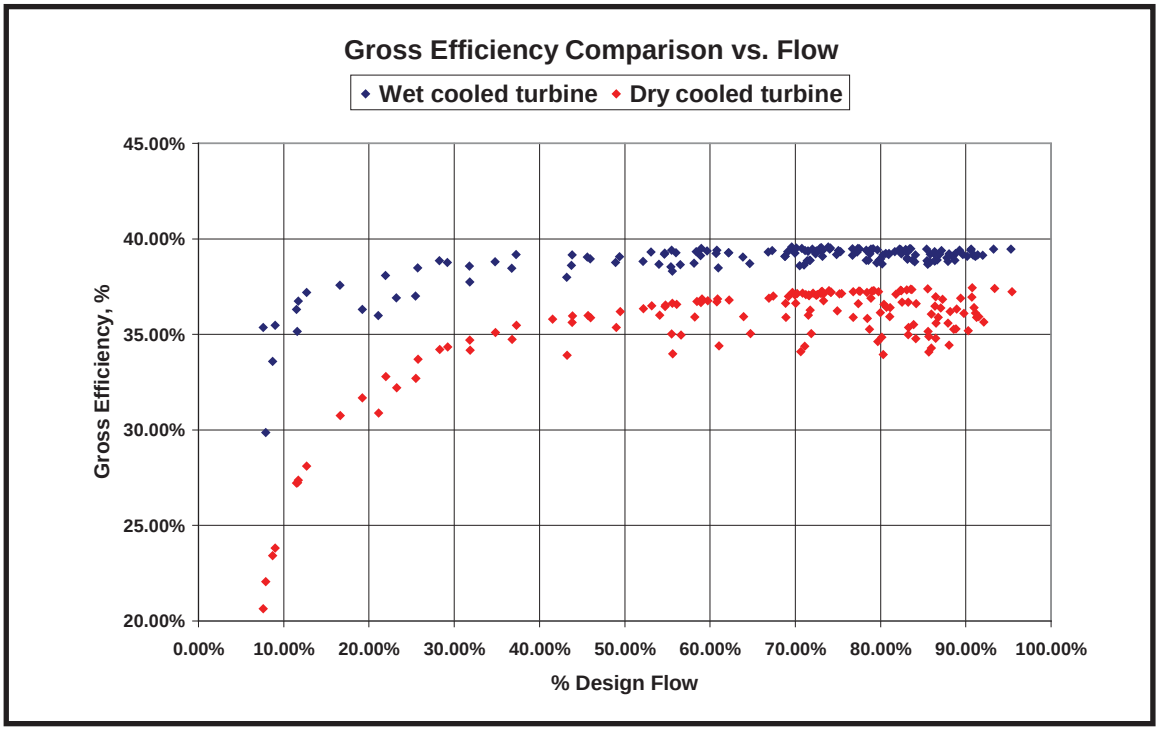
Dry Cooling Turbine Efficiency vs. Backpressure (flow as parameter)



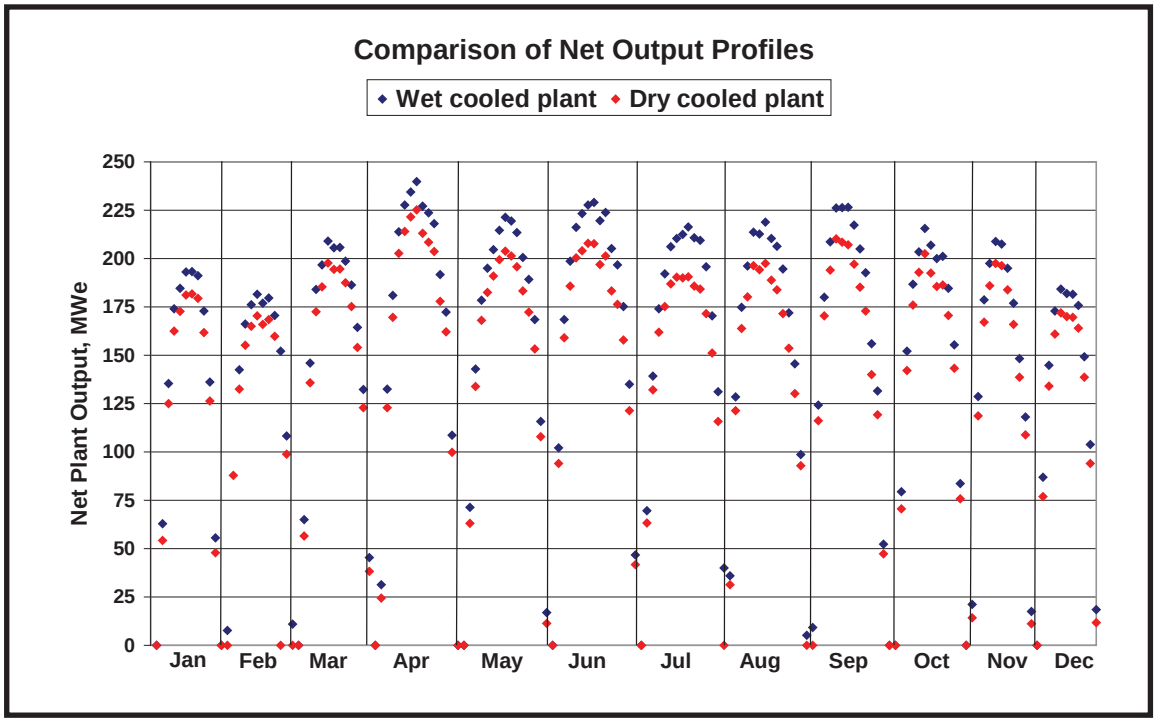
Dry Cooling Turbine Efficiency vs. Steam Flow (Backpressure of 2. in Hga)



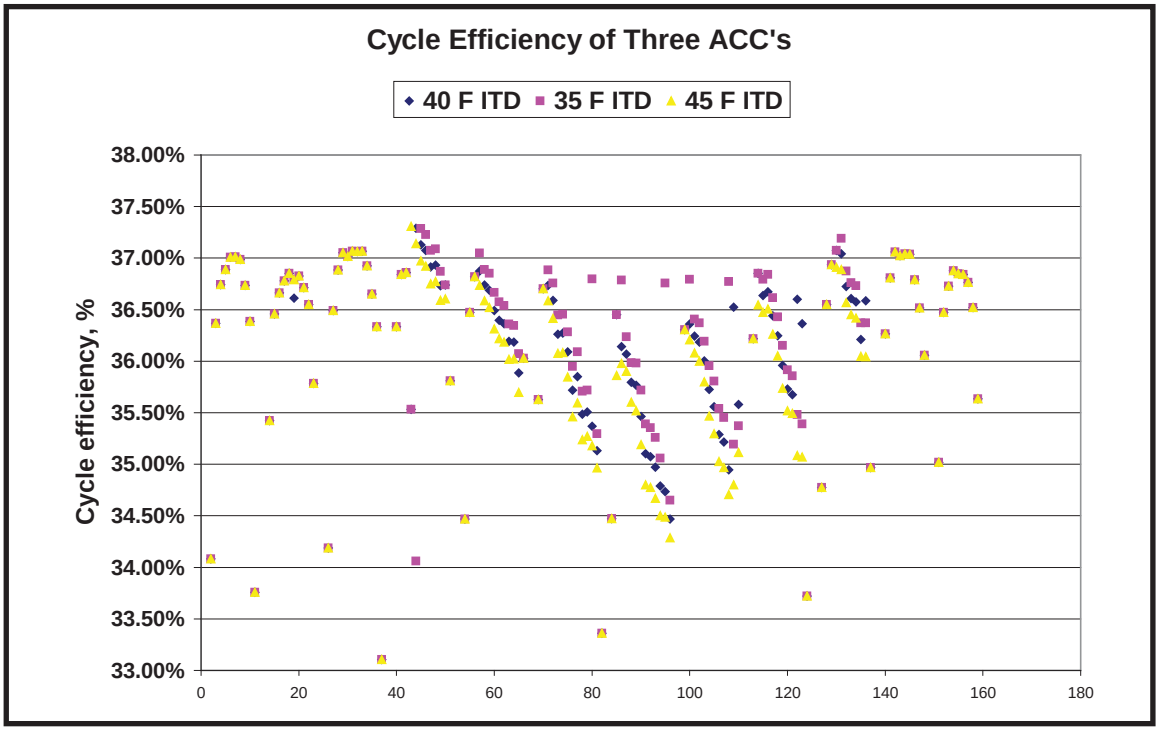
Cycle Efficiency Comparison of Wet and Dry Cooled Plants



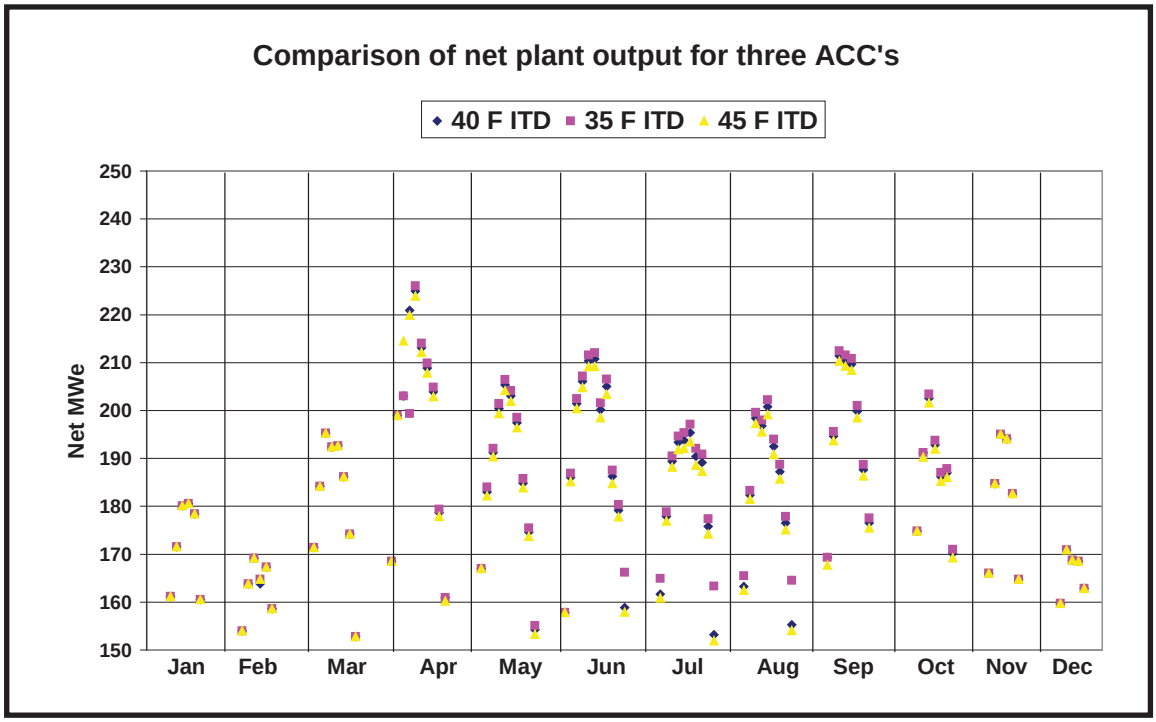
Net Output Comparison of Wet and Dry Cooled Plants



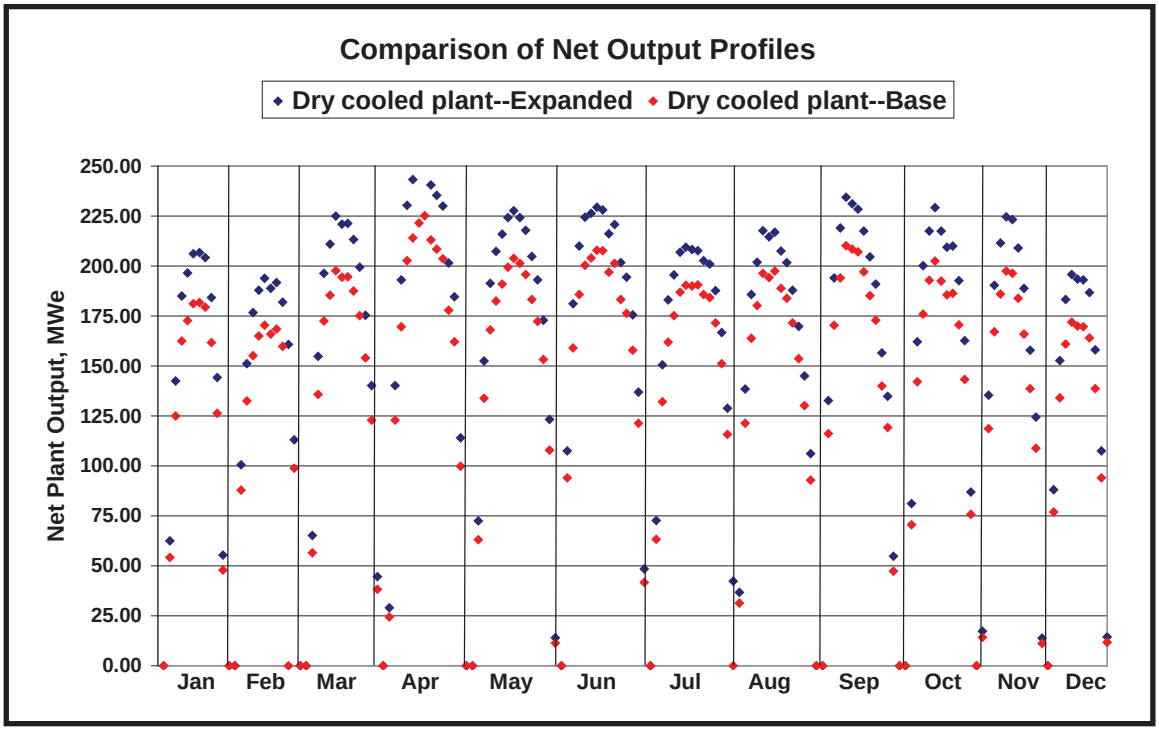
Comparison of Cycle Efficiencies for Three ACC's



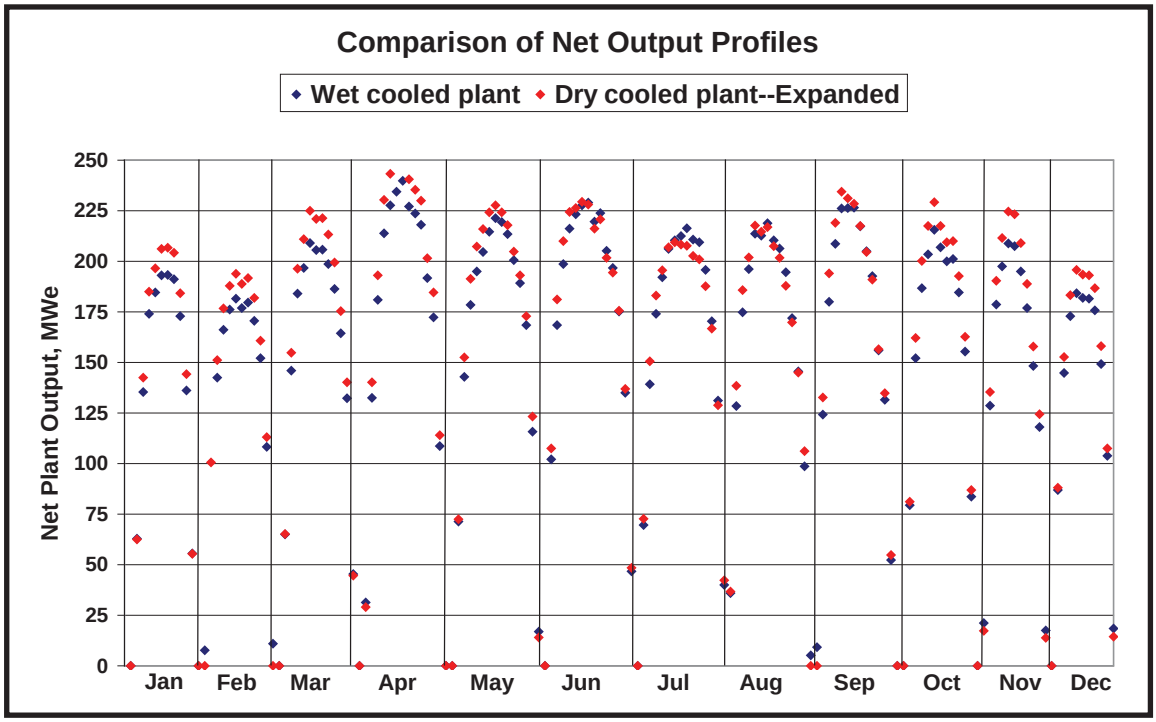
Comparison of Plant Net Output Profiles for Three ACC's



Expanded Field Performance

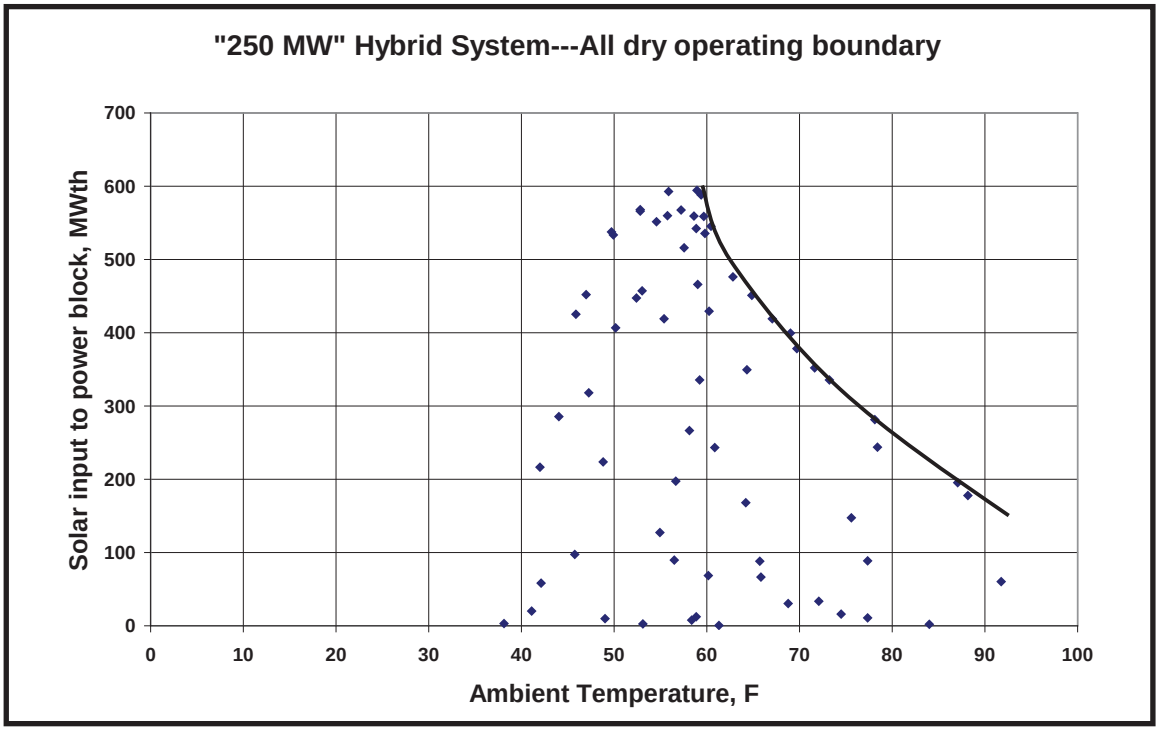


Expanded Field Performance (12% Expansion)

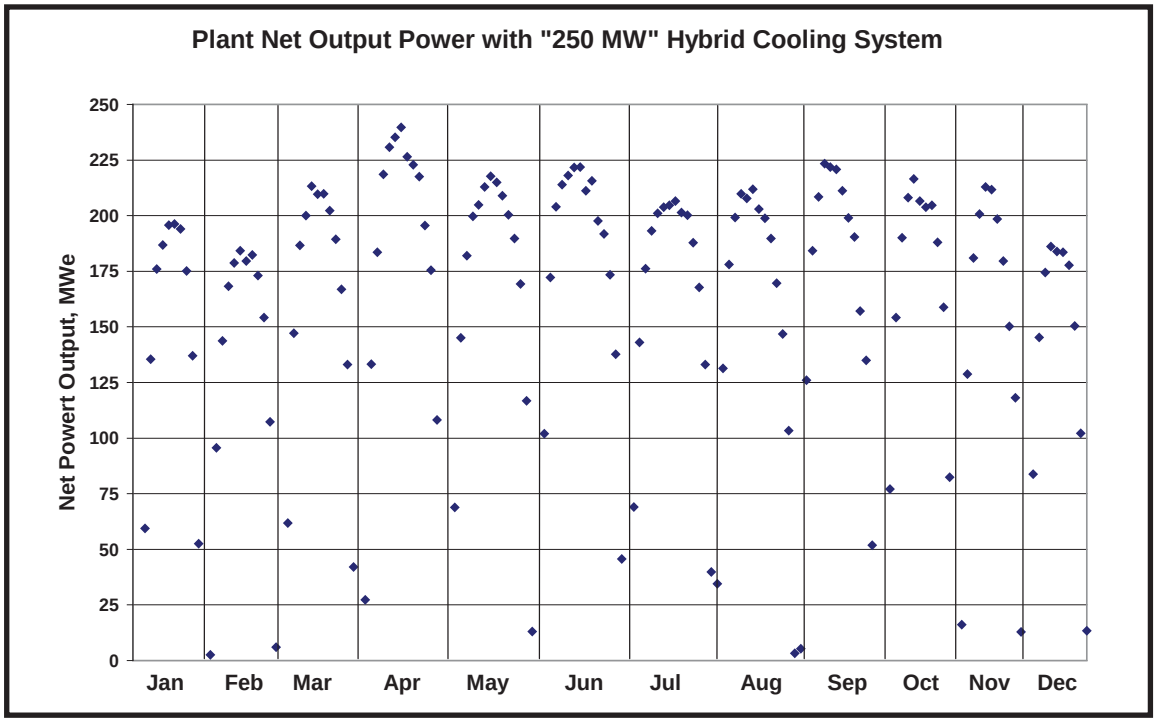


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMETAL PROTECTION DIVISION, SEPTEMBER 2009
SOURCE: APPENDIX B Maulbetsch 8-30-09

"All Dry" Operation Conditions With Boundary

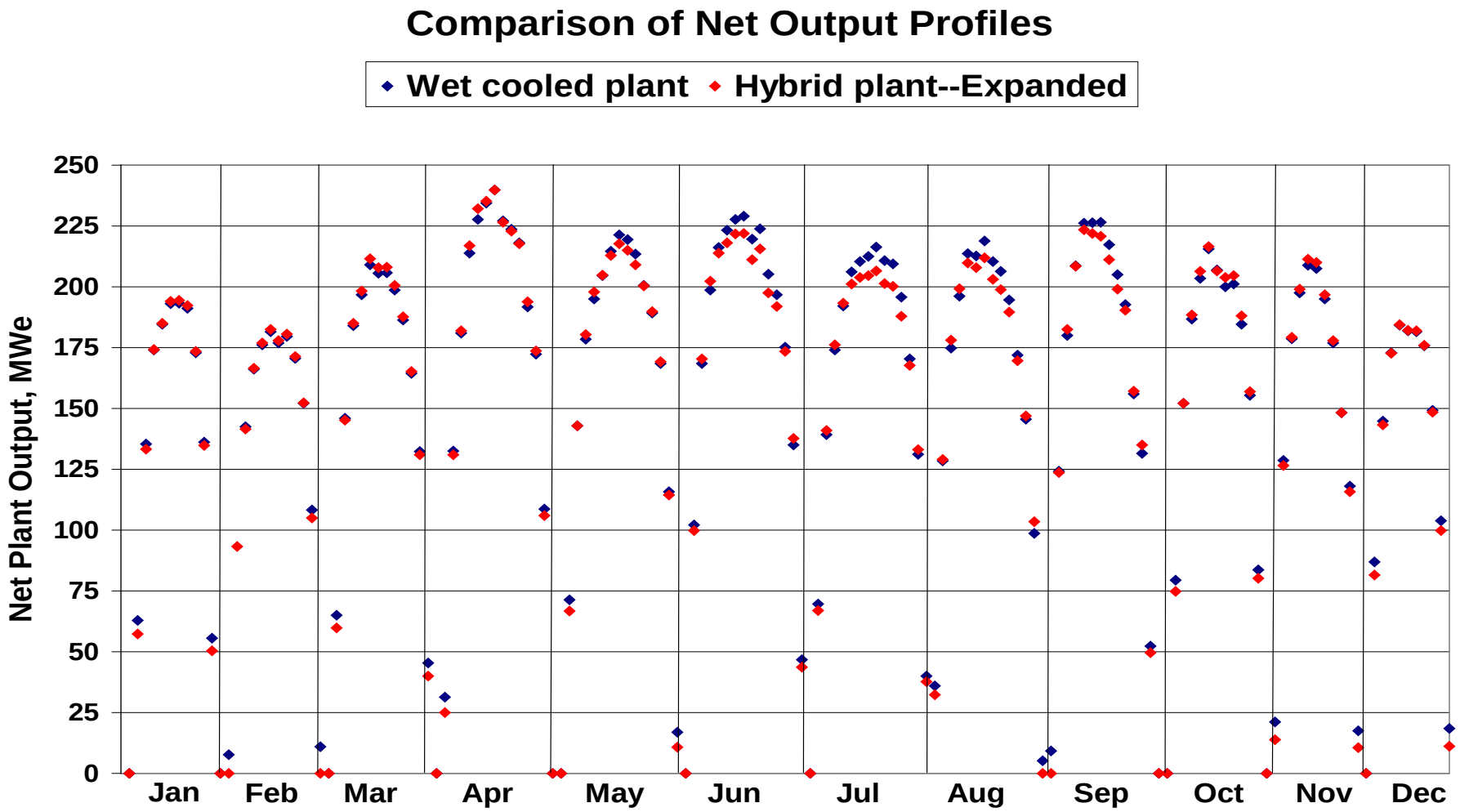


Annual Operating Profile for Plant with "250 MW" Hybrid System



APPENDIX B - FIGURE 13

Beacon Solar Energy Project - Comparison of Output Profiles Wet vs. Hybrid



SOURCE: APPENDIX B Maulbetsch 8-30-09

GENERAL CONDITIONS
INCLUDING
COMPLIANCE MONITORING AND CLOSURE PLAN

Testimony of Steve Munro

INTRODUCTION

The project's General Compliance Conditions of Certification, including Compliance Monitoring and Closure Plan (Compliance Plan) have been established as required by Public Resources Code section 25532. The plan provides a means for assuring that the facility is constructed, operated and closed in compliance with public health and safety, environmental and other applicable regulations, guidelines, and conditions adopted or established by the California Energy Commission and specified in the written decision on the Application for Certification or otherwise required by law.

The Compliance Plan is composed of elements that:

- set forth the duties and responsibilities of the Compliance Project Manager (CPM), the project owner, delegate agencies, and others;
- set forth the requirements for handling confidential records and maintaining the compliance record;
- state procedures for settling disputes and making post-certification changes;
- state the requirements for periodic compliance reports and other administrative procedures that are necessary to verify the compliance status for all Energy Commission approved conditions of certification;
- establish requirements for facility closure plans; and
- specify conditions of certification for each technical area containing the measures required to mitigate any and all potential adverse project impacts associated with construction, operation and closure below a level of significance. Each specific condition of certification also includes a verification provision that describes the method of assuring that the condition has been satisfied.

DEFINITIONS

The following terms and definitions are used to establish when Conditions of Certification are implemented.

PRE-CONSTRUCTION SITE MOBILIZATION

Site mobilization is limited preconstruction activities at the site to allow for the installation of fencing, construction trailers, construction trailer utilities, and construction trailer parking at the site. Limited ground disturbance, grading, and trenching associated with the above mentioned pre-construction activities is considered part of site mobilization. Walking, driving or parking a passenger vehicle, pickup truck and light vehicles is allowable during site mobilization.

CONSTRUCTION

Onsite work to install permanent equipment or structures for any facility.

Ground Disturbance

Construction-related ground disturbance refers to activities that result in the removal of top soil or vegetation at the site beyond site mobilization needs, and for access roads and linear facilities.

Grading, Boring, and Trenching

Construction-related grading, boring, and trenching refers to activities that result in subsurface soil work at the site and for access roads and linear facilities, e.g., alteration of the topographical features such as leveling, removal of hills or high spots, moving of soil from one area to another, and removal of soil.

Notwithstanding the definitions of ground disturbance, grading, boring and trenching above, construction does **not** include the following:

1. the installation of environmental monitoring equipment;
2. a soil or geological investigation;
3. a topographical survey;
4. any other study or investigation to determine the environmental acceptability or feasibility of the use of the site for any particular facility; and
5. any work to provide access to the site for any of the purposes specified in "Construction" 1, 2, 3, or 4 above.

START OF COMMERCIAL OPERATION

For compliance monitoring purposes, "commercial operation" begins after the completion of start-up and commissioning, when the power plant has reached reliable steady-state production of electricity at the rated capacity. At the start of commercial operation, plant control is usually transferred from the construction manager to the plant operations manager.

COMPLIANCE PROJECT MANAGER RESPONSIBILITIES

The Compliance Project Manager (CPM) shall oversee the compliance monitoring and is responsible for:

1. Ensuring that the design, construction, operation, and closure of the project facilities are in compliance with the terms and conditions of the Energy Commission Decision
2. Resolving complaints
3. Processing post-certification changes to the conditions of certification, project description (petition to amend), and ownership or operational control (petition for change of ownership) (See instructions for filing petitions)

4. Documenting and tracking compliance filings

5. Ensuring that compliance files are maintained and accessible

The CPM is the contact person for the Energy Commission and will consult with appropriate responsible agencies, Energy Commission, and staff when handling disputes, complaints, and amendments.

All project compliance submittals are submitted to the CPM for processing. Where a submittal required by a condition of certification requires CPM approval, the approval will involve all appropriate Energy Commission staff and management. All submittals must include searchable electronic versions (pdf or word files).

PRE-CONSTRUCTION AND PRE-OPERATION COMPLIANCE MEETING

The CPM usually schedules pre-construction and pre-operation compliance meetings prior to the projected start-dates of construction, plant operation, or both. The purpose of these meetings is to assemble both the Energy Commission's and project owner's technical staff to review the status of all pre-construction or pre-operation requirements, contained in the Energy Commission's conditions of certification. This is to confirm that all applicable conditions of certification have been met, or if they have not been met, to ensure that the proper action is taken. In addition, these meetings ensure, to the extent possible, that Energy Commission conditions will not delay the construction and operation of the plant due to oversight and to preclude any last minute, unforeseen issues from arising. Pre-construction meetings held during the certification process must be publicly noticed unless they are confined to administrative issues and processes.

ENERGY COMMISSION RECORD

The Energy Commission shall maintain the following documents and information as a public record, in either the Compliance file or Dockets file, for the life of the project (or other period as required):

- All documents demonstrating compliance with any legal requirements relating to the construction and operation of the facility;
- All monthly and annual compliance reports filed by the project owner;
- All complaints of noncompliance filed with the Energy Commission; and
- All petitions for project or condition of certification changes and the resulting staff or Energy Commission action.

PROJECT OWNER RESPONSIBILITIES

The project owner is responsible for ensuring that the compliance conditions of certification and all other conditions of certification that appear in the Commission Decision are satisfied. The compliance conditions regarding post-certification changes specify measures that the project owner must take when requesting changes in the project design, conditions of certification, or ownership. Failure to comply with any of the conditions of certification or the compliance conditions may result in reopening of the

case and revocation of Energy Commission certification; an administrative fine; or other action as appropriate. A summary of the Compliance Conditions of Certification is included as **Compliance Table 1** at the conclusion of this section.

COMPLIANCE CONDITIONS OF CERTIFICATION

Unrestricted Access (COMPLIANCE-1)

The CPM, responsible Energy Commission staff, and delegated agencies or consultants shall be guaranteed and granted unrestricted access to the power plant site, related facilities, project-related staff, and the records maintained on-site, for the purpose of conducting audits, surveys, inspections, or general site visits. Although the CPM will normally schedule site visits on dates and times agreeable to the project owner, the CPM reserves the right to make unannounced visits at any time.

Compliance Record (COMPLIANCE-2)

The project owner shall maintain project files on-site or at an alternative site approved by the CPM for the life of the project, unless a lesser period of time is specified by the conditions of certification. The files shall contain copies of all “as-built” drawings, documents submitted as verification for conditions, and other project-related documents.

Energy Commission staff and delegate agencies shall, upon request to the project owner, be given unrestricted access to the files maintained pursuant to this condition.

Compliance Verification Submittals (COMPLIANCE-3)

Each condition of certification is followed by a means of verification. The verification describes the Energy Commission’s procedure(s) to ensure post-certification compliance with adopted conditions. The verification procedures, unlike the conditions, may be modified as necessary by the CPM.

Verification of compliance with the conditions of certification can be accomplished by the following:

1. Monthly and/or annual compliance reports, filed by the project owner or authorized agent, reporting on work done and providing pertinent documentation, as required by the specific conditions of certification;

2. Appropriate letters from delegate agencies verifying compliance;

3. Energy Commission staff audits of project records; and/or

4. Energy Commission staff inspections of work, or other evidence that the requirements are satisfied.

Verification lead times associated with start of construction may require the project owner to file submittals during the certification process, particularly if construction is planned to commence shortly after certification.

A cover letter from the project owner or authorized agent is required for all compliance submittals and correspondence pertaining to compliance matters. **The cover letter subject line shall identify the project by AFC number, the appropriate condition(s) of certification by condition number(s), and a brief description of the subject of the submittal**. The project owner shall also identify those submittals **not** required by a condition of certification with a statement such as: "This submittal is for information only and is not required by a specific condition of certification." When submitting supplementary or corrected information, the project owner shall reference the date of the previous submittal and CEC submittal number.

The project owner is responsible for the delivery and content of all verification submittals to the CPM, whether such condition was satisfied by work performed by the project owner or an agent of the project owner.

All hardcopy submittals shall be addressed as follows:

Compliance Project Manager
(08-AFC-2C)
California Energy Commission
1516 Ninth Street (MS-2000)
Sacramento, CA 95814

Those submittals shall be accompanied by a searchable electronic copy, on a CD or by e-mail, as agreed upon by the CPM.

If the project owner desires Energy Commission staff action by a specific date, that request shall be made in the submittal cover letter and shall include a detailed explanation of the effects on the project if that date is not met.

Pre-Construction Matrix and Tasks Prior to Start of Construction (COMPLIANCE-4)

Prior to commencing construction, a compliance matrix addressing only those conditions that must be fulfilled before the start of construction shall be submitted by the project owner to the CPM. This matrix will be included with the project owner's first compliance submittal or prior to the first pre-construction meeting, whichever comes first. It will be submitted in the same format as the compliance matrix described below.

Construction shall not commence until the pre-construction matrix is submitted, all pre-construction conditions have been complied with, and the CPM has issued a letter to the project owner authorizing construction. Various lead times for submittal of compliance verification documents to the CPM for conditions of certification are established to allow sufficient staff time to review and comment and, if necessary, allow the project owner to revise the submittal in a timely manner. This will ensure that project construction may proceed according to schedule.

Failure to submit compliance documents within the specified lead-time may result in delays in authorization to commence various stages of project development.

If the project owner anticipates commencing project construction as soon as the project is certified, it may be necessary for the project owner to file compliance submittals prior

to project certification. Compliance submittals should be completed in advance where the necessary lead time for a required compliance event extends beyond the date anticipated for start of construction. The project owner must understand that the submittal of compliance documents prior to project certification is at the owner's own risk. Any approval by Energy Commission staff is subject to change, based upon the Commission Decision.

Compliance Reporting

There are two different compliance reports that the project owner must submit to assist the CPM in tracking activities and monitoring compliance with the terms and conditions of the Energy Commission Decision. During construction, the project owner or authorized agent will submit Monthly Compliance Reports. During operation, an Annual Compliance Report must be submitted. These reports, and the requirement for an accompanying compliance matrix, are described below. The majority of the conditions of certification require that compliance submittals be submitted to the CPM in the monthly or annual compliance reports.

Compliance Matrix (COMPLIANCE-5)

A compliance matrix shall be submitted by the project owner to the CPM along with each monthly and annual compliance report. The compliance matrix is intended to provide the CPM with the current status of all conditions of certification in a spreadsheet format. The compliance matrix must identify:

1. the technical area;
2. the condition number;
3. a brief description of the verification action or submittal required by the condition;
4. the date the submittal is required (e.g., 60 days prior to construction, after final inspection, etc.);
5. the expected or actual submittal date;
6. the date a submittal or action was approved by the Chief Building Official (CBO), CPM, or delegate agency, if applicable; and
7. the compliance status of each condition, e.g., "not started," "in progress" or "completed" (include the date).
8. if the condition was amended, the date of the amendment.

Satisfied conditions shall be placed at the end of the matrix.

Monthly Compliance Report (COMPLIANCE-6)

The first Monthly Compliance Report is due one month following the Energy Commission business meeting date upon which the project was approved, unless otherwise agreed to by the CPM. The first Monthly Compliance Report shall include the

AFC number and an initial list of dates for each of the events identified on the **Key Events List. The Key Events List Form is found at the end of this section.**

During pre-construction and construction of the project, the project owner or authorized agent shall submit an original and an electronic searchable version of the Monthly Compliance Report within 10 working days after the end of each reporting month. Monthly Compliance Reports shall be clearly identified for the month being reported. The reports shall contain, at a minimum:

1. A summary of the current project construction status, a revised/updated schedule if there are significant delays, and an explanation of any significant changes to the schedule;

2. Documents required by specific conditions to be submitted along with the Monthly Compliance Report. Each of these items must be identified in the transmittal letter, as well as the conditions they satisfy and submitted as attachments to the Monthly Compliance Report;

3. An initial, and thereafter updated, compliance matrix showing the status of all conditions of certification (fully satisfied conditions do not need to be included in the matrix after they have been reported as completed);

4. A list of conditions that have been satisfied during the reporting period, and a description or reference to the actions that satisfied the condition;

5. A list of any submittal deadlines that were missed, accompanied by an explanation and an estimate of when the information will be provided;

6. A cumulative listing of any approved changes to conditions of certification;

7. A listing of any filings submitted to, or permits issued by, other governmental agencies during the month;

8. A projection of project compliance activities scheduled during the next two months. The project owner shall notify the CPM as soon as any changes are made to the project construction schedule that would affect compliance with conditions of certification;

9. A listing of the month's additions to the on-site compliance file; and

10. A listing of complaints, notices of violation, official warnings, and citations received during the month, a description of the resolution of the resolved actions, and the status of any unresolved actions.

All sections, exhibits, or addendums shall be separated by tabbed dividers or as acceptable by the CPM.

Annual Compliance Report (COMPLIANCE-7)

After construction is complete, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports. The reports are for each year of

commercial operation and are due to the CPM each year at a date agreed to by the CPM. Annual Compliance Reports shall be submitted over the life of the project unless otherwise specified by the CPM. Each Annual Compliance Report shall include the AFC number, identify the reporting period and shall contain the following:

1. An updated compliance matrix showing the status of all conditions of certification (fully satisfied conditions do not need to be included in the matrix after they have been reported as completed);

2. A summary of the current project operating status and an explanation of any significant changes to facility operations during the year;

3. Documents required by specific conditions to be submitted along with the Annual Compliance Report. Each of these items must be identified in the transmittal letter, with the condition it satisfies, and submitted as attachments to the Annual Compliance Report;

4. A cumulative listing of all post-certification changes approved by the Energy Commission or cleared by the CPM;

5. An explanation for any submittal deadlines that were missed, accompanied by an estimate of when the information will be provided;

6. A listing of filings submitted to, or permits issued by, other governmental agencies during the year;

7. A projection of project compliance activities scheduled during the next year;

8. A listing of the year's additions to the on-site compliance file;

9. An evaluation of the on-site contingency plan for unplanned facility closure, including any suggestions necessary for bringing the plan up to date [see Compliance Conditions for Facility Closure addressed later in this section]; and

10. A listing of complaints, notices of violation, official warnings, and citations received during the year, a description of the resolution of any resolved matters, and the status of any unresolved matters.

Confidential Information (COMPLIANCE-8)

Any information that the project owner deems confidential shall be submitted to the Energy Commission's Dockets Unit with an application for confidentiality pursuant to Title 20, California Code of Regulations, section 2505(a). Any information that is determined to be confidential shall be kept confidential as provided for in Title 20, California Code of Regulations, section 2501 et. seq.

Annual Energy Facility Compliance Fee (COMPLIANCE-9)

Pursuant to the provisions of Section 25806(b) of the Public Resources Code, the project owner is required to pay an annual compliance fee, which is adjusted annually. The amount of the fee for FY2007-2008 was $17,676. The initial payment is due on the date the Energy Commission adopts the final decision. You will be notified of the

amount due. All subsequent payments are due by July 1 of each year in which the facility retains its certification. The payment instrument shall be made payable to the California Energy Commission and mailed to: Accounting Office MS-02, California Energy Commission, 1516 9th St., Sacramento, CA 95814.

Reporting of Complaints, Notices, and Citations (COMPLIANCE-10)

Prior to the start of construction, the project owner must send a letter to property owners living within one mile of the project notifying them of a telephone number to contact project representatives with questions, complaints or concerns. If the telephone is not staffed 24 hours per day, it shall include automatic answering with date and time stamp recording. All recorded complaints shall be responded to within 24 hours. The telephone number shall be posted at the project site and made easily visible to passersby during construction and operation. The telephone number shall be provided to the CPM who will post it on the Energy Commission's web page at:
http://www.energy.ca.gov/sitingcases/power_plants_contacts.html

Any changes to the telephone number shall be submitted immediately to the CPM, who will update the web page.

In addition to the monthly and annual compliance reporting requirements described above, the project owner shall report and provide copies to the CPM of all complaint forms, including noise and lighting complaints, notices of violation, notices of fines, official warnings, and citations, within 10 days of receipt. Complaints shall be logged and numbered. Noise complaints shall be recorded on the form provided in the **NOISE** conditions of certification. All other complaints shall be recorded on the complaint form (Attachment A).

FACILITY CLOSURE

At some point in the future, the project will cease operation and close down. At that time, it will be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts. Although the project setting for this project does not appear, at this time, to present any special or unusual closure problems, it is impossible to foresee what the situation will be in 30 years or more when the project ceases operation. Therefore, provisions must be made that provide the flexibility to deal with the specific situation and project setting that exist at the time of closure. Laws, Ordinances, Regulations and Standards (LORS) pertaining to facility closure are identified in the sections dealing with each technical area. Facility closure will be consistent with LORS in effect at the time of closure.

There are at least three circumstances in which a facility closure can take place: planned closure, unplanned temporary closure and unplanned permanent closure**.**

CLOSURE DEFINITIONS

Planned Closure

A planned closure occurs when the facility is closed in an anticipated, orderly manner, at the end of its useful economic or mechanical life, or due to gradual obsolescence.

Unplanned Temporary Closure

An unplanned temporary closure occurs when the facility is closed suddenly and/or unexpectedly, on a short-term basis, due to unforeseen circumstances such as a natural disaster or an emergency.

Unplanned Permanent Closure

An unplanned permanent closure occurs if the project owner closes the facility suddenly and/or unexpectedly, on a permanent basis. This includes unplanned closure where the owner implements the on-site contingency plan. It can also include unplanned closure where the project owner fails to implement the contingency plan, and the project is essentially abandoned.

COMPLIANCE CONDITIONS FOR FACILITY CLOSURE

Planned Closure (COMPLIANCE-11)

In order to ensure that a planned facility closure does not create adverse impacts, a closure process that provides for careful consideration of available options and applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of closure, will be undertaken. To ensure adequate review of a planned project closure, the project owner shall submit a proposed facility closure plan to the Energy Commission for review and approval at least 12 months (or other period of time agreed to by the CPM) prior to commencement of closure activities. The project owner shall file 120 copies (or other number of copies agreed upon by the CPM) of a proposed facility closure plan with the Energy Commission.

The plan shall:

1. identify and discuss any impacts and mitigation to address significant adverse impacts associated with proposed closure activities and to address facilities, equipment, or other project related remnants that will remain at the site;

2. identify a schedule of activities for closure of the power plant site, transmission line corridor, and all other appurtenant facilities constructed as part of the project;

3. identify any facilities or equipment intended to remain on site after closure, the reason, and any future use; and

4. address conformance of the plan with all applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of facility closure, and applicable conditions of certification.

Prior to submittal of the proposed facility closure plan, a meeting shall be held between the project owner and the Energy Commission CPM for the purpose of discussing the specific contents of the plan.

In the event that there are significant issues associated with the proposed facility closure plan's approval, or the desires of local officials or interested parties are inconsistent with the plan, the CPM shall hold one or more workshops and/or the Energy Commission may hold public hearings as part of its approval procedure.

As necessary, prior to or during the closure plan process, the project owner shall take appropriate steps to eliminate any immediate threats to public health and safety and the environment, but shall not commence any other closure activities until the Energy Commission approves the facility closure plan.

Unplanned Temporary Closure/On-Site Contingency Plan (COMPLIANCE-12)

In order to ensure that public health and safety and the environment are protected in the event of an unplanned temporary facility closure, it is essential to have an on-site contingency plan in place. The on-site contingency plan will help to ensure that all necessary steps to mitigate public health and safety impacts and environmental impacts are taken in a timely manner.

The project owner shall submit an on-site contingency plan for CPM review and approval. The plan shall be submitted no less than 60 days (or other time agreed to by the CPM) prior to commencement of commercial operation. The approved plan must be in place prior to commercial operation of the facility and shall be kept at the site at all times.

The project owner, in consultation with the CPM, will update the on-site contingency plan as necessary. The CPM may require revisions to the on-site contingency plan over the life of the project. In the annual compliance reports submitted to the Energy Commission, the project owner will review the on-site contingency plan, and recommend changes to bring the plan up to date. Any changes to the plan must be approved by the CPM.

The on-site contingency plan shall provide for taking immediate steps to secure the facility from trespassing or encroachment. In addition, for closures of more than 90 days, unless other arrangements are agreed to by the CPM, the plan shall provide for removal of hazardous materials and hazardous wastes, draining of all chemicals from storage tanks and other equipment, and the safe shutdown of all equipment. (Also see specific conditions of certification for the technical areas of Hazardous Materials Management and Waste Management.)

In addition, consistent with requirements under unplanned permanent closure addressed below, the nature and extent of insurance coverage, and major equipment warranties must also be included in the on-site contingency plan. In addition, the status of the insurance coverage and major equipment warranties must be updated in the annual compliance reports.

In the event of an unplanned temporary closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the circumstances and expected duration of the closure.

If the CPM determines that an unplanned temporary closure is likely to be permanent, or for a duration of more than 12 months, a closure plan consistent with the

requirements for a planned closure shall be developed and submitted to the CPM within 90 days of the CPM's determination (or other period of time agreed to by the CPM).

Unplanned Permanent Closure/On-Site Contingency Plan (COMPLIANCE-13)

The on-site contingency plan required for unplanned temporary closure shall also cover unplanned permanent facility closure. All of the requirements specified for unplanned temporary closure shall also apply to unplanned permanent closure.

In addition, the on-site contingency plan shall address how the project owner will ensure that all required closure steps will be successfully undertaken in the event of abandonment.

In the event of an unplanned permanent closure, the project owner shall notify the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the on-site contingency plan. The project owner shall keep the CPM informed of the status of all closure activities.

A closure plan, consistent with the requirements for a planned closure, shall be developed and submitted to the CPM within 90 days of the permanent closure or another period of time agreed to by the CPM.

Post Certification Changes to the Energy Commission Decision: Amendments, Ownership Changes, Staff Approved Project Modifications and Verification Changes (COMPLIANCE-14)

The project owner must petition the Energy Commission pursuant to Title 20, California Code of Regulations, section 1769, in order to modify the project (including linear facilities) design, operation or performance requirements, and to transfer ownership or operational control of the facility. **It is the responsibility of the project owner to contact the CPM to determine if a proposed project change should be considered a project modification pursuant to section 1769.** Implementation of a project modification without first securing Energy Commission, or Energy Commission staff approval, may result in enforcement action that could result in civil penalties in accordance with section 25534 of the Public Resources Code.

A petition is required for **amendments** and for staff approved project modifications, as specified below. Both shall be filed as a "Petition to Amend." Staff will determine if the change is significant or less than significant. For verification changes, a letter from the project owner is sufficient. In all cases, the petition or letter requesting a change should be submitted to the CPM, who will file it with the Energy Commission's Dockets Unit in accordance with Title 20, California Code of Regulations, section 1209.

The criteria that determine which type of approval and the process that applies are explained below. They reflect the provisions of Section 1769 at the time this condition was drafted. If the Commission's rules regarding amendments are amended, the rules in effect at the time an amendment is requested shall apply.

Amendment

The project owner shall petition the Energy Commission, pursuant to Title 20, California Code of Regulations, Section 1769(a), when proposing modifications to the project (including linear facilities) design, operation, or performance requirements. If a proposed modification results in deletion or change of a condition of certification, or makes changes that would cause the project not to comply with any applicable laws, ordinances, regulations or standards, the petition will be processed as a formal amendment to the final decision, which requires public notice and review of the Energy Commission staff analysis, and approval by the full Commission. The petition shall be in the form of a legal brief and fulfill the requirements of Section 1769(a). Upon request, the CPM will provide you with a sample petition to use as a template.

Change of Ownership

Change of ownership or operational control also requires that the project owner file a petition pursuant to section 1769 (b). This process requires public notice and approval by the full Commission. The petition shall be in the form of a legal brief and fulfill the requirements of Section 1769(b). Upon request, the CPM will provide you with a sample petition to use as a template.

Staff Approved Project Modification

Modifications that do not result in deletions or changes to conditions of certification, and that are compliant with laws, ordinances, regulations and standards may be authorized by the CPM as a Staff Approved Project Modification pursuant to section 1769(a) (2). This process usually requires minimal time to complete, and it requires a 14-day public review of the Notice of Staff Approved Project Modification that includes staff's intention to approve the modification unless substantive objections are filed. These requests must also be submitted in the form of a "petition to amend" as described above.

Verification Change

A verification may be modified by the CPM without requesting an amendment to the decision if the change does not conflict with the conditions of certification and provides an effective alternate means of verification.

CBO DELEGATION AND AGENCY COOPERATION

In performing construction and operation monitoring of the project, Energy Commission staff acts as, and has the authority of, the Chief Building Official (CBO). Energy Commission staff may delegate CBO responsibility to either an independent third party contractor or the local building official. Energy Commission staff retains CBO authority when selecting a delegate CBO, including enforcing and interpreting state and local codes, and use of discretion, as necessary, in implementing the various codes and standards.

Energy Commission staff may also seek the cooperation of state, regional and local agencies that have an interest in environmental protection when conducting project monitoring.

ENFORCEMENT

The Energy Commission's legal authority to enforce the terms and conditions of its Decision is specified in Public Resources Code sections 25534 and 25900. The Energy Commission may amend or revoke the certification for any facility, and may impose a civil penalty for any significant failure to comply with the terms or conditions of the Energy Commission Decision. The specific action and amount of any fines the Energy Commission may impose would take into account the specific circumstances of the incident(s). This would include such factors as the previous compliance history, whether the cause of the incident involves willful disregard of LORS, oversight, unforeseeable events, and other factors the Energy Commission may consider.

NONCOMPLIANCE COMPLAINT PROCEDURES

Any person or agency may file a complaint alleging noncompliance with the conditions of certification. Such a complaint will be subject to review by the Energy Commission pursuant to Title 20, California Code of Regulations, section 1237, but in many instances the noncompliance can be resolved by using the informal dispute resolution process. Both the informal and formal complaint procedure, as described in current State law and regulations, are described below. They shall be followed unless superseded by future law or regulations.

The Energy Commission has established a toll free compliance telephone number of **1-800-858-0784** for the public to contact the Energy Commission about power plant construction or operation-related questions, complaints or concerns.

Informal Dispute Resolution Process

The following procedure is designed to informally resolve disputes concerning the interpretation of compliance with the requirements of this compliance plan. The project owner, the Energy Commission, or any other party, including members of the public, may initiate an informal dispute resolution process. Disputes may pertain to actions or decisions made by any party, including the Energy Commission's delegate agents.

This process may precede the more formal complaint and investigation procedure specified in Title 20, California Code of Regulations, section 1237, but is not intended to be a substitute for, or prerequisite to it. This informal procedure may not be used to change the terms and conditions of certification as approved by the Energy Commission, although the agreed upon resolution may result in a project owner, or in some cases the Energy Commission staff, proposing an amendment.

The process encourages all parties involved in a dispute to discuss the matter and to reach an agreement resolving the dispute. If a dispute cannot be resolved, then the matter must be brought before the full Energy Commission for consideration via the complaint and investigation procedure.

Request for Informal Investigation

Any individual, group, or agency may request the Energy Commission to conduct an informal investigation of alleged noncompliance with the Energy Commission's terms and conditions of certification. All requests for informal investigations shall be made to the designated CPM.

Upon receipt of a request for informal investigation, the CPM shall promptly notify the project owner of the allegation by telephone and letter. All known and relevant information of the alleged noncompliance shall be provided to the project owner and to the Energy Commission staff. The CPM will evaluate the request and the information to determine if further investigation is necessary. If the CPM finds that further investigation is necessary, the project owner will be asked to promptly investigate the matter. Within seven working days of the CPM's request, provide a written report to the CPM of the results of the investigation, including corrective measures proposed or undertaken. Depending on the urgency of the noncompliance matter, the CPM may conduct a site visit and/or request the project owner to also provide an initial verbal report, within 48 hours.

Request for Informal Meeting

In the event that either the party requesting an investigation or the Energy Commission staff is not satisfied with the project owner's report, investigation of the event, or corrective measures proposed or undertaken, either party may submit a written request to the CPM for a meeting with the project owner. Such request shall be made within 14 days of the project owner's filing of its written report. Upon receipt of such a request, the CPM shall:

1. immediately schedule a meeting with the requesting party and the project owner, to be held at a mutually convenient time and place;

2. secure the attendance of appropriate Energy Commission staff and staff of any other agencies with expertise in the subject area of concern, as necessary;

3. conduct such meeting in an informal and objective manner so as to encourage the voluntary settlement of the dispute in a fair and equitable manner;

4. After the conclusion of such a meeting, promptly prepare and distribute copies to all in attendance and to the project file, a summary memorandum that fairly and accurately identifies the positions of all parties and any understandings reached. If an agreement has not been reached, the CPM shall inform the complainant of the formal complaint process and requirements provided under Title 20, California Code of Regulations, section 1230 et seq.

Formal Dispute Resolution Procedure-Complaints and Investigations

Any person may file a complaint with the Energy Commission's Dockets Unit alleging noncompliance with a Commission decision adopted pursuant to Public Resources Code section 25500. Requirements for complaint filings and a description of how complaints are processed are in Title 20, California Code of Regulations, section 1237.

KEY EVENTS LIST

PROJECT: _____

DOCKET #: _____

COMPLIANCE PROJECT MANAGER: _____

EVENT DESCRIPTION	DATE
Certification Date	
Obtain Site Control	
Online Date	
POWER PLANT SITE ACTIVITIES	
Start Site Mobilization	
Start Ground Disturbance	
Start Grading	
Start Construction	
Begin Pouring Major Foundation Concrete	
Begin Installation of Major Equipment	
Completion of Installation of Major Equipment	
First Combustion of Gas Turbine	
Obtain Building Occupation Permit	
Start Commercial Operation	
Complete All Construction	
TRANSMISSION LINE ACTIVITIES	
Start T/L Construction	
Synchronization with Grid and Interconnection	
Complete T/L Construction	
FUEL SUPPLY LINE ACTIVITIES	
Start Gas Pipeline Construction and Interconnection	
Complete Gas Pipeline Construction	
WATER SUPPLY LINE ACTIVITIES	
Start Water Supply Line Construction	
Complete Water Supply Line Construction	

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-1	Unrestricted Access	The project owner shall grant Energy Commission staff and delegate agencies or consultants unrestricted access to the power plant site.
COMPLIANCE-2	Compliance Record	The project owner shall maintain project files on-site. Energy Commission staff and delegate agencies shall be given unrestricted access to the files.
COMPLIANCE-3	Compliance Verification Submittals	The project owner is responsible for the delivery and content of all verification submittals to the CPM, whether such condition was satisfied by work performed or the project owner or his agent.
COMPLIANCE-4	Pre-construction Matrix and Tasks Prior to Start of Construction	Construction shall not commence until the all of the following activities/submittals have been completed: ▪ property owners living within one mile of the project have been notified of a telephone number to contact for questions, complaints or concerns, ▪ a pre-construction matrix has been submitted identifying only those conditions that must be fulfilled before the start of construction, ▪ all pre-construction conditions have been complied with, ▪ the CPM has issued a letter to the project owner authorizing construction.
COMPLIANCE-5	Compliance Matrix	The project owner shall submit a compliance matrix (in a spreadsheet format) with each monthly and annual compliance report which includes the status of all compliance conditions of certification.
COMPLIANCE-6	Monthly Compliance Report including a Key Events List	During construction, the project owner shall submit Monthly Compliance Reports (MCRs) which include specific information. The first MCR is due the month following the Energy Commission business meeting date on which the project was approved and shall include an initial list of dates for each of the events identified on the Key Events List.
COMPLIANCE-7	Annual Compliance Reports	After construction ends and throughout the life of the project, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports.

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-8	Confidential Information	Any information the project owner deems confidential shall be submitted to the Energy Commission's Dockets Unit with a request for confidentiality.
COMPLIANCE-9	Annual fees	Payment of Annual Energy Facility Compliance Fee
COMPLIANCE-10	Reporting of Complaints, Notices and Citations	Within 10 days of receipt, the project owner shall report to the CPM, all notices, complaints, and citations.
COMPLIANCE-11	Planned Facility Closure	The project owner shall submit a closure plan to the CPM at least 12 months prior to commencement of a planned closure.
COMPLIANCE-12	Unplanned Temporary Facility Closure	To ensure that public health and safety and the environment are protected in the event of an unplanned temporary closure, the project owner shall submit an on-site contingency plan no less than 60 days prior to commencement of commercial operation.
COMPLIANCE-13	Unplanned Permanent Facility Closure	To ensure that public health and safety and the environment are protected in the event of an unplanned permanent closure, the project owner shall submit an on-site contingency plan no less than 60 days prior to commencement of commercial operation.
COMPLIANCE-14	Post-certification changes to the Decision	The project owner must petition the Energy Commission to delete or change a condition of certification, modify the project design or operational requirements and/or transfer ownership of operational control of the facility.

ATTACHMENT A

COMPLAINT REPORT/RESOLUTION FORM

PROJECT NAME: AFC Number:
COMPLAINT LOG NUMBER _____ Complainant's name and address: Phone number: _____
Date and time complaint received: Indicate if by telephone or in writing (attach copy if written): Date of first occurrence:
Description of complaint (including dates, frequency, and duration):
Findings of investigation by plant personnel: Indicate if complaint relates to violation of a CEC requirement: Date complainant contacted to discuss findings: _____
Description of corrective measures taken or other complaint resolution: Indicate if complainant agrees with proposed resolution: If not, explain: Other relevant information:
If corrective action necessary, date completed: _____ Date first letter sent to complainant: _____(copy attached) Date final letter sent to complainant: _____(copy attached)
This information is certified to be correct. Plant Manager's Signature: _____ Date:

(Attach additional pages and supporting documentation, as required.)

PREPARATION TEAM

DECLARATION OF
Eric K. Solorio

I, Eric Solorio, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division, as a Project Manager (Planner II).

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on the **Executive Summary** and helped prepare staff testimony on the **Alternatives** section of the Final Staff Assessment for the **Beacon Solar Energy Project** (08-AFC-2) based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

ERIC SOLORIO

SUMMARY

I'm currently a project manager for the California Energy Commission. I have seven years of experience managing business operations for real estate development companies and three years of experience with economic development through international trade and foreign direct investment. I have a working knowledge of the California Environmental Quality Act. My strengths are in business development, strategic planning, team building, economic analysis, and raising private equity. I'm experienced with managing diverse groups of people to accomplish common objectives.

PROFESSIONAL EXPERIENCE

Presentation Skills

- Organize and participate in public workshops to facilitate public participation in the environmental review of large-scale real estate development projects, up to 4,000 acres in size.
- Organize and participate in international trade and investment, "business to business" workshops.
- Organize and participate in international trade and investment, business development seminars.
- Make presentations to foreign delegations and dignitaries to solicit "foreign direct investment" into California business ventures.
- Assist with implementing protocol for receiving foreign trade delegations visiting California.

Technical Skills

- Review and analyze Application(s) for Certification submitted to the California Energy Commission for proposed, utility-scale thermal power plant development.
- Manage the development of comprehensive environmental impact reports, in accordance with the California Environmental Quality Act, the Warren Alquist Act, the federal Clean Air Act and the federal Clean Water Act.
- Develop and maintain financial models for various business types: real estate development, resource development (forestry) and international trade (technology transfers).
- Work with the following software applications: Access, Excel, PowerPoint, Project and Word.

Legislation and Policy Analysis

- Review and analyze proposed legislation that could affect international trade and investment in California, and draft official Agency opinions.

Writing

- I've written weekly reports to the Governor's office (two years), business plans, letters, memos and environmental impact reports.

EMPLOYMENT HISTORY

October 2008 – Present	**Project Manager**	California Energy Commission; Siting, Transmission and Environmental Protection Division
May 1999 – April 2008	**Owner / Manager**	Various Real Estate Development Partnerships in California
Sept. 2001 – Nov. 2002	**Owner / Manager**	Technology Transfer Services
Nov. 1999 – August 2001	**Special Assistant to Deputy Secretary**	California Trade and Commerce Agency, International Trade and Investment Division

EDUCATION

California State University at Sacramento
Major: International Business
Minor: Economics

DECLARATION OF
MATTHEW S. LAYTON

I, Matthew S. Layton, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division as a Supervising Mechanical Engineer.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the greenhouse gas analysis in the Air Quality section for the Beacon Solar Energy Project Final Staff Assessment based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

MATTHEW S. LAYTON

Experience Summary

Twenty five years of experience in the electric power generation field, including regulatory compliance and modification; research and development; licensing of nuclear, coal-fired, peaking and combined cycle power plants; and engineering and policy analysis of regulatory issues.

Education

B.S., Applied Mechanics, University of California, San Diego.

Registered Professional Engineer - Mechanical, California.

Experience

1987-present – Senior Mechanical Engineer, Systems Assessment and Facilities Siting Division, California Energy Commission. Review and evaluate power plant proposals, identify issues and resolutions; coordinate with other agencies; and prepare testimony, in the areas of:

- Air quality resources and potential impacts, and mitigation measures;
- Public Heath; and
- Transmission Line Safety and Nuisance.

Prepared Commission demonstration project process; contributed to the Energy Technology Status, Energy Development, and Electricity Reports; Project Manager for demonstration projects; evaluated demonstration test plans, procedures, data and reports; disseminated test results; and managed research and development contracts.

1983-1986 -- Control Systems Engineer, Bechtel Power Corporation. Managed a multi-disciplined effort to environmentally qualify client's safety related nuclear plant equipment. Performed analyses, calculations and reviews against vendor test reports, NRC guidelines and plant normal and postulated accident conditions. Initiated purchase orders for testing and formulated test objectives and test plans. Developed and implemented plant equipment maintenance and surveillance program based on test results, vendor recommendations and industry operating experiences. Trained client in environmental qualification engineering analysis and equipment maintenance program. Prepared client for NRC audits and presentation.

1981-1983 -- Engineer, GA Technologies, Inc. Supervised design and procurement of full-scale test assembly used to evaluate design changes to operating reactor graphite core assembly. Conducted experiment to determine the relationship of graphite oxidation rate to water concentration, temperature, and helium pressure. Environmentally qualified essential and safety related nuclear power plant equipment to comply with NRC guidelines.

DECLARATION OF
Testimony of William Walters, P.E.

I**, William Walters,** declare as follows:

1. I am presently employed by Aspen Environmental Group, a contractor to the California Energy Commission, Systems Assessment and Facilities Siting Division, as a senior associate in engineering and physical sciences.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Air Quality** and **Visual Resources (Visible Plume Modeling Analysis)**, for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: July 27, 2009 Signed: _____

At: Agoura Hills, California

WILLIAM WALTERS, P.E.
Air Quality Specialist

ACADEMIC BACKGROUND
B.S., Chemical Engineering, 1985, Cornell University

PROFESSIONAL EXPERIENCE

Mr. Walters has over 20 years of technical and project management experience in environmental compliance work, including environmental impact reports, emissions inventories, source permitting, energy and pollution control research RCRA/CERCLA site assessment and closure, site inspection, and source monitoring,.

Aspen Environmental Group 2000 to present

Responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- **Engineering and Environmental Technical Assistance to Conduct Application for Certification Review for the California Energy Commission:**
  - Preparation and project management of the air quality section of the Staff Assessment and/or Initial Study and the visual plume assessment for the following California Energy Commission (CEC) licensing projects: Hanford Energy Park; United Golden Gate, Phase I; Huntington Beach Modernization Project (including Expert Witness Testimony); Woodland Generating Station 2; Ocotillo Energy Project, Phase I; Magnolia Power Project; Colusa Power Project; Inland Empire Energy Center; Rio Linda/Elverta Power Plant Project; Roseville Energy Center; Henrietta Peaker Project; Tracy Peaking Power Plant Project (including Expert Witness Testimony); Avenal Energy Project; San Joaquin Valley Energy Center (including expert witness testimony); Salton Sea Unit 6 Project (including expert witness testimony); Modesto Irrigation District Electric Generation Station (including expert witness testimony); Walnut Energy Center (including expert witness testimony); Riverside Energy Resource Center (including expert witness testimony); Pastoria Energy Facility Expansion; Panoche Energy Center; Starwood Power Plant; and Riverside Energy Resource Center Units 3 and 4 Project (in progress).
  - Preparation and project management of the visual plume assessment for the following California Energy Commission (Energy Commission) licensing projects: Metcalf Energy Center Power Project (including Expert Witness Testimony); Contra Costa Power Plant Project (including Expert Witness Testimony); Mountainview Power Project; Potrero Power Plant Project; El Segundo Modernization Project; Morro Bay Power Plant Project; Valero Cogeneration Project; East Altamont Energy Center (including expert witness testimony); Russell City Energy Center; SMUD Cosumnes Power Plant Project (including expert witness testimony); Pico Power Project; Blythe Energy Project Phase II; City of Vernon Malburg Generating Station; San Francisco Electric Reliability Project; Los Esteros Critical Energy Facility Phase II; Roseville Energy Park; City of Vernon Power Plant; South Bay Replacement Project; Walnut Creek Energy Park; Sun Valley Energy Project; Highgrove Power Plant; Colusa Generating Station; Russell City Energy Center; Avenal Energy Project; Carlsbad Energy Center; Community Power Project; Panoche Energy Center; San Gabriel Generating Station; Sentinel Energy Project; and Victorville 2 Hybrid Power Project.
  - Assistance in the aircraft safety review of thermal plume turbulence for the Riverside Energy Resources Center; Russell City Energy Center Amendment (including expert witness testimony); Eastshore Energy Power Plant (including expert witness testimony); Carlsbad Energy Center (in progress), Riverside Energy Resource Center Units 3 and 4 Project; Victorville 2 Hybrid Power Project; and the Blythe Energy Power

Plant and Blythe Energy Project Phase II (including expert witness testimony) siting cases. Assistance in the aircraft safety review of thermal and visual plumes of the operating Blythe Energy Power Plant. Preparation of a white paper on methods for the determination of vertical plume velocity determination for aircraft safety analyses.

- Preparation and instruction of a visual water vapor plume modeling methodology class for the CEC.
- Preparation and project management of the public health section of the Initial Study for the Woodland Generating Station 2 Energy Commission licensing project.
- Preparation of project amendment or project compliance assessments, for air quality or visual plume impacts, for several licensed power plants, including: Metcalf Energy Center; Pastoria Power Plant; Elk Hills Power Plant; Henrietta Peaker Project; Tracy Peaker Project; Magnolia Power Project; Delta Energy Center; SMUD Cosumnes Power Plant; Walnut Energy Center; San Joaquin Valley Energy Center; City of Vernon Malburg Generating Station; Otay Mesa Power Plant; Los Esteros Critical Energy Facility; Pico Power Project; Riverside Energy Resource Center; Blythe Energy Project Phase II; Inland Empire Energy Center; Salton Sea Unit 6 Project; and Starwood Power-Midway Peaking Power Plant.
- Preparation of the air quality section of the staff paper "A Preliminary Environmental Profile of California's Imported Electricity" for the Energy Commission and presentation of the findings before the Commission.
- Preparation of the draft staff paper "Natural Gas Quality: Power Turbine Performance During Heat Content Surge", and presentation of the preliminary findings at the California Air Resources Board Compressed Natural Gas Workshop and a SoCalGas Technical Advisory Committee meeting.
- Preparation of the staff paper "Emission Offsets Availability Issues" and preparation and presentation of the Emission Offsets Constraints Workshop Summary paper for the Energy Commission.
- Preparation of information request and data analysis to update the Energy Commission's Cost of Generation Model capital and operating cost factors for combined and simple cycle gas turbine projects. Additionally, performed a review of the presentation for the revised model as part of the CEC's 2007 Integrated Energy Policy Report workshops, and attended the workshop and answering Commissioner questions on the data collection and data analysis.

- For the **Los Angeles Department of Water and Power (LADWP)**:
  - Preparation of the Air Quality Inventory for the LADWP River Supply Pipeline Project EIR.
  - Project management and preparation of the Air Quality Section for the LADWP Valley Generating Station Stack Removal IS/MND support project.
- For the **U.S. Army Corps of Engineers (Corps)**:
  - Preparation of the Air Quality Section and General Conformity Analysis for the Matilija Dam Ecosystem Restoration Project EIS/R for the Corps.
  - Preparation of emission inventory and General Conformity Analysis of the Murrieta Creek Flood Control Project and the Joint Red Flag exercise to be conducted in the Nevada Test and Training Range.
  - Emission inventory for the construction activities forecast for the San Jose/Old San Jose Creeks Ecosystem Restoration project for the Corps.

- Other Projects:
  - Preparation of the Air Quality Section of the LAUSD New School Construction Program EIR and provided traffic trip and VMT calculation support for the Traffic and Transportation Section.

- Preparation of the draft staff paper "Natural Gas Quality: Power Turbine Performance During Heat Content Surge", and presentation of the preliminary findings at the California Air Resources Board Compressed Natural Gas Workshop and a SoCalGas Technical Advisory Committee meeting.
- Preparation of the Air Quality Section of the Environmental Information Document in support of the Coastal Consistency Determinations for the suspension of operation requests for undeveloped units and leases off the Central California Coast.
- Preparation of comments on the Air Quality, Alternatives, Marine Traffic, Public Safety, and Noise section of the Cabrillo Port Liquefied Natural Gas Deepwater Port Draft EIS/EIR for the City of Oxnard.
- Preparation of the emission estimates used in the Air Quality Sections for the DWR Tehachapi Second Afterbay Project Initial Study and EIR.

Camp Dresser & McKee, Inc. 1998 to 2000

Mr. Walters was responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- Preparation of emission inventories and dispersion modeling for criteria and air toxic pollutants for the Los Angeles International Airport Master Plan (LAXMP) EIS/EIR.
- Project Manager/Technical lead for the completion of air permit applications and air compliance audits for two Desa International fireplace accessory manufacturing facilities located in Santa Ana, California.
- Project manager/technical lead for the completion of Risk Management Plans (RMPs) for four J.R. Simplot food processing facilities in Oregon, Idaho, and Washington and the Consolidated Reprographics facility located in Irvine, California.

Planning Consultants Research 1997 to 1998

Mr. Walters was responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- Project Manager for a stationary source emission audit of the entire Los Angeles International Airport complex for Los Angeles World Airports (LAWA) in support of the LAXMP.
- Review of the Emission Dispersion Modeling System (EDMS) and preparation of a report with findings to the Federal Aviation Administration for LAWA in support of the LAXMP.
- Project manager for the ambient air monitoring and deposition monitoring studies performed for LAWA in support of the LAXMP, including the selection of the monitoring sites and specialty subcontractor, and review of all monitoring data.

Aspen Environmental Group/Clean Air Solutions 1995 to 1996

Mr. Walters was responsible as lead technical and/or project manager of environmental projects. Specific responsibilities and projects include the following:

- Manager of the Portland, Oregon, office of Clean Air Solutions from March 1995 to December 1995, with responsibilities including Project Management, Business Development, and Administration.
- Control technology assessment, engineering support and Notice of Intent to construct preparation for J.R. Simplot's Hermiston, Oregon, food processing facility. Review and revision of an Air Contaminant Discharge Permit application, Title V permit application, and PSD modeling analysis for J.R. Simplot's Hermiston facility.

- Air quality compliance report including an air emission inventory, regulation and permit compliance determination, and recommendations for compliance for Lumber Tech, Inc.'s Lebanon, Oregon, wood products facility.

Fluor Daniel, Inc. 1990 to 1995 and 1996 to 1997

Mr. Walters was responsible as lead technical or project manager for major environmental projects for both government and private clients. His projects included:

- Prepared several air permit applications for the ARCO Los Angeles Refinery Polypropylene Plant Project; Phase I environmental assessments for properties located in Southern California; and a site investigation and RCRA closure plan for a hazardous waste storage site in Vernon, California.
- Project manager of the Anaconda Smelter site for the U.S. Environmental Protection Agency's (EPA) Alternative Remedial Contract System (ARCS) project during the conclusion of technical activities and project closeout. Prepared a cost recovery report for the project.
- Performed environmental analysis for the Bonneville Power Authority, including air pollution BACT analysis, wastewater analysis, and evaluation of secondary environmental effects of electric power producing technologies.

Jacobs Engineering Group 1988 to 1990

Mr. Walters was responsible for a wide range of air pollution regulatory and testing projects, including the following:

- Project manager of air toxic emission inventory reports prepared for U.S. Borax's boron mining and refining facility and the Naval Aviation Depot (N. Island Naval Base, San Diego, California).
- Prepared air permit applications and regulatory correspondence for several facilities including the U.S. Department of Energy's Feed Material Production Center uranium processing facility in Fernald, Ohio; Evaluation of a sludge dewatering process at Unocal's Wilmington, California, Refinery; and United Airlines blade repair facility at the San Francisco Airport.
- Characterized and quantified air emissions for offshore oil and gas development activities associated with Federal oil and gas Lease Sale 95, offshore southern California, for the U.S. Minerals Management Service.

CERTIFICATIONS

- Chemical Engineer, California License 5973
- CARB, Fundamentals of Enforcement Seminar
- EPA Methods 1-8, 17; Training Seminar

AWARDS

- California Energy Commission Outstanding Performance Award 2001

DECLARATION OF
Carolyn A. Chainey-Davis

I**, Carolyn A. Chainey-Davis,** declare as follows:

1. I am presently under contract with Aspen Environmental Group to provide environmental technical assistance to the California Energy Commission. Under Contract No. 700-05-002, I am serving as a Biological Resource Specialist (Associate level) to provide Peak Workload Support for the Energy Facility Siting Program and for the Energy Planning Program.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Biological Resources** for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 10, 2009 Signed: _____

At: Nevada City, California

Carolyn Chainey-Davis, botanist

Ms. Chainey-Davis is a botanist specializing in the flora of California, with emphasis on cismontane California and the Great Basin and Mojave Desert regions. Ms. Chainey-Davis has nearly 20 years experience conducting biological inventories and impact assessments, rare plant and noxious weed surveys, large-scale vegetation mapping, wetland delineations, large-scale watershed assessments, designing and implementing mitigation, monitoring, and restoration plans. Her field experience includes a diverse group of clients and projects from large transmission and hydro relicensing projects to small, local urban and residential development projects, local, state and federal agencies, resource conservation organizations, landfill and mine reclamation projects, and many more. She led Garcia and Associates (GANDA) botanical studies for the PG&E Stanislaus River, Upper North Fork Feather River, Pit River, Bucks Lake and Poe hydro-relicensing projects, Transmission Separation project, Lower Owens River riparian monitoring, and hundreds of other large and small projects around the state.

Ms. Davis is past President of the California Native Plant Society, Nevada and Placer County Chapter and is a co-author of the recently published field guide "*Wildflowers of Nevada and Placer Counties*", published by the California Native Plant Society. Ms. Davis completed her wetland training at Portland State University and is certified for conducting wetland delineations based on the U.S. Army Corps of Engineers Wetland Delineation Manual. Ms. Chainey-Davis is skilled in the use of Trimble GeoExplorer series Global Positioning (GPS) equipment. As a botanist, she apprenticed for several years under some of the state's leading botanists, vegetation and wetland ecologists, including Robert Holland. Ms. Davis' continuing education includes several annual intensive botanical workshops through the U.C. Berkeley Jepson Herbarium, including identification workshops in the genus *Carex*, and the plant families Poaceae, Asteraceae, Apiaceae, and Boraginaceae, Polygonaceae, and Bryophytes.

A Sampling of Project Experience

Project: **Lower Owens River Monitoring Program**
Client: **Ecosystem Sciences**
Designed long-term monitoring program for collecting and analyzing data on riparian habitat and key wildlife habitat characteristics on 62 miles of the Lower Owens River. Directed field efforts to collect baseline data at 350 sites. Future monitoring, conducted after the initiation of appropriate flow and land management practices, will be compared against the baseline to determine if changes resulting from proposed restoration efforts (augmented stream flows) are consistent with the LORP goals and objectives.

Project: **Open ended Contract for Biological Services**
Client: **Southern California Edison (SCE)**
Led botanical studies (vegetation mapping, habitat asssessments, etc.) in support of various SCE construction and relicensing projects in the central and southern Sierras, Sierra east slope and Great Basin region, and the eastern edge of the San Joaquin Valley.

Project: **Stanislaus River Hydroelectric Project Relicensing Studies**
Client: **Pacific Gas and Electric Company, Technical and Ecological Services**
Led field efforts to conduct floristically-based botanical studies for the Federal Energy Regulatory Commission relicensing of four hydroelectric and transmission line projects located on the Stanislaus River, Stanislaus National Forest. Riparian and watershed vegetation mapping and sampling, special-status plant surveys, noxious weed mapping, and identify and map culturally significant Native American botanical resources for local tribes in support of the Federal Energy Regulatory Commission relicensing process. Prepared draft and final reports.

182 Grove Street Nevada City, CA 95959 [ph] 530.478.1963 [cell] 530.205.6218 bighair60@att.net

Project: **Kern River Natural Gas Pipeline**
Client: **Garcia and Associates**
Led Garcia and Associates botanical staff and conducted floristically-based special status plant surveys for the Daggett and Goodsprings segments of the interstate pipeline.

Project: **Owens Lake Dust Control Project**
Client: **CH2M Hill**
Conducted two years of floristically-based special status plant surveys and wetland delineations for the Los Angeles Department of Water and Power Owens Lake Dust Control mitigation project.

Project: **Pit River Hydroelectric Project Relicensing Studies**
Client: **Pacific Gas and Electric Company, Technical and Ecological Services**
Led field efforts to conduct floristically-based special status plant surveys, noxious weed surveys, upland habitat mapping, and riparian vegetation classification and mapping for PG&E's Pit 3, 4, and 5 hydroelectric project in Shasta County in support of the Federal Energy Regulatory Commission relicensing process. Prepared draft and final reports.

Project: **Upper North Fork Feather River and Poe Hydroelectric Projects, Lake Almanor Habitat Management Plan**
Client: **Pacific Gas and Electric Company, Technical and Ecological Services**
Led field efforts to conduct floristic surveys for special-status plant species and noxious weeds on the Upper North Fork Feather River (Plumas and Lassen National Forests) and Poe Project Included GIS-based riparian and upland vegetation mapping in support the Federal Energy Commission relicensing process. Prepared draft and final reports. Also conducted detailed mapping of the wet meadows around Lake Almanor and prepared a long-term habitat managment plan for meadow resources and willow flycatcher habitat.

Project: **Transmission Separation Project**
Client: **Foster Wheeler Environmental Corporation**
Led field efforts to conduct floristically-based special-status plant surveys and noxious weed surveys in the spring and summer of 2000 for Foster Wheeler Environmental Corporation for the PG&E Transmission Separation Project. GANDA botanists conducted surveys on selected transmission line segments and their associated access roads on USDA Forest Service (USFS) lands in the Plumas, Shasta-Trinity, Tahoe, and Eldorado National Forests, created GIS-based vegetation and noxious weed maps, and analyzed potential threats to special-status plant populations. Prepared draft and final reports.

Project: **Nevada and Placer County projects – large and small subdivisions, infrastructure development, etc.**
Client: **Susan Sanders Biological Consulting and Beedy Environmental Consulting**
Conducted biological inventory and impact analyses and prepared mitigation plans for over 100 large and small subdivisions and infrastructure development projects in Nevada and Placer County. Lead writer and botanist. All projects included vegetation mapping, habitat assessments, floristic surveys, and mitigation planning. Prepared detailed habitat management plans and recreation/ trail plans for over a thousand acres of open space.

Project: **Bear Valley Meadow Restoration**
Client: **American Rivers**
Sample design and long-range monitoring design and protocol for a large-scale meadow restoration project in Placer County. Included detailed vegetation mapping, conducting baseline inventory, and preparing report on sample design and results of baseline monitoring.

Project: **Dog Ranch-Salmon Creek Conservation Project**
Client: **Robert Holland/Geobotanical Phenominology**
Conducted endangered species surveys and documented over 300 occurrences of special status plants (using Trimble data dictionary and population sampling protocol) for a proposed conservation easement/land swap on a 400+ acre ranch in Humboldt County on the Samoa Peninsula.

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Project: **Field Guide to *Epilobium* in the Sierra Nevada, Tahoe National Forest**
Client: **U.S.D.A. Forest Service, Tahoe and Inyo National Forests (Open-ended Contract)**
Conducted surveys for rare *Epilobiums* at seven sites in the Tahoe and Inyo National Forests and prepared a field guide to all *Epilobiums* in the Sierra Nevada with illustrations and keys to identification. The field guide was geared to USFS field crews and volunteers. The goal was to produce a 'field-friendly' guide to a group of plants notoriously difficult to identify in the field. Research included a herbaria review.

Project: **Shirttail Creek Conservation Easement**
Client: **Beedy Environmental Consulting for Conservation Biology Institute**
Conducted biological inventory and conservation assessment for 800-acre property on Shirttail Creek in the American River watershed using protocol developed by The Nature Conservancy for conservation planning. Lead writer and botanist.

Project: **Natural Heritage 2020 Nevada County Watershed Assessment**
Client: **County of Nevada and Sierra Business Council**
Lead botanist for a countywide watershed and ecosystem assessment. A two-year process funded by the Sierra Business Council and the County of Nevada to create a GIS database and biotic inventory of the county's natural habitats and wildlife resources, including an assessment of vegetation, special status and invasive for 98 sub-watershed basins in the county. Duties included verifying the accuracy of more than 40 countywide GIS data themes, including information on the extent and distribution of major vegetation cover types, agriculture, development, and infrastructure. Assessed the extent and quality of each of the county's ecosystem types and their suitability or occurrence potential for special-status plants and animals. Mapped, photo-logged, described and collected GPS coordinates for small-patch or sensitive vegetation communities encountered, such as fens, ephemeral or perennial wetlands, marshes, vernal pools, serpentine and gabbro habitats, etc.

Project: **Special Status Plant Surveys and Habitat Mapping for Rock Creek/Cresta Hydroelectric**
Client: **Pacific Gas and Electric Company, Technical and Ecological Services**
Conducted floristically-based special status plant surveys and habitat mapping for PG&E's Rock Creek-Cresta hydroelectric facility project area, including transmission lines and associated project facilities and roads. The hydro facility is located on the North Fork of the Feather River near Oroville; the associated transmission line extends 72 miles south and traverses portions of Plumas, Butte, Yuba and Sutter counties.

Project: **Travis Air Force Base Vernal Pool Study**
Client: **CH2M Hill**
Conducted floristically-based special status plant surveys, wetland delineation and habitat-ranking of natural and artificially-created pools at Travis Air Force Base in Fairfield.

Project: **Beale Air Force Base Best Slough Mitigation**
Client: **CH2M Hill**
Conducted floristically-based special status plant surveys, and wetland delineation of vernal pools and other seasonal wetlands at the Best Slough Super Fund site at Beale Air Force Base in Yuba County.

Project: **Osborne Hill Open Space Habitat Management Plan**
Client: **Susan Sanders Biological Consulting**
Prepared a detailed, goal-driven long-range habitat management plan for 250 acres of open space for a residential development in Nevada County. Included guidelines for forest management to promote old-growth conditions, fules management specifications, habitat management specifications, and designs and implementation plan for recreational trails, educational signage, and formation of an independent non-profit land trust to manage the open space. Prepared similar plans for several other residential developments in Nevada County.

Project: **Ragsdale Creek Setback Study**
Client: **Susan Sanders Biological Consulting & County of Nevada**
Identified, described, and mapped important biological resources on an urban stream in Nevada County and recommended appropriate development setbacks to avoid/minimize impacts, assessed potential impacts to the creek as a result of adjacent development, and recommended mitigation measures to reduce impacts. Coordinated with County GIS Department in production of map of sensitive resources, and presented results of study to citizen advisory committee.

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DECLARATION OF
Richard L Anderson

I**, Richard L Anderson,** declare as follows:

1. I am presently under contract with Aspen Environmental Group to provide environmental technical assistance to the California Energy Commission. Under Contract No. 700-05-002, I am serving as a Biological Resource Specialist and Project Manager to provide Peak Workload Support for the Energy Facility Siting Program and for the Energy Planning Program.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Biological Resources** for the **Rosemond Water Pipeline Alternative Route** for the **Beacon Solar Energy Project** based on my independent analysis of the route, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 10, 2009 Signed: _____

At: Davis, California

RICHARD L. ANDERSON

2850 Layton Dr.
Davis, CA 95616
530.758.4672
Danderson@cal.net

EDUCATION

1976	B.S. Biological Sciences, University of California at Davis

EXPERIENCE

March 2005 - Present	Biological Resources, water Resources and soil resources consulting related to energy production.
March 2001 – March 2005	Energy Facilities Siting Planner lll---Supervised the Biology, Water, and Soil Resources Unit of the Systems Assessment and Facilities Siting Division of the California Energy Commission. Responsible for biology, water, and soil staff and related products regarding energy planning, policy, and siting.
August 1979 - March 2001	Planner l and Planner ll---Staff Biologist, California Energy Commission Develop and review planning and policy objectives for California's energy facility siting program. Work on interdisciplinary teams responsible for review and preparation of Environmental Impact Reports, environmental planning projects, and locational analyses. Provide expert testimony in the area of biological resources. Act as project manager and contract manager for field research. Organize and direct workshops. Survey existing and proposed energy facility sites. Coordinate biological resource issue evaluation and mitigation planning with Federal, State; and local agencies and other interested parties. Managed several complex multi-year research projects.
October 1977- July 1979	Environmental Specialist ll, California State Water Resources Control Board Responsible for environmental documents produced in the Division of Water Right's application unit. Analyzed and evaluated impacts of direct diversion and/or water storage (reservoir) on the environment. Coordinated and communicated with other State, Federal and local agencies, and the general public. Trained new employees.

PROFESSIONAL AFFILIATIONS/ CERTIFICATION	Raptor Research Foundation The Wildlife Society---Certified Wildlife Biologist, TWS American Ornithological Union Coopers Society American Field Ornithologists Swainson's Hawk Technical Advisory Committee International Erosion Control Association National Wind Coordinating Committee
PUBLICATIONS	Author of numerous staff biological and water resources testimonies for the California Energy Commission of energy projects throughout the state including desert projects to marine biology and water quality issues associated with once-through cooling power plants. Author of numerous environmental assessments for water diversion and impoundment projects. Author of numerous reports and papers regarding conservation of T&E species, wind energy/bird interactions, and standard metrics and methods for monitoring bird interactions with wind turbines/utility structures.

DECLARATION OF
Susan D. Sanders

I**, Susan D. Sanders,** declare as follows:

1. I am presently under contract with Aspen Environmental Group to provide environmental technical assistance to the California Energy Commission. Under Contract No. 700-05-002, I am serving as a Biological Resource Specialist and Project Manager to provide Peak Workload Support for the Energy Facility Siting Program and for the Energy Planning Program.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Biological Resources** for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 24, 2009 Signed: _____

At: Nevada City, California

Susan Sanders Biological Consulting

12213 Half Moon Way
Nevada City, California 95959
Phone: (530) 477-7415 Fax: (530) 477-7580
ssanders55@comcast.net

RESUME OF SUSAN SANDERS

EDUCATION

Ph.D.	Zoology	University of California, Davis (1983)
M.A.	Zoology	University of California, Davis (1979)
B.A.	Zoology	University of California, Berkeley (1976)

REGULATORY COMPLIANCE EXPERTISE in coordination with state, federal, and local agencies in the environmental review process for projects regulated by the California Environmental Quality Act, National Environmental Policy Act, Federal and State Endangered Species Acts, National Fish & Wildlife Coordination Act, Clean Water Act, and California Coastal Act. Also experienced in providing technical support and agency coordination for license and permit applications.

TECHNICAL EXPERTISE in surveys for threatened and endangered wildlife species; biological inventories; preparation of Biological Assessments; habitat management plans; raptor surveys; wildlife habitat assessment; mitigation monitoring; expert testimony; constraints analysis; sensitive species research.

CONSULTING EXPERIENCE (1982 - 2009)

CALIFORNIA ENERGY COMMISSION TECHNICAL ASSISTANCE (2005 – 2009)

Siting Work: Reviewed Applications for Certification; prepared Data Adequacy Forms, Data Requests, Preliminary and Final Staff Assessments; participated in PSA Workshops and provided testimony at Evidentiary Hearings; organized and conducted issue resolution workshops and interagency conference calls to resolve complex and controversial biological resource issues; coordinated extensively with local, state and federal agencies, including California Department of Fish and Game, U.S. Fish and Wildlife Service, Regional Water Quality Control Board, U.S. Army Corps of Engineers, and Bureau of Land Management. Projects include:

- **Beacon Solar Energy Project** - Beacon Solar LLC (08-AFC-2)
- **Orange Grove Energy** - J Power USA (08-AFC-4)
- **Ivanpah Solar Electric Generating System -**BrightSource (07-AFC-5)
- **MMC Chula Vista Expansion** - MMC Energy Inc. (07-AFC-4)
- **Eastshore Energy Center** - Eastshore Energy, LLC / Tierra Energy (07-AFC-5)
- **Pastoria Phase 2 Expansion Project** - simple cycle addition - Calpine (05-AFC-1)
- **San Francisco Reliability Project** - City of SF (04-AFC-1)

Avian Specialist for Renewable Energy Issues: Since 2005 provided Energy Commission staff with technical expertise as an avian specialist on wildlife interactions with wind turbines and other utility structures. Activities/publications include the following:

- **Wind-Wildlife Guidelines:** Co-authored *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development in California* published by the Energy Commission in September 2007; helped organize and coordinate this statewide effort to develop science-based protocols for pre-and post-construction monitoring methods to

assess the effects of wind energy development on birds and bats. Worked closely with siting, PIER, and legal staff from Energy Commission and California Department of Fish and Game; coordinated the efforts of an eight-member Science Advisory Committee, helped organize and conduct public workshops, worked with wind energy developers, non-governmental organizations, and other stakeholders on this collaborative effort. <www.energy.ca.gov/windguidelines/index.>

- **Guidelines Implementation:** Working with CDFG and Energy Commission staff since 2007 on training for and implementation of the *Guidelines*. Conduct monthly interagency conference calls, helped organize and conduct two training workshops for CDFG, worked with CDFG headquarters and regional staff to develop a draft white paper: *Recommended Compensatory Mitigation Approaches for Reducing Unavoidable Impacts to Biological Resources from Wind Energy Development*. Co-author or on-line *Frequently Asked Questions about the Guidelines* <www.dfg.ca.gov/habcon/energy/wind>

- **Renewable Energy Research for PIER:** Prepared: *A Roadmap for PIER Research on Methods to Assess and Mitigate Impacts of Wind Energy Development on Birds and Bats in California* (Sanders and Spiegel 2008). This roadmap summarizes the current state of knowledge on the impacts of wind energy on birds and bats, and describes research that will improve the biological assessment, mitigation, and monitoring of wind energy projects in California. Currently working with PIER staff to oversee disbursement of $2.25 million in grant money to address Terrestrial resources Energy Research (PON 08-003) and to monitor and manage this research. Continuing work to develop an annotated bibliography of publications relating to research on wildlife interactions with wind turbines. </www.energy.ca.gov/publications/search>

CONSULTING PROJECTS WITH CEQA/NEPA COMPLIANCE

Commerical/Industrial/Linear Projects. Prepared biological resource sections of Environmental Impact Reports/Statements, Initial Studies, and Environmental Assessments for hundreds of commercial, industrial, and residential developments, water projects, transportation and other linear projects throughout California. Conducted wildlife and plant community surveys, habitat assessments, agency coordination, data analysis and report preparation. Secured permits for 1600 Streambed Alteration Agreements from California Department of Fish and Game, Section 404 Permits from U.S. Army Corps of Engineers, and 401 Permits from Regional Water Quality Control Board. Some representative projects involving linear facilities include:

- Western Area Power Administration North Area Right of Way Maintenance Project;
- Pacific Bell Route 101 Fiber Optic Cable, Kern County;
- Laguna Creek Interceptor and Sewer Alignment Constraints Study, Sacramento County;
- Roseville Water Facilities Project, City of Roseville, Placer County;
- South Branch 60 kV Pole Line Project, Roseville, Placer County;
- Smith-Moulton Pipeline Project, Nevada County;
- Lower Laguna Drainage Master Plan, Sacramento County;
- Natomas Ditch Abandonment and Pipeline Construction Project, Sacramento County;
- Tuolumne River Wildlife Studies for FERC License, Tuolumne County;
- Calabazas Creek Flood Control Project, Santa Clara County.

Transportation Projects. Prepared Caltrans Natural Environment Study Reports, Biological Assessments, Categorical Exemption/Exclusions, Preliminary Environmental Study Forms, and other documentation for over 50 projects, including bridge replacements, interchange modifications, seismic retrofits, road widenings, emergency storm damage repairs, and other transportation projects in Caltrans Districts 1, 2, 3, 4, 5, 6, and 10. Involved extensive coordination

with federal agencies (Federal Highway Administration, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers) state (California Department of Fish and Game, Regional Quality Control Board, State Lands Commission, Coastal Commission), and cities and counties. Some representative projects include:

- SR 101/Prado Rd. Interchange Improvement Project, San Luis Obispo County;
- I-580/Isabel Avenue Interchange Project, Livermore, Alameda County;
- Route 99/Route 120 East Interchange Project, Manteca, San Joaquin County;
- Route 1 Improvement Project, Sand City to Seaside, Monterey County;
- Northeast Area Transportation Plan, Constraints Analysis, Sacramento;
- Route 92 Widening, Half Moon Bay, San Mateo County;
- Route 99/Hammer Lane Interchange Improvements, Stockton, San Joaquin County;
- La Gonda Way/Paraiso Drive Bridge Seismic Retrofit, Danville, Contra Costa County;
- HOV Lane Construction, US 50, Sunrise to El Dorado Blvd., Sact/El Dorado Co;
- Emergency Storm Damage Repair, Routes 49 and 89, Sierra and Nevada Counties;
- Interstate 5 - Benjamin Holt/Hammer Lane Interchange project, San Joaquin County;
- State Route 113/Interstate 5 Connector Study, Woodland, Yolo County, California;
- State Route 50/Folsom Interchange Improvement Project, Sacramento County.

Compliance Monitoring. Supervised the design and ongoing monitoring of wetland and sensitive species mitigation projects, including riparian revegetation, vernal pool creation, and mitigation banking. Some projects involved preparation of a Habitat Mitigation and Monitoring Plan, and long-term monitoring efforts (five years plus), as well as preparation of annual reports, and coordination with US Army Corps of Engineers, US Fish and Wildlife Service, California Department of Fish and Game, California Department of Transportation, Regional Water Quality Control Board, and the US Environmental Protection Agency. Projects include:

- State Route 99/Calvine Interchange Vernal Pool Vegetation and Fairy Shrimp Mitigation Monitoring, Sacramento County;
- Roseville Sanitary Landfill Riparian Revegetation Project, Roseville, Placer County;
- Burrowing Owl Mitigation Monitoring, Meadowview, Sacramento County;
- Wilbur Avenue Overhead Project, Habitat Restoration for Lange's Metalmark Butterfly, Antioch, Contra Costa County;
- Swainson's Hawk Nest Monitoring, Garden Highway, Sacramento, Sacramento County;
- Sierra College Boulevard Riparian Revegetation Monitoring, Roseville, Placer County;
- Potrero Hills Landfill Bird Deterrence Monitoring, Solano County;
- State Route 50/Folsom Boulevard Improvement Project, Beach Lakes Mitigation Bank;
- Niblick Bridge Riparian Revegetation and Mitigation Monitoring, San Luis Obispo County;
- Humboldt Lily Mitigation Monitoring, Eskaton Village, Nevada County
- Dark Horse Mitigation Monitoring, Nevada County.

***Federal Land Exchanges*:** Prepared Biological Assessments/Evaluations for USDA Forest Service land exchanges in the Plumas National Forest, including the 11,000-acre Soper-Wheeler Company land exchange, a two-year project requiring management of eight employees and several subconsultants for surveys of rare plants, California spotted owls, northern goshawks, California red-legged frogs, and other sensitive species. Other projects include the Crites Mineral Fraction Land Exchange and the Saunders Land Exchange, Plumas National Forest.

Litigation Support/Expert Witness. Provided technical assistance to project attorneys, prepared declarations, and expert testimony for the following litigation:

- El Portal Road Improvement Project (Sierra Club *et al. vs*. National Park Service);
- Merced River Plan (Sierra Club *et al. vs.* National Park Service);
- Lower American River Instream Flows. (Friends of the American River v. EBMUD);
- Putah Creek Instream Flows. (Putah Creek Council V. Solano Irrigation District et al.).

PUBLICATIONS

Sanders, S. D. and L. Spiegel. 2008. *A Roadmap for PIER Research on Methods to Assess and Mitigate Impacts of Wind Energy Development on Birds and Bats in California.* Consultant Report, Prepared for the California Energy Commission. CEC-500-2008-076 October 2008

California Energy Commission and California Department of Fish and Game. 2007. *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development.* Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. Prepared by D. Anderson, S. Flint, S. Sanders, and D. Sterner. CEC700-2007-008-CMF.September 2007.

Beedy, E. C., S. D. Sanders, and D. A. Bloom. 1991. *Breeding status, distribution, and habitat associations of the tricolored blackbird* (*Agelaius tricolor*), 1850-1989. June 21, 1991. Jones & Stokes Associates (JSA 88-187.) Sacramento, CA. Prepared for USFWS, Sacramento, CA.

Flett, M. A. and S. D. Sanders. 1987. *Ecology of a Sierra Nevada population of Willow Flycatchers*. Western Birds. 18:37-42.

Fowler, C., B. Valentine, S. Sanders, and M. Stafford. 1991. *Habitat Suitability Index Model: Willow Flycatcher* (*Empidonax traillii*). USDA Forest Service, Tahoe National Forest.

Harris, J. D., S. D. Sanders, and M. A. Flett. 1987. Willow Flycatcher surveys in the Sierra Nevada. Western Birds. 18:27-36.

Sanders, S. D. and M. A. Flett. 1989. *The ecology of a Sierra Nevada population of Willow Flycatchers (Empidonax traillii), 1986 and 1987*. California Management Branch Administrative Report No. 89-3, California Department of Fish and Game.

Sanders, S. D. 1983. *Foraging Ecology of a Sierra Nevada population of Douglas Tree Squirrels* (*Tamiasciurus douglasii*). Ph.D. Dissertation, University of California, Davis

DECLARATION OF
Amanda Blosser

I, Amanda Blosser, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting Office of the Energy Facilities Siting Division as a Cultural Resources Specialist (Planner II).

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I have contributed to the Cultural Resources Section for the Beacon Solar Energy Project Final Staff Assessment and based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge agree with the staff conclusions and I am willing to testify in support of these conclusions.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

Amanda Blosser

Planner II, California Energy Commission
1516 9th Street
Sacramento, CA 95814
916.654.4884
Ablosser@state.energy.ca.gov

Summary of Qualifications

Ten years experience in the field of historic preservation and cultural resource management. Expertise includes survey of architectural and engineering resources, assessment of effects on historic resources, and preparation of local and state landmark applications.

Professional Experience

California Energy Commission, Planner II, Environmental Office-Facilities Siting, May 2008-present.

Perform technical analysis for complex facility siting cases and planning studies in the area of cultural resources for Applications of Certification and Small Power Plant Exemptions.

California Office of Historic Preservation, Staff Historian II/, Project Review Unit, November 2005- present.

Major responsibilities include reviewing and providing comment, both from an academic and regulatory perspective, on project impacts to cultural resources, assessment of adequacy of reports prepared for review, recommending revisions to submission, and prepare agreement documents to resolve adverse affects to cultural resources, assists federal agencies in completing compliance with National Historic Preservation Act.

JRP Historical Consulting Services, Staff Historian II/Architectural Historian II, October 16, 2001- present.

Major responsibilities include inventory and evaluation of historic resources, preparation of environmental documents and other reports regarding compliance with state and federal environmental regulations and policies, undertaking site specific and general historical research, writing and compiling physical descriptions and integrity assessments of historic resources for historic property surveys, prescribing mitigation measures for historic resources as necessary and completing mitigation measures, assisting or training other staff in historical research methods and techniques. Other work related experience includes client and review agency coordination, project management, approaches, project budgets and schedules, proposals for projects, managing multiple projects and staff members, interaction with clients and various federal, state, and local agencies and the public.

Independent Architectural Historian and Preservation Planner, August 15, 1999-September 15, 2001.

Projects while an independent contractor encompassed preparation of small inventory and evaluation and historic architecture survey reports for city planning organizations and other municipal agencies, preparation of National Register of Historic Places nomination forms,

Amanda Blosser

Planner II, California Energy Commission
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preparation of Federal Tax Credit applications, and authoring land use histories. Additional project work included participating in design guideline recommendations for historic resources during master planning process.

Student Intern, Colonial Williamsburg, Architectural History and Material Conservation Departments, January 21, 1999-April 15, 1999.
Responsibilities included completion of research tasks for staff, undertaking paint analysis, conservation of objects, and preparation of written documentation. All work was undertaken under supervision of Architectural Historians and furniture conservators.

Ft. Davis National Historic Site, Student Architectural Conservator, June 15, 1998-August 15, 1998.
Responsibilities included preparation of written and photographic documentation, conducting condition assessments, undertaking plaster and paint stabilization and consolidation for historic structures within the Ft. Davis National Historic site. All work was undertaken in conjunction with additional architectural conservators and student architectural conservators.

Teaching Assistant, Texas Tech University, Architecture History, January 21, 1998 - May 15, 1998.

Education

Bachelor of Arts in Art History, University of Texas, Austin, 1995.
Undergraduate Deans' Research Scholarship Recipient, 1995.

Master of Science in Architecture, Historic Preservation, Texas Tech University, 1999.
Thesis: *Paint Analysis at Colonial Williamsburg, An Evolution of Technique*.

Los Rios Community College, GIS Applications certificate, currently enrolled.

Professional Memberships and Community Activities

Vice-President, Northern California Chapter of the Society of Architectural Historians.

Presenter, "Restoring Wood Windows," September 2005, 2006, 2007 at various locations.

Presenter, "Researching Your Historic Property," *Fainted Ladies Restoration Seminar*, October 16, 2004.

Society of Architectural Historians.

California Garden and Landscape History Society.

DECLARATION OF
Beverly E. Bastian

I, **Beverly E. Bastian**, declare as follows:

1. I am presently employed by The California Energy Commission in the **Siting, Transmission, and Environmental Protection Division** as a **Planner II**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Cultural Resources,** for the Beacon Solar Energy Project, based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 10, 2009 Signed: _____

At: Sacramento, California

Beverly E. Bastian
1516 Ninth Street MS 40
Sacramento, CA 95814-5504
(916) 654-4840 email: bbastian@energy.state.ca.us

Education	Field	Degree	Year
University of California, Davis	Anthropology	B.A	1967
University of California, Davis	Anthropology	M.A	1969
Tulane University	Anthropology	A.B.D.	1975
University of Mississippi	American History	(courses only)	1989
University of California, Santa Barbara	Public (American) History and Historic Preservation	A.B.D.	1996

Experience

State of California, California Energy Commission *2005 to present*
Planner II, Siting, Transmission, and Environmental Protection Division, Environmental Office, Biological and Cultural Unit
All tasks related to the production of the cultural resources sections of CEQA-equivalent (California Environmental Quality Act) documents for the environmental review of proposed 50-MW+ power plants in California, including: Evaluating data in applications; writing data requests to applicants and doing independent research to compile an inventory of and evaluate the historical/cultural significance of cultural resources subject to significant impacts from proposed projects; providing and receiving information in public hearings on applications; analyzing all pertinent data; writing Staff Assessments of impacts; identifying California Register of Historical Resources-eligible cultural resources; developing mitigation measures to reduce to insignificant any impacts to Register-eligible cultural resources; providing expert testimony on my analyses and recommendations in public hearings; and reviewing compliance with mitigation measures during the construction, operation, and decommissioning of certified power plants. Additional tasks include: providing prefiling assistance to applicants; coordinating environmental review of power plant projects with cultural resources specialists in sister state agencies and in federal agencies; supervising and reviewing the work of Commission cultural resources consultants; reviewing the CEQA documents of sister state agencies; and developing internal procedures and guidelines to improve cultural resources review of applications.

State of California, Department of Parks and Recreation *2001 to 2005*
Historian II, Cultural Resources Division, Cultural Resources Support Unit
Major and complex historical and historic architectural investigations and studies dealing with the significance, integrity, and management of historic buildings, structures, and landscapes in California's state parks; participation in interdisciplinary teams and project assignments; preparation of technical reports and correspondence; inventorying and evaluating historic properties; coordinating the statewide registration of historical properties; assessing the eligibility of historic properties to the National Register of Historic Places and the California Register of Historical Resources; reviewing environmental documents and providing technical analyses of major Departmental projects to determine impacts to cultural resources under State and federal laws; identifying resource issues and constraints; establishing allowable use and development guidelines; developing approaches to protect, enhance, and perpetuate cultural resources under relevant State and federal laws, regulations, and standards; proposing and developing programs, policies, and budgets to meet Department's historic preservation missions.

Department of Social Sciences, American River College *2000 to 2002*
Instructor (part-time), American History
Creation and presentation of classroom lectures, selection of assigned texts and readings, creation and administration of quizzes and examinations, assignment and supervision of student research papers, student consultation in office hours, grading of all quizzes, tests, and papers, and assigning final student grades. These research, organizing, and teaching skills demonstrate ability to organize information, to speak effectively to the public, and to train and direct other personnel.

Department of Sociology and Anthropology, University of Mississippi *1987 to 1989*
Archaeologist, Center for Archaeological Research
All tasks for the completion of the historical archaeological part of an archaeological survey and testing program final report related to a U. S. Army Corps of Engineers erosion control project in twelve north-central Mississippi counties, including: Coordinating the activities of a field crew and the research of historians working in archives; setting up an artifact database using survey data to generate statistical summaries for discovered historical archaeological sites; gathering historical settlement and land-use data for twelve counties; conducting a special statistical analysis and synthesis of historical data only, focusing on pre-and post-Civil War land tenure and agricultural production for plantations in two counties where soil fertility contrasted; synthesizing data from all sources, collaborating on the final cultural resources management report with archaeologists specializing in prehistory and survey and sampling methodology; presenting findings at the annual meeting of the Society for Historical Archaeology in 1989.

Gilbert Commonwealth, Inc. *1984 to 1987*
Historical Archaeologist and Project Manager, Environmental Unit
All tasks as Principal Investigator for six major historical archaeological and/or historical architectural cultural resources management projects done under contract to federal, state, and local governments, including: Writing winning proposals for these projects; negotiating and managing project budgets; gathering/supervising the gathering of historical, oral historical, and archaeological data; analyzing/supervising the analysis of gathered data; and writing/supervising the writing of reports of findings, along with the creation of maps, illustrations, and data tables for these reports; serving as the historian and historical preservationist on several multidisciplinary teams tasked with siting the routes for several major power lines in east Texas.

Tennessee Valley Authority (personal services contract) *1979 to 1981, 1983-1984*
Historical Archaeologist (self-employed)
All tasks as Principal Investigator for various cultural resources management projects in areas affected by TVA construction, the most significant of which were: the complete excavation of and report on seven nineteenth-century log-cabin sites in Cedar Creek Reservoir in northwestern Alabama; and all historical research, the field work, and the report for the underwater remote-sensing reconnaissance and underwater videotaping of sunken Civil War cargo boats and gunboats at Johnsonville, Tennessee, in the western part of the Tennessee River.

Other Archaeological Projects *1966 to 1981*

Professional Societies
Register of Professional Archaeologists, #10683
Society for Historical Archaeology
California Council for the Promotion of History
Vernacular Architecture Forum
Society for California Archeology

DECLARATION OF
Michael D. McGuirt

I, **Michael D. McGuirt**, declare as follows:

1. I am presently employed by The California Energy Commission in the **Siting, Transmission, and Environmental Protection Division** as a **Planner II**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Cultural Resources,** for the Beacon Solar Energy project, based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 2, 2009 Signed: _____

At: Sacramento, California

MICHAEL D. MCGUIRT, MA, RPA

OBJECTIVE

To participate in the consultations that guide the management of heritage resources in native, public, and private trusts, to foster public support for heritage resource conservation through archaeological research and public outreach, and to contribute to the formulation of historic preservation policy.

EDUCATION

MASTER OF ARTS in Anthropology ◦ The University of Texas at Austin May 1996

Area concentration in the North American Southwest. Technical concentrations in geoarchaeology, palynology, and ceramic analysis.

BACHELOR OF ARTS in Anthropology and Archaeological Studies ◦ The University of Texas at Austin December 1990

Area concentrations in Mesoamerica and the Andes. Technical concentration in lithic analysis.

PROFESSIONAL EMPLOYMENT

ENERGY PLANNER II ◦ California Energy Commission, Sacramento, California November 2007 to November 2008

Develop environmental impact analyses of the potential effects that the construction and operation of proposed thermal power plants may have on significant cultural resources. Apply applicable Federal, State, and local statutes and regulations, as they relate to the consideration of cultural resources. Design and execute cultural resource impact analyses that are appropriate to the specific regulatory context for each proposed project. Gather and evaluate information on projects and on cultural resources in project areas. Develop and maintain agency and public relationships to acquire the most useful data and to elicit input in the development of California Energy Commission conditions of certification. Succinctly convey, orally in different public forums and in different written technical formats, the results of cultural resource impact analyses and proposed conditions of certifications meant to mitigate adverse impacts to significant cultural resources. Periodic reviews of licensees' actions to ensure compliance with extant conditions of certification. Oversight of consultants' who are preparing cultural resource impact analyses preservation program.

SENIOR STATE ARCHAEOLOGIST ◦ Office of Historic Preservation, California Department of Parks and Recreation (California State Parks), Sacramento, California December 2004 to December 2005

Out-of-class assignment supervising the Project Review Unit for the California State Historic Preservation Officer (SHPO) in the California Office of Historic Preservation (OHP). As the Acting Chief of Project Review, I managed and trained a staff of eight professionals and one clerical assistant to conduct, on behalf of the SHPO, the review of all Federal agency actions in the State of California under 36 CFR Part 800. 36 CFR Part 800 is the Advisory Council on Historic Preservation's implementing regulation for Section 106 of the National Historic Preservation Act of 1966, and the primary Federal historic preservation program.

ASSOCIATE STATE ARCHAEOLOGIST ◦ Office of Historic Preservation, California Department of Parks and Recreation (California State Parks), Sacramento, California May 2001 to November 2007

Project Review Unit archaeologist for the California State Historic Preservation Officer (SHPO). Consulted under 36 CFR Part 800 on the adequacy of federal agency efforts to comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470f). Served as SHPO contact person for informal federal agency consultation and formal initiation of Section 106 consultation (36 CFR § 800.3). Reviewed documentation of and provide comment on federal agency determinations and

findings (36 CFR §§ 800.4 and 800.5). Negotiated, drafted, and reviewed memoranda of agreement and treatment plans to resolve adverse effects to historic properties (36 CFR § 800.6). Negotiated, drafted, and reviewed program alternatives and management plans (36 CFR § 800.14). Administered federal agency efforts to comply with previously executed agreement documents. Developed and delivered public and professional presentations and workshops on the Section 106 regulatory process in California and the role of the SHPO in Section 106 consultation. Helped create initiatives through the National Park Service's Certified Local Government (CLG) program to encourage the development of local community archaeological site preservation plans. Evaluated and recommended proposals for CLG grants and helped administer resultant grants. Reviewed and provided comment on National Register of Historic Places (National Register) property nominations, and prepared and presented staff reports on the nominations to the State Historical Resources Commission. Member of committee to revise the Comprehensive Statewide Historic Preservation Plan for California, and author of the archaeology section of the plan. The Office of Historic
Preservation's (OHP) liaison to the Society for California Archaeology (June 2002 to September 2009).

ARCHAEOLOGICAL CONSULTANT ◦ Kaniakapūpū Project, O`ahu, Hawai`i ◦ Department of Anthropology, University of Hawai`i at Mānoa, Honolulu, Hawai`i June 2000

Recorded exposed architectural elements and directed test excavations to reconstruct building sequences of Native Hawaiian stone architecture. Advised on the interpretation of archaeological stratigraphy and on the field application of archaeological mapping methods and techniques.

ENVIRONMENTAL SPECIALIST III ◦ Jones & Stokes, Sacramento, California February 1999 to May 2001

Designed, conducted, and managed short- and long-term archaeological projects in California, Nevada, and New Mexico to comply with Sections 106 and 110 of the NHPA. Prepared proposals. Assisted with client contract negotiations. Conducted archaeological record searches and archival research. Directed Phase I pedestrian inventory surveys and test excavations for Phase II evaluations. Analyzed material culture assemblages. Prepared technical reports and regulatory compliance documents including National Register property and district evaluations, and monitoring and discovery plans. Represented clients in consultations with federal and state agencies, and coordinated and managed clients' compliance with federal cultural resource regulations and the cultural resource regulations of California, Nevada, and New Mexico.

ARCHAEOLOGICAL TECHNICIAN ◦ B.O.A.S., Inc., Seattle, Washington August 1998 to October 1998

Assisted with data recovery excavations on a short-term cultural resource management contract.

ASSISTANT ANTHROPOLOGIST ◦ Bernice Pauahi Bishop Museum, Honolulu, Hawai`i August 1996 to June 1998

Assisted with archaeological project design, preparation of proposals, and client contract negotiations, directed Phase I pedestrian inventory surveys, test excavations for Phase I subsurface inventory surveys, test excavations for property evaluations, and data recovery excavations, and assisted with preparation of technical reports on short-term cultural resource management contracts. Analyzed field records, prepared site reports and synthetic report chapters, and analyzed and prepared reports on lithic assemblages for Phases I–III of a long-term federal highway project (Interstate Route H–3). Conducted research in Hawaiian archaeology, and delivered public and professional presentations of that research. Advised on the integration of geoarchaeological methods and techniques into cultural resource management field efforts, and on geoarchaeological interpretations of extant field records, and designed and conducted geoarchaeological components of fieldwork for short–term cultural resource management contracts.

FIELD DIRECTOR ◦ Chersonesos Project, Ukraine, Eastern Europe ◦ Institute of Classical Archaeology, University of Texas at Austin, Austin, Texas May 1996 to July 1996

Assisted in archaeological project design. Directed a geoarchaeological reconnaissance, a pedestrian inventory survey, archaeological mapping, test excavations, and data recovery excavations in the National Preserve of Tauric Chersonesos. Conducted on-site project presentations for the United States Ambassador to Ukraine, and Ukrainian and Russian archaeological scholars. Assisted in the preparation and implementation of archaeological site preservation plans. Taught archaeological field methods and techniques to graduate students. Prepared portion of requisite field report for Crimean Archaeological Council, Simferopol.

ASSISTANT FIELD DIRECTOR ◦ Chersonesos Project, Ukraine, Eastern Europe ◦ Institute of Classical Archaeology, University of Texas at Austin, Austin, Texas May 1995 to July 1995

Assisted in the direction of data recovery excavations in the National Preserve of Tauric Chersonesos. Taught archaeological field methods and techniques to graduate students. Advised on the interpretation of archaeological stratigraphy.

ARCHEOLOGIST I ◦ Archeology Survey Team ◦ Texas Parks and Wildlife Department, Austin, Texas December 1994 to May 1995

Assisted in the direction of pedestrian inventory surveys, the preparation of cultural resource management plans, and the preparation of state site forms and reports of investigations. Advised on the integration of
global positioning system (GPS) technology and the field methods of archaeological survey.

RESEARCH ASSISTANT ◦ Colha Project, Belize, Central America ◦ Department of Anthropology, University of Texas at Austin, Austin, Texas July 1994 to August 1994

Conducted an extensive ground survey to correct the published base map for the Maya site of Colha. Assisted in mapping of surface architectural ruins. Directed a test excavation crew. Assisted in the preparation of the field report.

ARCHAEOLOGIST ◦ Lower Colorado River Authority, Austin, Texas February 1994 to December 1994

Designed and implemented trial mitigation plans for archaeological sites threatened by fluvial and lacustrine erosion. Assisted in pedestrian inventory surveys and test excavations, the preparation of state site forms, the development of the agency's database of its archaeological site inventory, and public education initiatives that included site tours for primary and secondary students, and workshops for primary and secondary teachers.

COLLEGIATE EXPERIENCE

TEACHING ASSISTANT ◦ Archaeological Analysis ◦ Department of Anthropology, University of Texas at Austin, Austin, Texas August 1993 to December 1993

Presented undergraduate lectures on archaeological method and theory. Wrote and graded examinations. Advised students.

TEACHING ASSISTANT ◦ Archaeological Field School, New Mexico ◦ Department of Anthropology, University of Texas at Austin, Austin, Texas May 1993 to July 1993

Taught archaeological field methods and techniques to undergraduate and graduate students.

PROJECT ARCHAEOLOGIST ◦ WS Ranch Project, New Mexico ◦ Department of Anthropology, University of Texas at Austin, Austin, Texas May 1992 to July 1992, May 1993 to July 1993

Designed and prepared proposals for two field seasons. Addressed New Mexico State Historic Preservation Office and United States Forest Service comments on the proposals. Directed test excavations and data recovery excavations for two field seasons. Conducted geoarchaeological, palynological, and material culture analyses. Prepared a report of the research.

VOLUNTEER LITHIC ANALYST ◦ WS Ranch Project, New Mexico ◦ Department of Anthropology, University of Texas at Austin September 1991 to December 1991

Analyzed lithic tool collections from San Francisco and Three Circle phase Mogollon sites on the Gila National Forest.

VOLUNTEER ARCHAEOLOGICAL TECHNICIAN ◦ WS Ranch Project, New Mexico ◦ Department of Anthropology, University of Texas at Austin June 1991

Assisted in test excavations for the Phase II evaluations of San Francisco and Three Circle phase Mogollon sites on the Gila National Forest in advance of the development of an interpretative trail.

VOLUNTEER LITHIC ANALYST ◦ WS Ranch Project, New Mexico ◦ Department of Anthropology, University of Texas at Austin September 1990 to December 1990

Analyzed a lithic tool collection from a Three Circle to Tularosa phase Mogollon site on the Gila National Forest and submitted a report of the analysis.

ARCHAEOLOGICAL TECHNICIAN ◦ Archaeological Research, Inc., Austin, Texas July 1990

Assisted in a Phase I pedestrian inventory survey on the Sitgreaves National Forest, Arizona in advance of a timber sale.

ARCHAEOLOGICAL TECHNICIAN ◦ New World Consultants, Inc., Albuquerque, New Mexico June 1990

Assisted in a Phase I pedestrian inventory survey on the Gila National Forest, New Mexico in advance of a timber sale.

UNDERGRADUATE PARTICIPANT ◦ Archaeological Field School, New Mexico ◦ Department of Anthropology, University of Texas at Austin May 1990 to July 1990

Laid out mapping control networks and assisted in test excavations on a Reserve phase Mogollon site and a Three Circle to Tularosa phase Mogollon site, and assisted in a pedestrian inventory survey of the upper San Francisco River Valley on the Gila National Forest.

TECHNICAL KNOWLEDGE AND SKILLS

CULTURAL RESOURCE AND ENVIRONMENTAL LAW

Expert knowledge of Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470f), as amended, and the regulation that implements Section 106 (36 CFR Part 800). Thorough knowledge of Section 110 of the NHPA and the U.S. Army Corps of Engineers' Appendix C to 33 CFR Part 325. Working knowledge of the Native American Graves Protection and Repatriation Act of 1990, the National Environmental Policy Act of 1969, the Archaeological Resource Protection Act of 1979, the California Environmental Quality Act of 1970, and cultural resource statutes, regulations, and guidelines for the states of California, Hawai`i, Nevada, New Mexico, and Texas.

GEOARCHAEOLOGY

Specialty in geoarchaeology with emphases on processual and historical geomorphology, paleoecology, stratigraphy, pedology, and sedimentology. Strong ability to reconstruct the depositional history and paleoenvironment of archaeological resources at multiple areal scales. Design and implement geoarchaeological data collection strategies. Analyze and interpret resultant data. Analyze and interpret geoarchaeological data from extant field records. Expertise used to provide superior contexts for material

culture assemblages and architecture at sites in Hawai`i, Ukraine, and New Mexico.

Mapping and Spatial Analysis

Five years of professional land surveying experience prior to 1988. Thorough knowledge of principles and techniques of land surveying, of a wide variety of optical instruments, of GPS receivers, and of the integration and manipulation of positional and attribute data from multiple sources in drafting and GIS applications. Expertise used to develop archaeological mapping and GIS programs for projects in California, Ukraine, Belize, Hawai`i, New Mexico, and Texas.

Archaeological Survey and Excavation

Archeological survey and excavation experience on sites that represent a wide range of cultures, time periods, and environments. Survey experience in California on nineteenth and twentieth century Karuk sites and late nineteenth to early twentieth century Euroamerican mining sites, in Nevada on Pre-Archaic, Archaic, and Protohistoric Native American sites and mid-nineteenth to early twentieth century railroad, mining, emigrant trail, and homestead sites with European, Euroamerican, and Asian components, in northeastern and southern Texas on Paleoindian, Archaic, Caddoan, and early nineteenth to early twentieth century Euroamerican sites, in western New Mexico and eastern Arizona on Archaic and Mogollon sites, on the Na Pali Coast of Kaua`i, Hawai`i on precontact Native Hawaiian sites and in the southern Crimea, Ukraine on Neolithic, Bronze Age, Greek, Roman, Byzantine, and nineteenth century Russian sites.

Excavation experience in California on late nineteenth to early twentieth century Euroamerican mining sites, early twentieth century Euroamerican homesteads, and a Feather River site with Maidu and Euroamerican components, in western New Mexico on Early Pithouse period, Three Circle, Reserve, and Tularosa phase Mogollon sites, in eastern Belize on the Middle Preclassic to Postclassic Maya site of Colha, on O`ahu, Hawai`i on early postcontact to early twentieth century sites with Native Hawaiian, Chinese, Japanese, European, and Euroamerican components in downtown Honolulu, on the East Loch of Pearl Harbor, and in Nu`uanu Valley, in Washington on an Olcott phase Native American site, and in the southern Crimea, Ukraine on Hellenistic Greek and Roman sites.

Experience in the excavation of adobe and stone architecture, house pits or pithouses, former sites of wooden and grass structures, ancient roadways, hearths, refuse pits, storage pits, and extramural surfaces.

Material Analyses

Experience with a wide range of prehistoric and historic material culture. Analyzed and reported on lithic assemblages from Hawai`i and New Mexico, ceramic assemblages from Ukraine and New Mexico, sediments from Hawai`i, Ukraine, and New Mexico, and fossil pollen from New Mexico. Ability to identify and date archaeological site assemblages with late eighteenth to early twentieth century architectural materials, bottle glass, tin cans, and American, British, Chinese, and Japanese ceramics.

Computer Literacy

Experience with diverse word processing, spreadsheet, database, drafting, graphics, data processing, and GIS applications on PC (Windows XP) and MacIntosh platforms in networked environments. Word processing applications used include Microsoft Word and WordPerfect. Spreadsheet applications used include Microsoft Excel. Database applications used include Microsoft Access, Quattro Pro, FoxPro, and MinArk. Drafting applications used include AutoCAD and Surfer. Graphics applications used include CorelDraw. Data processing applications used include PathFinder, SurveyLink, and GeoLink. GIS applications used include ArcView.

Recent Professional Development

Cultural Resource and Environmental Law

ACHP - FHWA Advanced Seminar: Reaching Successful Outcomes in Section 106 Review ◦ Vancouver, Washington ◦ Advisory Council on Historic Preservation, Don Klima and Carol Legard; Federal Highway Administration, Mary Ann Naber October 2007

NEPA Compliance and Cultural Resources ◦ Portland, Oregon ◦ National Preservation Institute, Joe Trnka October 2007

Section 106: How to Negotiate and Write Agreements ◦ Sacramento, California ◦ National Preservation Institute, Claudia Nissley November 2004

Consultation with Indian Tribes on Cultural Resource Issues ◦ Sacramento, California ◦ National Preservation Institute, Thomas F. King and Reba Fuller September 2003

Section 106: How to Negotiate and Write Agreements ◦ The Presidio, San Francisco, California ◦ National Preservation Institute, Thomas F. King May 2002

Introduction to CEQA ◦ Sacramento, California ◦ University of California, Davis, Continuing and Professional Education, Ken Bogdan and Terry Rivasplata July 2000

Technical Archaeology

Introduction to Historic Site Survey, Preliminary Evaluation, and Artifact ID ◦ West Sacramento, California ◦ California Department of Transportation and California Department of Parks and Recreation, Glenn Farris, Larry Felton, Julia Huddleson, Anmarie Medin, Pete Schulz, Judy Tordoff, and Kimberly Wooten September 2006

Principles of Geoarchaeology for Transportation Projects (Course No. 100246). Sacramento, California ◦ California Department of Transportation, Graham Dalldorf, Glenn Gmoser, Jack Meyer, Stephen Norwick, Adrian Praetzellis, and William Silva October 2006

Information Technology and Cultural Resource Management

GIS: Practical Applications for Cultural Resource Projects ◦ Sacramento, California ◦ National Preservation Institute, Deidre McCarthy September 2006

State Government

Introduction to California State Parks ◦ Asilomar, Monterey County, California ◦ California Department of Parks and Recreation and Monterey Peninsula College December 2001

Publications, Reports, Papers, and Workshops

Darcangelo, Jennifer, John Sharp, Michael D. McGuirt, Andrea Galvin, and Clarence Caesar

2004 *Section 106 for Experienced Practitioners: Consulting with the California SHPO (GEV4111).* Course taught on 8 September in Oakland to California Department of Transportation cultural resources personnel and private sector cultural resource consultants (8 hours).

Darcangelo, Jennifer, John Sharp, Michael D. McGuirt, and Andrea Galvin

2005 *How to Consult with the California SHPO.* Workshop presented on 23 April at the 39th Annual Meeting of the Society for California Archaeology, Sacramento, California (6 hours).

1999a *Cultural Resource Inventory Report for Williams Communications, Inc. Fiber Optic Cable System Installation Project, Wendover, Nevada to the California State Line*. Volume 1: Draft Report. July. (JSA 98-358.) Sacramento, California. Prepared for Williams Communications, Inc., Tulsa, Oklahoma.

1999b *Cultural Resources Report for the Williams Communications, Inc. Interstate 80 Fiber Optic Cable System Installation Project*. Volume I. September. (JSA 98-358.) Submitted to Williams Communications, Inc., Tulsa, Oklahoma. On file with the State Historic Preservation Office, Carson City, Nevada.

1999c *Archaeological Site Avoidance and Monitoring Plans for Williams Communications' Fiber Optic Cable Installation In the Union Pacific Railroad Right-of-Way, Doña Ana County to Hidalgo County, New Mexico*. October. (JSA98-379.) Sacramento, California. Prepared for Williams Communications, Inc., Tulsa, Oklahoma.

2001 *Final Phase II Cultural Resource Evaluation for the Kramer Mining District, Edwards AFB, Kern and San Bernardino Counties, California*. Volume I. November. Sacramento, California. On file with the Base Historic Preservation Officer, Edwards AFB, California.

Lebo, Susan A. and Michael D. McGuirt

1997 *Geoarchaeology at 800 Nuuanu: Archaeological Inventory Survey of Site 50-80-14-5496 (TMK1-7-02:02), Honolulu, Hawai`i*. Department of Anthropology, Bishop Museum, Honolulu. (100 pp.) Submitted to Bank of Hawaii, Honolulu. On file with the State Historic Preservation Division, Honolulu.

1998a *Assessments of Stone Architecture: a Case Study from North Hālawa Valley, O`ahu*. Paper presented at the 11th Annual Hawaiian Archaeology Conference of the Society for Hawaiian Archaeology, Kailua-Kona, Hawai`i.

1998b Pili *Grass, Wood Frame, Brick, and Concrete: Archaeology at 800 Nuuanu*. Department of Anthropology, Bishop Museum, Honolulu. (142 pp.) Submitted to Bank of Hawaii, Honolulu. On file with the State Historic Preservation Division, Honolulu.

Lennstrom, Heidi A., P. Christiaan Klieger, Michael D. McGuirt, and Susan A. Lebo

1997 *Archaeological Reconnaissance of Pouhala Marsh, `Ewa District, O`ahu*. Department of Anthropology, Bishop Museum, Honolulu. (14 pp.) Submitted to Ducks Unlimited, Inc., Rancho Cordova, California. On file with the State Historic Preservation Division, Honolulu.

McGuirt, Michael D.

1996 *The Geoarchaeology and Palynology of an Early Formative Pithouse Village in West-Central New Mexico*. Unpublished M.A. thesis, Department of Anthropology, University of Texas at Austin.

1998 50-80-10-2010, 50-80-10-2016, 50-80-10-2088, and 50-80-10-2134. In *Activities and Settlement in an Upper Valley: Data Recovery and Monitoring Archaeology in North Hālawa Valley, O`ahu*, vols. 2a and 2b, edited by Department of Anthropology, Bishop Museum, pp. 1–3, 1–44, 1–5, and 1–46. Department of Anthropology, Bishop Museum, Honolulu. Submitted to State of Hawaii, Department of Transportation, Honolulu. On file with the State Historic Preservation Division, Honolulu.

2002 Committee Reports, OHP Liaison. *SCA Newsletter* 36(3):4–5.

2004 Committee Reports, OHP Liaison. *SCA Newsletter* 38(2): 7, 38(3):6–8.

2006 Preservation Archaeology. In *California Statewide Historic Preservation Plan: 2006–2010*, edited by Marie Nelson, pp. 8–15. California Department of Parks and Recreation's Office of Historic Preservation, Sacramento. Submitted to the National Park Service, Washington, D.C. On file at the California Office of Historic Preservation, Sacramento.

2008 Dealing with Multi-element Cultural Resources under Section 106. In *Historic Properties Are More Than Meets the Eye: Dealing with Historical Archaeological Resources under the Regulatory*

Context of Section 106 and CEQA. Session presented on 25 April at the *33rd Annual California Preservation Conference* of the California Preservation Foundation in Napa, California, moderated by Michelle Messinger and Michael D. McGuirt (1 1/2 hours).

McGuirt, Michael D. and Leigh Ann Garcia

1991 Lithic Stew at Apache Creek: the 1990 Chipped Stone Artifact Collection from LA 2949. In *An Analysis of Lithic Artifacts Recovered During the 1990 Test Excavations at the Apache Creek Site (LA 2949), Gila National Forest, West Central New Mexico*, edited by James A. Neely and Jay R. Peck, pp. 13–61. Department of Anthropology, University of Texas at Austin. Submitted to United States Forest Service. On file at the Gila National Forest Office, Silver City, New Mexico.

McGuirt, Michael D. and Leslie H. Hartzell

1997 50-80-10-2139 and 50-80-10-2459. In *Imu, Adzes, and Upland Agriculture: Inventory Survey Archaeology in North Hālawa Valley, O`ahu*, vols. 2c and 2d, edited by Department of Anthropology, Bishop Museum, pp. 1–17 and 1–5. Department of Anthropology, Bishop Museum, Honolulu. Submitted to State of Hawaii, Department of Transportation, Honolulu. On file with the State Historic Preservation Division, Honolulu.

1998 Chapter 1: Introduction. In *Activities and Settlement in an Upper Valley: Data Recovery and Monitoring Archaeology in North Hālawa Valley, O`ahu*, vol. 1, edited by Department of Anthropology, Bishop Museum, pp. 1–14. Department of Anthropology, Bishop Museum, Honolulu. Submitted to State of Hawaii, Department of Transportation, Honolulu. On file with the State Historic Preservation Division, Honolulu.

McGuirt, Michael D. and Margaret Howard

1995 Prehistoric Background. In *Archeological Survey of Tyler State Park, Smith County, Texas*, edited by Margaret Howard, pp. 16–31. Texas Parks and Wildlife Department, Austin. On file with the Texas Historical Commission, Austin, Texas Antiquities Committee Permit No. 1484.

McGuirt, Michael D. and Shannon P. MacPherron

1998 50-80-10-2137 . In *Activities and Settlement in an Upper Valley: Data Recovery and Monitoring Archaeology in North Hālawa Valley, O`ahu*, vol. 2b, edited by Department of Anthropology, Bishop Museum, pp. 1–86. Department of Anthropology, Bishop Museum, Honolulu. Submitted to State of Hawaii, Department of Transportation, Honolulu. On file with the State Historic Preservation Division, Honolulu.

McGuirt, Michael D. and Deborah I. Olszewski

1997 50-80-10-2256. In *Imu, Adzes, and Upland Agriculture: Inventory Survey Archaeology in North Hālawa Valley, O`ahu*, vol. 2d, edited by Department of Anthropology, Bishop Museum, pp. 1–9. Department of Anthropology, Bishop Museum, Honolulu. Submitted to State of Hawaii, Department of Transportation, Honolulu. On file with the State Historic Preservation Division, Honolulu.

Mikesell, Stephen, Michael McGuirt, and Trish Fernandez

2007 Introduction to the White Papers in State Historical Resources Commission Archaeology Committee White Papers. *SCA Newsletter* 41(1):18–21.

Sharp, John, Michael D. McGuirt, Jennifer Darcangelo, and Andrea Galvin

2004 *How to Consult with the California SHPO*. Workshop presented on 18 March at the 38th Annual Meeting of the Society for California Archaeology, Riverside, California (4 hours).

Professional and Honorary Associations

Register of Professional Archaeologists
Society for American Archaeology
Society for California Archaeology
Honor Society of Phi Kappa Phi

References and Writing Samples

Available upon request.

DECLARATION OF
Geoffrey Lesh

I**, Geoffrey Lesh** declare as follows:

1. I am presently employed by the California Energy Commission in the **Engineering Office** of the Siting, Transmission and Environmental Protection Division as a **Mechanical Engineer.**

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on the **Hazardous Materials Management Section and the Worker Safety and Fire Protection Section** for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

Geoffrey Lesh, P.E.
Mechanical Engineer

WORK HISTORY

California Energy Commission Mechanical Engineer 2002 - Current
• Review and analyze applicants' plans for safe management of hazardous materials, fire prevention, and worker safety.

Self-Employed Independent Investor 2000 - 2002
• Wrote market analysis computer software.

Read-Rite Corp Wafer Engineering Manager 1994 - 2000
• Designed and developed wafer manufacturing processes for computer data storage systems. Managed team of engineers and technicians responsible for developing wet and dry chemical processes for manufacturing, including process and safety documentation.
• Managed process and equipment selection for manufacturing processes.
• Processes included vacuum processed metals and ceramics, grinding-polishing, plating, etching, encapsulation, process troubleshooting, and SPC reporting.

Dastek Corp (Komag Joint Venture Start-up) Wafer Engineering Manager 1992 - 1994
• Developed wafer processes for new technology recording head for hard disk drives.
• Managed team of engineers and technicians.
• This position included start-up of wafer fab, including line layout, purchase, installation, and startup of new process equipment, etc.

Komag, Inc Alloy Development Manager 1989 - 1992
• Developed new vacuum-deposited recording alloys
• Responsible for planning and carrying-out tests, designing experiments, analyzing results, managing test lab conducting materials characterizations.
• Extensive process modeling and data analysis.

Verbatim Corp (Kodak) Process Development Manager 1983 - 1989
• Mechanical engineering for computer disk manufacturing, including product, process, and equipment including metal-ceramic-plastic processes for optical disk development.
• Production processes included plating, metal evaporation, reactive sputtering, laser-based photolithography, injection molding.
• Steering Committee Member, *Center for Magnetic Recording Research, UC San Diego*
• Steering Committee Member, *Institute for Information Storage Technology, University of Santa Clara*

IBM Corp Mechanical/Process Engineer 1977 - 1983
• Product development for photocopiers and computer tape-storage systems.

EDUCATION

Stanford University, Master of Science Degree	Materials Science and Engineering
UC-Berkeley, Bachelor of Science Degree (Double Major)	Mechanical Engineering, Materials Science and Engineering
University of Santa Clara, Graduate Certificate	Magnetic Recording Engineering
Registered Professional Engineer, California	Mechanical #M32576 Metallurgical #MT1940

PUBLICATIONS

All-Solid Lithium Electrodes with Mixed-Conductor Matrix, J. Electrocchem. Soc. **128**, 725 (1981).

Proc. Symp. on Lithium Batteries, H.V. Venkatasetty, Ed., Electrochem Soc (1981), p. 467.

PATENTS

Method of Preparing Thermo-Magneto-Optic Recording Elements, US Pat# 4,892,634 (assigned to Eastman Kodak Co.)

DECLARATION OF
Rick Tyler

I, **Rick A. Tyler**, declare as follows:

1. I am presently employed by the California Energy Commission in the Siting Office of the Energy Facilities Siting Division as a Senior Mechanical Engineer**.**

2. A copy of my professional qualifications and experience were included in the FSA, and is incorporated by reference herein.

3. I supervised the preparation of Staff Testimony on Hazardous Materials Management, Worker Safety / Fire Protection and Public Health for the Beacon Energy Project based on my independent analysis of the Application for Certification and any supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 10, 2009 Signed:_____

At: Sacramento, California

RESUME

RICK A. TYLER

Senior Mechanical Engineer

CALIFORNIA ENERGY COMMISSION

EXPERIENCE

Oct. 2001- Oct 2004 (Part Time)

Corporate President, Chairman, and CEO Professional Engineers in California Government (PECG) 2002, **Section Director** 2003-2004, 2008-2009 PECG Board of Directors

As President / CEO of the Professional Engineers in California Government, I served as the Chairman of the Board and Chief Executive Officer of this 13,000 member organization representing engineers employed by the State of California. In this capacity I was 1) the primary interface between the Corporate Board and the consultant organization that conducted most of the day to day business of the organization 2) the Chairman responsible for conducting quarterly board meetings and 3) responsible for ensuring that the member stake holders received good value for their investment. During my tenure on the corporate board we obtained the best contract negotiated in more than 20 years. This was achieved during a period of extreme economic constraints for, our employer, the State of California. I believe that this achievement was the direct result of my focus on the organization's primary mission and my success in keeping the organization on task.

As Section Director I represented the interests of the stakeholders in one of the 17 local sections represented on the PECG Board. This experience gave me a keen understanding of corporate board dynamics and how interactions between individual directors having conflicting priorities affects board function.

My experiences on the PECG Board of Directors provided me with a clear understanding of corporate board structure, function, and leadership as well as extensive knowledge of labor relations functions. It also provided me with a first hand understanding of the need for a clear vision and strong corporate governance which I provided during my tenure.

June 2000- Present (Full Time)

California Energy Commission – **Senior Mechanical Engineer (energy facility permitting)** Systems Assessment and Facilities Siting Division

Responsible for planning, organizing and directing the work of the Facility Safety Unit within the Systems Assessment and Facilities Siting Division's, Engineering Office. This unit evaluates the adequacy of proposed and ongoing safety management practices associated with hazardous material handling, worker safety and fire protection at very large conventional and alternative/renewable energy power facilities certified by the California Energy Commission. Responsible for quality and timeliness of all work conducted by employees and contractors performing work for this unit, including engineering analysis, products such as expert witness testimonies, compliance verifications, and conducting accident evaluations and investigations.

Jan. 1998-
June 2000
(Full Time)

California Energy Commission - **Associate Mechanical Engineer (energy facility siting)** Energy Facility Siting and Environmental Protection Division

Responsible for review of Applications for Certification (applications for permits) for large power plants including the review of handling practices associated with the use of hazardous and acutely hazardous materials, loss prevention, safety management practices, design of engineered equipment and safety systems associated with equipment involving hazardous materials use, evaluation of the potential for impacts associated with accidental releases and preparation and presentation of expert witness testimony and conditions of certification. Review of compliance submittals regarding conditions of certifications for hazardous materials handling, including Risk Management Plans Process Safety Management.

April 1985-
Jan. 1998
(Full Time)

California Energy Commission - **Health and Safety Program Specialist (energy facility siting)** ; Energy Facility Siting and Environmental Protection Division.

Responsible for review of Public Health Risk Assessments, air quality, noise, industrial safety, and hazardous materials handling of Environmental Impact Reports on large power generating and waste to energy facilities, evaluation of health effects data related to toxic substances, development of recommendations regarding safe levels of exposure, effectiveness of measures to control criteria and non-criteria pollutants, emission factors, multimedia exposure models. Preparation of testimony providing Staff's position regarding public health, noise, industrial safety, hazardous materials handling, and air quality issues associated with proposed power plants. Advise Commissioners, Management, other Staff and the public regarding issues related to health risk assessment of hazardous materials handling. Present expert witness testimony at regulatory hearings.

Nov. 1977-
April 1985
(Full Time)

California Air Resources Board – **Mechanical Engineer (regulatory compliance)** last four years at Associate level

Responsible for testing to determine pollution emission levels at major industrial facilities; including planning, supervision of field personnel, report preparation and case development for litigation; evaluate, select and acceptance-test instruments prior to purchase; design of instrumentation systems and oversight of their repair and maintenance; conduct inspections of industrial facilities to determine compliance with applicable pollution control regulations; improved quality assurance measures; selected and programmed a computer system to automate data collection and reduction; developed regulatory procedures and the instrument system necessary to certify and audit independent testing companies; prepared regulatory proposals and other presentations to classes at professional symposia and directly to the Air Resources Board at public hearings. As a representative, of the State I coordinated efforts with federal, local, and industrial representatives.

EDUCATION

B.S., Mechanical Engineering, California State University, Sacramento.

KNOWLEDGE OF

Knowledge of; corporate governance, Roberts Rules of Order, corporate

organization, structure and bylaws, business plan development, management supervision, organizational failure, contract management, process safety management, CEQA, statistics, instrumentation, technical writing, toxicology, risk assessment, loss prevention, environmental chemistry, hazardous materials management, technical management of chemical process safety, noise measurement, regulations and framework of toxic substances control and workplace safety, and presentation expert witness testimony.

PUBLICATIONS, PROFESSIONAL PRESINTATIONS, AND ACCOMPLISHMENTS

Authored staff reports published by the California Air Resource Board and presented papers regarding continuous emission monitoring at symposiums

Authored a paper entitled "A Comprehensive Approach to Health Risk Assessment", presented at the New York Conference on Solid Waste Management and Materials Policy.

Authored a paper entitled "Risk Assessment A Tool For Decision Makers" at the Association of Environmental Professionals AEP Conference on Public Policy and Environmental Challenges.

Conducted a seminar at University of California, Los Angeles for the Doctoral programs in Environmental Science and Public Health on the subject of "Health Risk Assessment".

Authored a paper entitled "Uncertainty Analysis -An Essential Component of Health Risk Assessment and Risk Management" presented at the EPA/ORNL expert workshop on Risk Assessment for Municipal Waste Combustion: Deposition, Uncertainty, and Research Needs.

Presented a talk on off-site consequence analysis for extremely hazardous materials releases. Presented at the workshop for administering agencies conducted by the City of Los Angeles Fire Department.

Evaluated, provided analysis and testimony regarding public health and hazardous materials management issues associated with the permitting of more than 20 major power plants throughout California.

Developed Departmental policy, prepared policy documents, regulations, staff instruction, and other guidance documents and reference materials for use in evaluation of public health and hazardous materials management aspects of proposed power plants.

Project Manager, overseeing contract work totaling more than $500,000.

DECLARATION OF
James Adams

I**,** James Adams declare as follows:

1. I am presently employed by the California Energy Commission in the Environmental Office of the Siting, Transmission, and Environmental Protection Division as an Environmental Planner II.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on Land Use for the Final Staff Assessment for the Beacon Solar Energy Project (08-AFC-2), based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: _____ Signed: _____

At: Sacramento, California

James S. Adams, M.A.
Environmental Protection Office
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5504
PH (916) 653-0702, FAX (916) 651-8868
jadams@energy.state.ca.us

5/1999
Present **Environmental Planner**
Review applications for certification to acquire permits from the California Energy Commission to build electric generating power plants. Specific technical fields include socioeconomics, traffic and transportation, land use and visual resources. Work on special projects as requested.

11/1997
Present **Energy and Resource Consultant**
Provide clients with technical expertise on various issues related to natural resource use and development. Current activities include managing an intervention by the Surfrider Foundation before the California Public Utilities Commission regarding decommissioning issues concerning Humboldt Bay, Diablo Canyon and San Onofre nuclear reactors.

9/1994--
10/1997 **Senior Analyst - Safe Energy Communication Council (SECC)**
Responsible for developing and/or implementing campaigns on various energy issues involving the promotion of energy efficiency and renewable energy and advocating less reliance on nuclear power. Managed educational outreach efforts to newspaper editorial writers throughout the U.S. to encourage coverage of energy issues. Participated in meetings and negotiations with key Clinton administration officials, members of Congress and staff, national coalitions, and grassroots organizations on important energy issues (e.g. U.S. Department of Energy Budget for Fiscal Years 1996-1998). Successfully raised $140,000 from private foundations to support SECC activities.

6/1978--
12/1992 **Principal Consultant - Redwood Alliance**
Provided consulting services to the Alliance; a renewable energy/political advocacy organization. Major responsibilities included managing and/or participating in several interventions/appearances before the California Public Utilities Commission, California Energy Commission, California Legislature, U.S. Congress and the U.S. Nuclear Regulatory Commission. Issues included electric utility planning options, greater reliance on energy efficiency and renewable energy, nuclear power economic analyses, decommissioning cost estimates, and nuclear waste management and disposal.

2/1983--
8/1986 **Natural Resource Specialist**
Assisted private consulting, firms, non-profit corporations and government agencies in various projects related to the enhancement and protection of national forests in Northern California and Southern Oregon. This included contracts with the U.S. Forest Service, Fish and Wildlife Service, National Park Service, the California Coastal Conservancy, and private landowners.

6/1978--
present Consultant/Journalist/Paralegal/Lobbyist
Throughout the period of work outlined above, I have written a considerable amount of news articles and reports connected to ongoing-projects and issues of personal interest. The leg, al/administrative interventions have required extensive paralegal work to support attorneys, and technical expertise to identify and assist consultants. In addition, many of the projects required consulting services and lobbying, at the local, state and federal level whenever necessary, as well as working with the print and television media as appropriate.

From 1978 through 1984 1 served on the Board of Directors for two locals non-profit agencies devoted to sustainable community development, Redwood Community Development Council and Redwood Community Action Agency (RCAA). I also was hired on staff at RCAA as a natural resource specialist which is explained more fully above. I am proficient with computers, printers, fax machines and related equipment.

EDUCATION

M.A. Social Science. Political science and natural resources emphasis. California State University at Humboldt. Graduated December 1988.

B.A. Political Science. Political and economic aspects of natural resource development, with a particular emphasis in forest ecology and appropriate technology. California State University at Humboldt. Graduated June 1978.

Academic
Honors. Member of PI GAMMU MU Honor Society since 1986.

MILITARY SERVICE

7/1969--
9/1975 U.S. Navy. Air Traffic Controller.
Honorable Discharge.

DECLARATION OF
Erin Bright

I**, Erin Bright,** declare as follows:

1. I am presently employed by the California Energy Commission in the **Engineering Office** of the Siting Transmission and Environmental Protection Division as a **Mechanical Engineer**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Facility Design** and **Noise and Vibration** for the **Beacon Solar Energy Project** based on my independent analysis of the Application, supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

   I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: July 28, 2009 Signed: _____

At: Sacramento, California

Erin Bright
Mechanical Engineer

Experience Summary

One year of experience in the electric power generation field, including analysis of noise pollution, construction/licensing of electric generating power plants, and engineering and policy analysis of thermal power plant regulatory issues. One year of experience in the alternative energy field, including analysis of alternative fuel production and use.

Education

- University of California, Davis--Bachelor of Science, Mechanical Engineering and Materials Science
- University of California, Davis Extension Program--Renewable Energy Systems

Professional Experience

2007 to Present-- Mechanical Engineer, Energy Facilities Siting Division - California Energy Commission

Performed analysis of generating capacity, reliability, efficiency, noise, and the mechanical, civil/structural and geotechnical engineering aspects of power plant siting cases.

2006 to 2007--Energy Analyst, Fuels & Transportation Division - California Energy Commission

Performed analysis of use potential and environmental effects of emerging non-petroleum fuels, including compressed natural gas, biomass, hydrogen and electricity, in heavy and light duty transportation vehicles. Contributor to Energy Commission's alternative fuels plan.

DECLARATION OF
Steve Baker

I, Steve Baker, declare as follows:

1. I am presently employed by the California Energy Commission in the Engineering Office of the Siting, Transmission and Environmental Protection Division as a Senior Mechanical Engineer.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I assisted in the preparation of the staff testimony on **Noise and Vibration**, and supervised preparation of the staff testimony on **Power Plant Efficiency, Power Plant Reliability, Facility Design** and **Geology and Paleontology**, for the Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

STEVE BAKER, P.E.
Senior Mechanical Engineer

Experience Summary

Thirty-five years experience in the electric power generation field, including mechanical design, QA/QC, construction/startup and business development/licensing of nuclear, coal-fired, hydroelectric, geothermal and windpower plants; and engineering and policy analysis of thermal power plant regulatory issues.

Education

- California State University, Long Beach--Master of Business Administration
- California State Polytechnic University, Pomona--Bachelor of Science, Mechanical Engineering
- Registered Professional Engineer (Mechanical), California —
  No. M27737 expires 6/30/2010

Professional Experience

1990 to Present--Senior Mechanical Engineer, Facilities Siting Division - California Energy Commission

Technical lead person for the analysis of generating capacity, reliability, efficiency, noise, geology, paleontology and the mechanical, civil/structural and geotechnical engineering aspects of power plant siting cases. Key contributor to Commission's investigation into market impediments to the deployment of advanced high-efficiency generating technologies.

1987 to 1990--Generation Systems/Facility Design Unit Supervisor, Siting & Environmental Division - California Energy Commission

Responsible for supervising the analysis of generating capacity, reliability, efficiency, safety, and mechanical, civil/structural, and geotechnical engineering aspects of power plant siting cases.

1981-1986--Operations Manager, Alternate Energy - Santa Fe Pacific Realty Corporation

Participated in and supervised identification, evaluation and feasibility analysis, licensing and permitting of hydroelectric, geothermal, windpower and biomass power projects.

1974-1981--Mechanical Engineer, Quality Engineer - Bechtel Power Corporation and Bechtel National, Inc.

Wrote equipment specifications, drew flow diagrams and P&ID's, performed system design and safety analysis for nuclear power plants and nuclear fuel processing plant. Wrote and implemented QA/QC procedures for nuclear power plant. Participated in construction/startup of large coal-fired power plant.

DECLARATION OF

Dr.Obed Odoemelam

I, **Obed Odoemelam** declare as follows:

1. I am presently employed by the California Energy Commission in the Facilities Siting, Transmission, and Environmental protection Division as a Staff Toxicologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Public Health** for the Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

DECLARATION OF

Dr.Obed Odoemelam

I, **Obed Odoemelam** declare as follows:

1. I am presently employed by the California Energy Commission in the Facilities Siting, Transmission, and Environmental Protection Division as a Staff Toxicologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Transmission Line safety and Nuisance** for Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

RESUME

DR. OBED ODOEMELAM

EDUCATION:

1979-1981 University of California, Davis, California. Ph.D., Ecotoxicology

1976-1978 University of Wisconsin, Eau Claire, Wisconsin. M.S., Biology.

1972-1976 University of Wisconsin, Eau Claire, Wisconsin. B.S., Biology

EXPERIENCE:

1989
The Present: California Energy Commission. Staff Toxicologist.

Responsible for the technical oversight of staffs from all Divisions in the Commission as well as outside consultants or University researchers who manage or conduct multi-disciplinary research in support of Commission programs. Research is in the following program areas: Energy conservation-related indoor pollution, power plant-related outdoor pollution, power plant-related waste management, alternative fuels-related health effects, waste water treatment, and the health effects of electromagnetic fields. Serve as scientific adviser to Commissioners and Commission staff on issues related to energy conservation. Serve on statewide advisory panels on issues related to multiple chemical sensitivity, ventilation standards, electromagnetic field regulation, health risk assessment, and outdoor pollution control technology. Testify as an expert witness at Commission hearings and before the California legislature on health issues related to energy development and conservation. Review research proposals and findings for policy implications, interact with federal and state agencies and industry on the establishment of exposure limits for environmental pollutants, and prepare reports for publication.

1985-1989 California Energy Commission.

Responsible for assessing the potential impacts of criteria and noncriteria pollutants and hazardous wastes associated with the construction, operation and decommissioning of specific power plant projects. Testified before the Commission in the power plant certification process, and interacted with federal and state agencies on the establishment of environmental limits for air and water pollutants.

1983-1985 California Department of Food and Agriculture.

Environmental Health Specialist.

Evaluated pesticide registration data regarding the health and environmental effects of agricultural chemicals. Prepared reports for public information in connection with the eradication of specific agricultural pests in California.

DECLARATION OF
Marie McLean

I**,** Marie McLean, declare as follows:

1. I am presently employed by the California Energy Commission in the Environmental Office of the Siting, Transmission, and Environmental Protection Division as an Environmental Planner II.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on Socioeconomics for the Final Staff Assessment for the Beacon Solar Energy Project (08-AFC-2), based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: _____ Signed: _____

At: Sacramento, California

MARIE McLEAN

QUALIFICATIONS SUMMARY

Twenty years experience in the field of environmental research, analysis, and planning, with specific emphasis on the economics of water, energy, and land use and its social, visual, and cultural ramifications. Specific projects involved (1) assessing economic costs and benefits of water delivery contracts and energy sales; (2) conducting and presenting visual analyses of historic and other local, state, and federal resources; (3) preparing local, state, and federal resource assessment forms; (4) determining and communicating benefits and costs of proposed development projects (housing, energy, and water) on the social and economic life of communities in which they are located; and (5) as member of local design review, historic preservation, and housing boards, recommended programs and policies and monitored their implementation.

RECENT PROFESSIONAL EXPERIENCE

California Energy Commission, Planner II, Environmental Office-Facilities Siting, January 2008—present.

Conduct technical analyses for complex facility siting cases and planning studies in the area of socioeconomics and visual resources.

Electricity Oversight Board; June 1, 2007—December 31, 2008.

Developed, conducted, and presented economic studies on energy markets and transmission projects; California Independent System Operator (CAISO) market redesign and technology upgrade program; and investigated, analyzed, and reported the effects of existing and proposed energy programs on supply, demand, and rates.

California Department of Water Resources, State Water Project Analysis Office, June 2001—July 31, 2007.

Developed and implemented complex analyses of the social, economic, and financial ramifications of contracted and proposed water deliveries and transfers and changes to valuation methods for selling energy in deregulated markets. Researched, identified, and reported on market activities in energy and water and their economic effects on ratepayers.

EDUCATION

Bachelor of Arts, Economics, California State University, Sacramento, 1983

DECLARATION OF
Casey Weaver

I**,** Casey Weaver declare as follows:

1. I am presently employed by the California Energy Commission in the Soil and Water and Resources Unit of the Siting, Transmission and Environmental Protection Division as an Engineering Geologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on SOIL AND WATER SECTION, for the BEACON SOLAR ENERGY PROJECT based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 11, 2009 Signed: Casey Weaver

At: Sacramento, California

CASEY W. WEAVER, RG, CEG

SUMMARY OF EXPERIENCE:

Certified Engineering Geologist with over 20 years of environmental and geotechnical consulting experience. Experience includes remedial investigations and feasibility studies (RI/FS), groundwater investigations, corrective action plans, landfill studies (SWATs, siting, closure), preliminary environmental site assessments (PESA, Phase I), regulatory compliance (RCRA/CERCLA), geotechnical investigation/evaluation, geologic hazard evaluations, active fault evaluations, seismic studies, landslide evaluation/repair, foundation suitability studies, personnel management and business development.

EDUCATION:

B.S. Geology, Humboldt State University, Arcata, CA, 1981
University of California, Davis Extension Courses

REGISTRATIONS/LICENCES/CERTIFICATIONS:

Certified Engineering Geologist, California
Registered Geologist, California, Oregon, Arizona
Registered Environmental Assessor
OSHA 1910.120 Hazardous Waste Operations and Emergency Response - 40hr
OSHA 1910.120 Hazardous Waste Operations and Emergency Response -Supervising Operations at Hazardous Waste Sites.

PROFESSIONAL HISTORY:

2008 to Present **Engineering Geologist**
California Energy Commission, Sacramento, CA

Duties within the Water and Soils Unit of the Environmental Office in the Facilities Siting Division include review and evaluation of applications for certification of thermal power plants within the state of California. The focus of the work is on sensitive project sites that may have issues involving groundwater and surface water resources, soil erosion, flooding potential, water quality and plant-derived waste generation and disposal. In addition, evaluate construction, operation and maintenance of the facilities and conduct investigations to determine if violations of the program's regulations, the Energy Commission's conditions of certification, or the California Environmental Quality Act (CEQA) have occurred.

2001 to 2008 **Engineering Geologist**

State Water Resources Control Board, Headquarters, Sacramento, CA

With the UST Enforcement Unit, under direction from the State Attorney General's Office, conducted inspections of UST systems to evaluate compliance with 1998 upgrade requirements. This work culminated in the largest settlement of its kind in the nation's history. In addition, conducted surveillance of unlawful discharges from remediation systems and conducted investigations of UST Fund fraud cases.

With the USTCF Technical Review Unit, evaluated the technical elements of USTCF claims.

With the Division of Financial Assistance, assisted with the development of program policy for the Agricultural Water Quality Grant Program ($46 million) and the Integrated Water Quality Grant Program ($380 million), participated in stakeholder workshops, contributed to multijurisdictional work groups for program development and implementation.

With the Office of Enforcement, conducted investigations of operator misconduct, wrote enforcement investigation reports and prepared disciplinary letters.

1998 to 2001

Senior Engineering Geologist
BSK & Associates, Rancho Cordova, CA

Designed and directed hydrogeologic investigations for use with environmental remediation projects. Supervised field personnel installing groundwater monitoring wells, conducting aquifer tests & SVE pilot tests, reviewed reports and workplans, and conducted business development.

Conducted review of Alquist-Priolo active fault hazard reports as county geologist for Kern County.

1993 to 1998

Senior Geologist, Geoscience Team Leader and RI/FS Task Leader
LAW Engineering and Environmental Services, Inc., Sacramento, CA

As Geoscience Team Leader, responsible for career development, training and personnel management of ten employees. This group consisted of 3 senior-level geologists, 4 project level geologists and scientists, 2 junior level geologists and 1 technician.

As RI/FS Task Leader, responsible for the development of cost estimates/budgets, preparation of Work Plans and Sampling and Analysis Plans, management of field activities, data collection and documentation associated with the investigation of 15 Installation Restoration Program sites at Beale Air Force Base awarded under several Delivery Orders with combined project budgets of $18 million. Also responsible for aerial photographic interpretations associated with a basewide (23,000 acres),

Preliminary Assessment, and preparation of a basewide Hydrogeologic Evaluation Report.

1990 to 1993

Senior Project Manger/General Manager
Earthtec, Ltd., Roseville, CA

Management of Environmental Department, business development, preparation of cost estimates and proposals, client and regulatory agency interface, supervision and training, report writing, technical review, budget management, and quality control. Initiated and supported the development of company's wetland and wildlife departments. Typical projects included preliminary sire assessments, soil vapor studies, detailed hydrogeologic evaluations, waste plume delineations, and development of remediation alternatives associated with landfills, service stations, bulk oil facilities and other potentially contaminated sites.

1981 to 1990

Project Geologist
SHN Group, Inc. Eureka, CA

Managed project work directed toward solving environmental issues at variably contaminated sites and provided geotechnical information for land development and construction. Responsibilities included development of cost estimates/budgets, planned and supervised field operations, collected and interpreted subsurface information, evaluated areas traversed by Alquist-Priolo Special Studies Zones and sites subject to slope stability hazards. Typical projects included geotechnical evaluations and geologic hazard studies for major subdivisions, hospitals, schools, lumber companies, run-of-the-river hydroelectric projects, underground storage tank sites, and solid waste landfills.

1979 to 1981

Geologist/Seismologic Technician
Woodward-Clyde Consultants, San Francisco, CA

Designed and operated a laboratory model to study surface effects of thrust faulting in connection with seismic evaluation studies for the PG&E Humboldt Bay nuclear reactor. In addition, installed and operated field seismographs in the Humboldt Bay region.

DECLARATION OF
Vince C. Geronimo, PE

I, Vince Geronimo, declare as follows:

1. I am presently employed by the California Energy Commission in the Environmental Office of the Energy Facilities Siting Division as a Soil & Water Resources Specialist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on Soil & Water Resources, for the Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: October 14, 2009 Signed: _____

At: Sacramento, California

Vince C. Geronimo, PE, CFM

Associate Principal

Vince Geronimo is a registered California Professional Civil Engineer with 14 years of experience in the field of civil, environmental, and water resources engineering. Mr. Geronimo specializes in the planning, design, and implementation of flood mitigation projects that integrate ecosystem restoration. As part of PWA's fluvial team Mr. Geronimo provides technical QA/QC review of hydrologic and hydraulic analyses. Mr. Geronimo manages PWA's IDIQ contract with FEMA Region IX. For the California Energy Commission, Mr. Geronimo has conducted CEQA analysis, recommended mitigation measures, and contributed to Staff Assessments on four siting cases. Mr. Geronimo has conducted various environmental compliance reviews for more than 20 energy facilities. His education and project experience includes wastewater treatment facility design, water transmission and storage analysis, economic analysis, sediment and erosion control planning, stream and wetland restoration, and design of hydraulic structures. As a Certified Floodplain Manager and an engineer, Mr. Geronimo is knowledgeable of methods, to employ, that help reduce flood losses and protect and enhance the natural resources and functions of floodplains.

Education	M.S., 2004	Civil Engineering, Water Resources Emphasis, University of Colorado - Denver, Colorado
	B.S., 1995	Civil Engineering, Environmental Emphasis, Southern Illinois University - Edwardsville, Illinois
Professional Registration	2001 2006	Professional Engineer, State of Colorado, 35224 Civil Engineer, State of California, 70165
Certifications	2002	Certified Floodplain Manager, Certificate No. US-02-00543, Association of State Floodplain Managers
Memberships		American Society of Civil Engineers Environmental & Water Resources Institute of ASCE-Sacramento (Treasurer) Association of State Floodplain Managers Floodplain Managers Association

Selected Project Experience

Beacon Solar Energy Plant; Kern County, CA 2005 -Present. PWA Project Manager provided environmental review for the California Energy Commission of a proposed solar energy plant in the Mojave desert. The environmental review focused on the stormwater, BMPs, and flood related impacts. Mr. Geronimo conducted hydrologic, hydraulic, and geomorphic analyses to assess the project plan to divert an existing dry wash through a constructed earthen diversion channel. Mr. Geronimo provided environmental review of the Storm Water Pollution Prevention Plan and the Drainage Erosion and Sediment Control Plan (DESCP). Mr. Geronimo authored the stormwater and flood related portions of the Preliminary Staff Assessment which included an engineer's evaluation of the project in a separate appendix.

GWF Tracy; Tracy, CA 2008 – Present. PWA Project Manager provided environmental review of a proposed combined-cycle power plant in the City of Tracy for the California Energy Commission. The environmental review focused on the impacts to soil and water use. Mr. Geronimo specifically reviewed the project's proposed stormwater related facilities, BMPs, the septic facility, and water use to evaluate potential soil and water impacts. Mr. Geronimo conducted an assessment of the availability of recycled water and provided oversight for the Soil and Water Section of the Preliminary Staff Assessment.

Compliance Reviews; Throughout California. 2006 – Present. PWA Project Manager responsible for compliance reviews for the California Energy Commission. Mr. Geronimo is a technical reviewer for Soil & Water and Waste compliance submittals. Mr. Geronimo reviews Storm Pollution Prevention Plans (SWPPPs), Drainage Erosion and Sediment Control Plans (DESCP), water use, monthly/annual compliance reports, and flood related compliance submittals to determine if the Project remains in compliance with the Conditions of Certification specified in the Energy Commission's licensing decision.

Selected Project Experience
(Continued)

San Francisco Electric Reliability Plant; San Francisco, CA 2005 -Present. PWA Assistant Project Manager provided environmental review of a proposed power plant in San Francisco for the California Energy Commission. The environmental review was focused on the impacts to soil and water use. Mr. Geronimo specifically reviewed potential flooding, water reclamation and re-use, tertiary wastewater treatment facility, water quality impacts related soil erosion, and the Storm Water Pollution Prevention Plan and storm water best management practices.

Inland Empire Energy Center; Romoland, CA 2005. PWA Assistant Project Manager provided environmental review of a proposed power plant in Romoland for the California Energy Commission. The environmental review was focused on the impacts to soil and water use. Specific analyses included assessing potential flooding, water quality impacts related soil erosion, and the Storm Water Pollution Prevention Plan and storm water BMPs.

South Bay Salt Ponds Restoration Project, For the California State Coastal Conservancy, 2004 – 2008. PWA Task Manager for the riverine analysis of the Guadalupe River/Alviso Slough system. The analysis supported the EIR/S documentation for the South Bay Salt Pond Restoration Project NEPA/CEQA environmental review processes. The analysis combined a steady-state HEC-RAS model and an unsteady UNET model to test a combination of flooding scenarios related to the project alternatives that reduce offline storage and improve conveyance. The South Bay project is approximately 15,000 acres and will restore and enhance wetland habitats, improve public access and reduce flood hazards.

Independent QA/QC Review; FEMA Region IX, 2005 - 2008, PWA Project Manager responsible for developing the QA/QC procedures and checklist to provide independent review of three FEMA Flood Insurance Restudies within Monterey County, Siskiyou County, and Placer County. The independent technical review was conducted in accordance with the established policy principles and procedures in the *Guidelines and Specifications for Flood Hazard Mapping Partners*. The technical review included: Topographic Data, Hydrologic Data, Hydraulic Data, Floodplain Mapping (Revised Areas), as well as secondary checks of the data submitted as part of the TSDN for each re-study.

Flood Insurance Re-Studies; **FEMA Region IX**, 2007 - Present, PWA Project Manager responsible for managing a Marin County (Ross Valley) and a Santa Cruz County (Watsonville) Flood Insurance Re-study of several creeks in the study areas. The re-studies include: field survey, topographic mapping, hydrologic and hydraulic modeling, flood hazard assessment, and floodplain mapping.

Newhall Ranch Development, Valencia, CA, 2006-2008. For Newhall Land and Farming Company. Led the hydraulic assessment and conceptual civil design for improving five tributaries of the Santa Clara River that will be subject to hydromodification. Mr. Geronimo developed a suite of channel stabilization and bank stabilization application methods and design criteria to achieve stable channel morphology in response to reductions in sediment delivery and increases in flow.

Contra Costa Clean Water Program Hydrograph Modification Management Plan – Project Engineer, 2006-2007; for Contra Costa Clean Water program. Mr. Geronimo was part of the consultant team to assist the Contra Costa Clean Water Program in developing a Hydrograph Modification Management Plan (HMP). The HMP will include standards and performance criteria for hydrograph modification management by new development projects. Mr. Geronimo was involved in developing engineering concepts and practical civil design for Integrated Maintenance Practices (IMP).

Lake Sonoma Water Diversion; Sonoma County, CA 2005, PWA Project Manager to study feasibility of diverting water from Lake Sonoma, to the Russian River. The purpose of the analysis was for an EIR scoping process. Mr. Geronimo performed a reconnaissance level, engineering evaluation and provided an approximate cost to deliver 26,000 acre-feet of water from Lake Sonoma to the Russian River. The summary cost estimate included: facilities cost, approximate electrical demand engineering costs as percentage of facilities cost.

DECLARATION OF
John L. Fio

I, John L. Fio, declare as follows:

1. I am presently a consultant to the California Energy Commission for the Siting Office of the Energy Facilities Siting Division as a Hydrogeologic Consultant through Aspen Environmental Group**.**

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Soil and Water Resources** for the Beacon Solar Energy Project based on my independent analysis of the Application for Certification and the supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 17, 2009 Signed:_____

At: Davis, California

JOHN L. FIO

QUALIFICATIONS

John L. Fio has almost 25 years of problem-solving experience. Mr. Fio analyzes groundwater systems, quantifies chemical transport in the subsurface, and evaluates groundwater surface-water interactions. He is a recognized expert on hydrologic and water quality issues. Mr. Fio develops and employs numerical models for site, water district, and basin-wide investigations; calculates extraction effects on groundwater levels, stream flow, and lake levels; establishes water quality monitoring programs; designs water management plans; evaluates groundwater quality effects of wastewater and recycled water disposal to land; develops and implements Geographic Information System (GIS) databases; and determines water sources using chemical and age-dating techniques.

PROFESSIONAL EXPERIENCE

January, 1998 – present

Principal Hydrologist, HydroFocus, Inc. *Davis, CA*

California Energy Commission (2008-2009): As part of several proposed power plant permitting reviews (CPV Sentinel, Beacon, and Carizzo), project applicants developed groundwater-flow models to simulate groundwater level changes in response to pumping from power plant extraction wells. Mr. Fio reviewed model construction, assumptions, parameters, calibration, sensitivities, results, and validity. When appropriate, he also employed the models to complete analyses to identify model uncertainty and help develop mitigation and project Conditions of Certification. His written reports are integrated as part of Staff's Preliminary and Final Assessments. Additionally, John provided hydrogeologic assessments to interpret model results and describe basin conditions.

Grasslands Bypass EIR/EIS (1999 and 2008): The Grasslands Drainage Area includes 97,400 acres of farmland approximately located between the California Aqueduct on the west and San Joaquin River on the east. In 1999 and again in 2008, Mr. Fio utilized groundwater-flow and geochemical models to simulate changes in salt and selenium distributions in soil under different water- and land-management alternatives as part of NEPA/CEQA compliance documentation.

San Luis Drainage Feature Evaluation (2005-2007): John Fio completed groundwater hydraulic and soil and water quality assessments for drainage-water management alternatives. As a principal of HydroFocus, Inc., he was part of the URS team that received a commendation from the U.S. Bureau of Reclamation for outstanding performance in the successful completion and certification of the NEPA/CEQA Environmental Impact Report and Environmental Impact Statement.

Alexander Valley Resort AB-610 Water Supply Assessment (2008): The proposed Alexander Valley Resort is located in Cloverdale, California. John Fio completed the SB-610 water supply assessment as required by CEQA for the City of Cloverdale, who is both the public water supplier and the lead agency for the project. Because the City of Cloverdale did not have an adopted Urban Water Management Plan, other data sources,

reports, and soil moisture budget modeling were required to determine the total available water supplies during normal, single dry, and multiple dry years for a 20-year projection. The analysis determined whether supplies met the estimated water demand associated with the proposed project and future residential and non-residential water uses.

Additional relevant data and modeling analyses include:

- Groundwater-flow, solute-transport, and water-quality impacts from wastewater disposal to land: sanitary districts and municipalities located in San Joaquin and Contra Costa Counties, California.
- Quantitative hydrogeochemical assessment of contaminant transport near Menlo Park, California. Development of groundwater-flow and solute-transport models to quantify hydrocarbon transport beneath industrial facility near San Francisco Bay.
- Groundwater recharge and subsurface storage, Merced County, California. Developed and implemented regional groundwater-flow model to assess groundwater recharge and pumping projects.
- Depletion of subsurface flow to the North Platte River, Wyoming and Nebraska. Data analysis and modeling of stream aquifer interactions in support of interstate water rights conflict.

1995 to 1997

Senior Project Hydrologist, Hydrologic Consultants, Inc. *Sacramento, CA*

Project experience in the evaluation of groundwater flow, water quality, and solute transport. Consulting assignments included the following:

- Developed relationships to describe geologic controls and load-flow relationships for Santa Ynez River drainage system. The relationships were part of a network of interacting reservoir operations, surface-water, and groundwater-flow and transport models.
- Evaluation of groundwater-flow paths beneath South San Francisco Bay. The groundwater-flow system was quantified using a groundwater-flow model to assess system response to pumping centers located east and west of the Bay.
- Coordination with the California Regional Water Quality Control Board on the remediation of a VOC plume in Mountain View, California.
- Assess the response of groundwater levels, streamflow, and spring discharge to groundwater pumpage in the Mammoth Basin, California.
- Quantifying stream flow depletions owing to increased consumption and groundwater pumping.

1990 to 1995

Research Grade Hydraulic Engineer, U.S. Geological Survey Sacramento, CA

- Geohydrologic and groundwater quality investigations in the western San Joaquin Valley, California.
- Directed the development of a regional Geographic Information System database for the South San Francisco and Peninsula Area, California.
- Supervised data collection and development of databases, data analyses, and report writing.

- Constructed groundwater flow models for parts of the western San Joaquin Valley and South San Francisco Bay areas, California.
- Interacted with private and public cooperators and funding agencies.

1987 to 1990

Civil Engineer, U.S. Geological Survey *Sacramento, CA*

- Conducted field-scale investigations of on-farm drainage systems.
- Developed groundwater-flow model of tile drainage system. Assessed flow paths and salt transport in shallow flow-system. Quantified regional groundwater-flow paths intercepted by on-farm drainage systems.
- Integrated particle-tracking models with groundwater-flow model results to assess advective transport of salts and selenium.

1985 to 1987

Hydrologist, U.S. Geological Survey *Sacramento, CA*

- Designed and conducted sorption experiments and incorporated results into a solute transport model.
- Assessed the distribution of salts and selenium in unsaturated and saturated soil profiles.
- Developed analytical method to estimate organic selenium concentrations in soil extracts.

1983 to 1984

Research Assistant, University of California *Davis, CA*

- Conducted an assessment of methods used to analyze for selenium in soil extracts, aqueous samples, and animal tissues.
- Implemented experiments to assess arsenic volatilization from soils.
- Conducted laboratory analyses to estimate the buffering capacity of soils in response to acidic deposition.

ACADEMIC BACKGROUND

Master of Science, 1987, Civil Engineering, University of California at Davis
Bachelor of Science, 1984, Soil and Water Science, University of California at Davis

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers
Association of Groundwater Scientists and Engineers
California Groundwater Resources Association
Citation for Outstanding Performance, University of California, Davis (1981).

DECLARATION OF
DAVID FLORES

I, **David Flores** declare as follows:

1. I am presently employed by the California Energy Commission in the Siting, Transmission and Environmental Protection Division as a **Planner 2**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I prepared the staff testimony on **Traffic and Transportation** for the Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: July 28, 2009 Signed: _____

At: Sacramento, California

DAVID FLORES

WORK EXPERIENCE

Sept. 1998 to Present — **Planner 2.** California Energy Commission, Energy Facilities Siting and Protection Division.

- Provide technical analysis of proposed energy planning, conservation, and development programs on land use, visual and traffic and transportation resources. Specific tasks include: the analysis of potential impacts; identification of suitable mitigation measures; preparation of testimony; participate in public workshops; present sworn testimony during evidentiary hearings, and project monitoring to ensure compliance with local, state and federal environmental laws and regulations.

March 29,1988 to September 12, 1998 — **Senior Planner.** County of Yolo Planning and Public Works Department

Senior Planner - Current and Advanced Planning (Resources Management and Planning)

Responsibilities included the following:

- Administered the establishment of Planning schedules and timeframe completion schedules; Administration and staff support to Planning Commission and Board of Supervisors; Staff support and liaison to citizen's committees. Preparation of Environmental documents (Negative Declarations, preparation of Environmental Impact Reports and Categorical Exemptions) in accordance with State and Federal Regulations.

June 1, 1976 to March 25, 1988 — **Manager of Resources** Citizens Utilities Company of California

Responsibilities included the following:

- Coordinated, planned and developed semi-annual and annual construction and operating and maintenance budgets for all Northern California operations.
- Assisted in the development of rate and fee schedules before the California Public Utilities Commission for all Northern California Operations.
- Direct five employees and twenty-five employees in the outlying operations.
- Extensive experience in specification writing, project planning and scheduling, construction management, and site supervision

EDUCATION

California State University @ Sacramento
University of California @Davis
Major: Environmental Studies
Minor: Business Administration

DECLARATION OF
Michael N DiFilippo

I**, Michael N DiFilippo** declare as follows:

1. I am presently employed **as a consultant for** the California Energy Commission in the Energy Facilities Siting Division as a **water treatment consultant**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Alternatives**, for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 21, 2009

Signed:

At: Berkeley, California

DECLARATION OF
Michael N DiFilippo

I**, Michael N DiFilippo** declare as follows:

1. I am presently employed **as a consultant to** the California Energy Commission for the Energy Facilities Siting Division as a **water treatment consultant through Aspen Environmental Group**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Soil and Water Resources**, for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: September 18, 2009

Signed:

At: Berkeley, California

Resume

Michael N DiFilippo

2803 Woolsey Street
Berkeley, CA 94705
510-655-6629
510-406-6629 (cell phone)
510-653-5874 (fax)
mndconslt@aol.com

Mr. DiFilippo is a chemical engineer with 38 years of experience in environmental and industrial projects involving water and wastewater treatment, water reuse and process optimization. He has also managed a number of consulting operations, multi-disciplinary organizations and design teams. For the past fourteen years, his consulting practice has been focused on the use and reuse of degraded water for the power industry.

Mr. DiFilippo has managed large projects involving: use of reclaimed water in power plants, zero-liquid discharge (ZLD), petrochemical process water and wastewater, geothermal fluids, metal finishing wastewater, electronics industry ultrapure water, irrigation and municipal wastewater reclamation, seawater desalinization and treatment facility design. In most of these projects, process improvements were made to existing or planned facilities to minimize the use of raw materials, reduce waste production and improve overall efficiency.

Before starting his own practice, Mr. DiFilippo worked for Southern California Edison for nine years in new plant design and CH2M Hill for ten years as a project manager and regional technical manager. He also worked for RCC (a water and wastewater equipment manufacturer) and a several small consulting firms.

Mr. DiFilippo prepared a guidance document for the Electric Power Research Institute (EPRI) on the use of degraded water (e.g. reclaimed water) for power plant cooling. He also updated the Institute's standards for cooling tower chemistry. The revised standards will enable power plant developers to more realistically evaluate "challenging" water sources.

For the Los Angeles Department of Water and Power (LADWP), Mr. DiFilippo evaluated the use of reclaimed water for the 585 MW Scattergood Generating Station and 220 MW Harbor Generating Station as alternatives to once-through ocean cooling. For Scattergood, secondary treated effluent from the Hyperion Wastewater Plant (adjacent to Scattergood) was evaluated for both one-through cooling as well as makeup to retrofitted cooling towers. The project involved evaluating existing infrastructure, locations for tie-in points, and conceptual-level cost estimates. A similar study was done for the Harbor Generating Station. Wastewater from the Carson Treatment plant was evaluated for once-through cooling and Title 22 water from West Basin Water District was evaluated for cooling tower makeup.

Mr. DiFilippo is currently working water treatment improvements for the 1100 MW Mountainview Power Plant (owned and operated by Southern California Edison). He has been involved in numerous studies to improve zero discharge system and cooling system performance.

Mr. DiFilippo recently participated in three power plant projects – all were slated to use reclaimed municipal effluent for cooling water. The projects involved detailed evaluations of constituents of concern that typically pose problems in cooling systems, i.e. sparingly soluble salts, suspended solids, BOD, ammonia, etc. Water usage, cycles of concentration, materials of construction, biological control, scale and deposition controls and corrosion controls were assessed for each project.

For the 1,800 MW San Juan Generating Station in New Mexico, Mr. DiFilippo assessed the use of non-traditional sources waters for boiler feed water, SO_2 scrubber make-up, cooling tower make-up and plant service water. The plant is coal fired power plant and is operated as a ZLD facility. Saline produced water (generated by oil and gas production) was evaluated to supply 10 to 12 percent of the plant's water needs. The TDS of the water ranged from 3,000 to 20,000 mg/l with an average concentration of 12,000 mg/l. Off-the-shelf technologies were evaluated to treat the water – this would enable PNM to act quickly to install a treatment plant if deemed feasible. Treatment alternatives included precipitation softening, ion exchange, high-pH RO and evaporators.

For two coal-fired power plants in Texas, Mr. DiFilippo evaluated water use and reuse to minimize wastewater generation to their respective cooling lakes. The projects involved developing detailed water balances, the identification of water reuse opportunities and the design and procurement of a wastewater treatment system.

For four different projects, Mr. DiFilippo evaluated the treatment of oil-field wastewater (produced water) as the owners' process consultant. Oil-field wastewater can be very saline (TDS up to 25,000 mg/l) with significant levels of scale-forming constituents, oil, organic compounds, boron, ammonia, silica, strontium and barium. The water can also have high levels of bacteria. Each project planned to treat the water for reuse or discharge to the environment. Some critical discharge parameters presented technical hurdles, e.g. boron, ammonia, BTEX, etc. A number of treatment technologies were evaluated – PACT process (biological process), precipitation softening, ultrafiltration, reverse osmosis, evaporation, etc.

Mr. DiFilippo managed numerous studies and designs for the Southern California Edison Company. Also, he developed a number of computer-based models to predict the performance of water treatment equipment, cooling-system water consumption, ZLD treatment alternatives, evaporation pond performance, water quality impacts during plant start-up, etc. Studies and designs covered boiler feedwater, cooling water treatment and ZLD wastewater and recycle treatment systems. A partial list of projects includes:

- 700 Megawatt (MW) Long Beach Combined Cycle Generating Station – split stream softener/dealkalizer for boiler feedwater treatment and wastewater neutralization.
- 900 MW Coolwater Combined Cycle Generating Station – ZLD design – boiler feedwater treatment, makeup and side-stream cooling water treatment, water reuse and final-disposal evaporation ponds.
- 50 MW Coolwater Solar I Generating Station – ZLD design – one-of-a-kind boiler feedwater treatment.

- 450 MW Coolwater Coal Gasification Plant – ZLD design – wastewater reuse and treatment.
- 2200 MW San Onofre Nuclear Generating Station – cycle make-up and steam generator blowdown treatment and reuse.

Mr. DiFilippo received a B.S. degree in Chemical Engineering from California State University at Long Beach in 1971.

DECLARATION OF
Mark R. Hamblin

I, Mark R. Hamblin declare as follows:

I am presently employed by the California Energy Commission in the Environmental Protection Office of the Siting, Transmission, Environmental Protection Division as a Planner II.

My professional qualifications and experience were included in the FSA, and are incorporated by reference herein.

I prepared the additional staff testimony for the Visual Resources section for the proposed Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: July 16, 2009 Signed: _____

At: Sacramento, California

MARK R. HAMBLIN

Summary

Public administrator/land use planner with 15 years experience addressing land use development matters of concern to citizens and government leaders. Expertise in interpreting public policy pertaining to land use and environmental assessment. Demonstrated ability in working with individuals, and on teams involved in the development permitting process.

Professional Experience

California Energy Commission, Sacramento, CA.
Planner II November 2000 to present.
Prepares an independent technical analysis in the area(s) of land use, traffic & transportation, and visual resources to inform interested persons and to make recommendations to the Energy Commission regarding the consequences of a natural gas fired power generation plant proposal; reviews information provided by the applicant and other sources to assess the environmental effects of a proposal as required by the California Environmental Quality Act (CEQA), and the California Energy Commission siting regulations; evaluates project in accordance with federal, state and local laws, ordinances, regulations, standards (LORS); coordinates proposal with federal, state and local agencies; conducts field studies; oversees technical consultant(s); participates in public workshop(s) on proposal; presents sworn testimony during evidentiary hearings; implements compliance monitoring programs for projects approved by the Energy Commission to ensure that power plants are constructed and operated according to the conditions of certification of their license.

Yolo County Planning and Public Works Department, Woodland, CA.
Associate Planner June 1992 to October 2000.
Advised and assisted individuals in the processing of land use requests (general plan amendments, conditional use permits, subdivision maps, etc.); reviewed information provided by the applicant and other sources for consistency with the state zoning and planning law, the county General Plan, the county government code, and the requirements of the CEQA; collected and analyzed information pertaining to a land use request and presented it in a staff report for consideration by the county planning commission and/or county board of supervisors; board of supervisors liaison, and planning department staff person to citizen and inter-agency committees (county airport advisory committee, county habitat conservation plan steering committee, and community general plan citizen advisory committee(s); drafted zoning ordinances and regulations; prepared environmental assessment documents in accordance with CEQA and NEPA (National Environmental Protection Act); hired and supervised consultants; executed county zoning administrator duties; conducted zone code enforcement; reviewed building plans for issuance of permits; answered questions at the public counter, or on the telephone regarding land use issues and development proposals in the County.

Yolo County Community Development Agency, Woodland, CA.
Assistant Planner January 1991 to June 1992.
Advised and assisted individuals in the processing of land use requests; reviewed information provided by the applicant and other sources for consistency with the county

General Plan, the state and county government code, and the requirements of CEQA; collected and analyzed information pertaining to a land use request and presented it in a staff report for consideration by the county planning commission; drafted zoning ordinances; prepared environmental assessment documents in accordance to the CEQA; supervised consultants; conducted zone code enforcement; reviewed building plans for issuance of permits; answered questions at the public counter, or on the telephone regarding land use and development in the County.

Tulare County Planning and Development Department, Visalia, CA.
Planning Technician II March 1988 to January 1990.
Advised and assisted individuals in the processing of land use requests, specifically special-use permits, variances, parcel and subdivision maps; reviewed information provided by the applicant and other sources for consistency with the county General Plan, the state and county government code, and the requirements of CEQA; collected and evaluated information for presentation in a staff report on the proposed land use request for consideration by the county zoning administrator, site plan review committee, or planning commission; prepared environmental assessment documents in accordance with CEQA; conducted zone code enforcement; reviewed building plans for issuance of permits; answered questions at the public counter, or on the telephone regarding land use and development in the County.

Education

University of California, Davis Extension. Coursework in California Land Use Planning and the California Environmental Quality Act 1988 to 1995.
Cosumnes River College. Coursework in Television and Radio Broadcasting1990 to 1991.
California State University, Bakersfield. Master of Public Administration; August 1988. Concentration in Public Policy. Coursework in Business Administration and Political Science.
California State University, Sacramento. Bachelor of Science in Public Administration; May 1984. Concentration in Human Resources Management.
Porterville College. Associate in Arts Social Science; May 1982. Coursework in Administration of Justice.

Awards

2001 Superior Accomplishment Award - Recognition of outstanding performance and contribution as a Team Member of the “21 Day, 4, 6, and 12 Month Processes Team.” California Energy Commission.

2001 Superior Accomplishment Award - Recognition of outstanding performance and contribution as a Team Member of the “Expedited 4 Month AFC/SPPE Team,”
California Energy Commission.

DECLARATION OF
Ellen Townsend-Hough

I, **Ellen Townsend-Hough** declare as follows:

1. I am presently employed by the California Energy Commission in the Environmental Siting Office of the Energy Facilities Siting Division as an Associate Mechanical Engineer.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on Waste Management for the Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

Ellen Townsend-Hough

SUMMARY

I am a chemical engineer with 29 years of experience. My strengths are in analyzing and performing complex environmental engineering analyses, in areas such as Waste Management, Hazardous Materials Management, Worker Safety, and Water Resources. I perform inspections work involved in the design and construction of thermal electrical generating power plants. I have a working knowledge of the California Environmental Quality Act. I worked as a policy advisor to a California Energy Commissioner for three years. I am also an US Environmental Protection Agency Environmental Justice trainer.

PROFESSIONAL EXPERIENCE

Technical Analysis and Presentation

- Performs mechanical engineering analysis of designs for complex mechanical engineering analysis of designs for systems such as combustion chambers and steam boilers, turbine generators, heat transfer systems, air quality abatement systems, cooling water tower systems, pumps and control systems
- Provide an engineering analysis examining the likelihood of compliance with the design criteria for power plants and also examine site specific potential significant adverse environmental impacts
- Review and analyze compliance submittals in accordance with the California Environmental Quality Act, the Warren Alquist Act, the Federal Clean Air Act and the California and Federal Occupational Health and Safety Acts to assure compliance of projects
- Provides licensing recommendations and function as an expert witness in regulatory hearings.
- Provide public health impact analysis to assess the potential for impacts associated with project related air toxic/non-criteria pollutant emissions.
- Evaluate the potential of public exposure to pollutant emissions during routine operation and during incidents due to accidents or control equipment failure

Technical Skills

- Establish mitigation that reduces the potential for human exposure to levels which would not result in significant health impact or health risk in any segment of the exposed population.
- Assist with on-site audits and inspection to assure compliance with Commission decisions.
- Review and evaluate the pollution control technology applied to thermal power plants and other industrial energy conversion technologies.
- Work with the following software applications: WORD, Excel, and PowerPoint.

Policy Advisor

- Provided policy, administrative and technical advice to the Commissioner Robert Pernell. My work with the Commissioner focused on the policy and environmental issues related to the Commission's power plant licensing, research and development and export programs.
- Track and provide research on varied California Energy Commission (CEC) programs. Prepare analysis of economic, environmental and public health impacts of programs, proposals and other Commission business items.
- Represent Commissioner's position in policy arenas and power plant siting discussions.

- Write and review comments articulating commission positions before other regulatory bodies including Air Resources Board, California Public Utilities Commission, and the Coastal Commission.

- Wrote speeches for the Commissioner's presentations.

-

Writing

- Write letters, memos, negative declarations, environmental impact reports that require technical evaluation of mechanical engineering and environmental aspects of pollution control systems, environmental impacts, public health issues and worker safety.

EMPLOYMENT HISTORY

2002-Present	Associate Mechanical Engineer	California Energy Commission (CEC) Sacramento CA
1999-2002	Advisor to CEC Commissioner	CEC Sacramento CA
1989-1999	Associate Mechanical Engineer	CEC Sacramento CA
1992-1993	Managing Partner	EnvironNet Sacramento CA
1988-1989	Sales Engineering Representative	Honeywell Inc Commerce CA
`1987-1988	Chemical Engineer	Groundwater Technology Torrance CA
1985-1986	Technical Marketing Engineer	Personal Computer Engineers Los Angeles CA
1985-1985	Energy Systems Engineer	Southern California Gas Company Anaheim CA
1980-1985	Design Engineer	Southern California Edison Rosemead CA
1975-1980	Student Chemical Engineer	Gulf Oil Company Pittsburgh PA

EDUCATION

Bachelor of Science, Chemical Engineering
Drexel University, Philadelphia Pennsylvania

Continuing Education

Hazardous Material Management Certificate, University California Davis
Urban Redevelopment and Environmental Law, University of California Berkley
Analytical Skills, California Department of Personnel Administration (DPA) Training Center
Legislative Process/Bill Analysis, DPA Training Center
Federally Certified Environmental Justice Trainer

References furnished upon request.

DECLARATION OF
Testimony of Dal Hunter, Ph.D., C.E.G.

I**, Dal Hunter, Ph.D., C.E.G.,** declare as follows:

1. I am presently employed as a subcontractor to Aspen Environmental Group, a contractor to the California Energy Commission, Systems Assessment and Facilities Siting Division, as an engineering geologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **GEOLOGY AND PALEONTOLOGY** for the proposed **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: July 27, 2009 Signed:_____

At: Black Eagle Consulting, Inc.
Reno, Nevada

Robert D. Hunter, Ph.D., C.E.G.
Engineering Geologist
Vice President

Education

- Ph.D. – Geology – 1989 – University of Nevada, Reno
- M.S. – Geology – 1976 – University of California - Riverside
- B.S. – Earth Science – 1972 – California State University, Fullerton

Registrations

- Registered Geologist – California
- Certified Engineering Geologist – California
- Professional Geological Engineer – Nevada

Experience

1997 to Present: Black Eagle Consulting, Inc.; Vice President. Dr. Hunter is in charge of all phases of geological, geotechnical, and geochemical projects and is responsible for conducting, coordinating, and supervising geotechnical investigations for public and private sector clients. He has worked on numerous industrial and commercial projects over the last 30 years. Dr. Hunter is very familiar with state and federal design specifications as well as CEQA and NEQA requirements related to geology and paleontology.

Dr. Hunter has also provided geological, geotechnical, and paleontological review and written and oral testimony for California Energy Commission (CEC) power plant projects including:

- El Segundo Power Redevelopment Project (including compliance monitoring)
- Magnolia Power Project (including compliance monitoring)
- Ocotillo Energy Project (Wind Turbines)
- Vernon-Malburg Generating Station
- Inland Empire Energy Center (including compliance monitoring)
- Palomar Energy Project
- Henrietta Peaker Project
- BP Carson Peaker Project
- East Altamont Energy Center
- Avenal Energy Center
- Teayawa Energy Center monitoring
- Walnut Energy Center (including compliance monitoring)
- Riverside Energy Resource Center
- Salton Sea Unit 6 (Geothermal Turbines)
- National Modoc Power Plant
- Pastoria Energy Center
- Walnut Creek Energy Park
- Sun Valley Energy Project
- El Centro Unit 3 Repower Project

- AES Highgrove Project
- South Bay Replacement Project
- Vernon Power Plant
- Bullard Energy Center Project
- Humboldt Bay Repowering Project (including compliance monitoring)
- Victorville Power Project
- Carlsbad Energy Center
- San Gabriel Generating Station
- Orange Grove
- Chula Vista Energy Upgrade
- Carrizo (Solar)
- KRCD Community Power
- Carrizo Power Plant (including compliance monitoring)
- Sentinel Peaker Project
- Canyon Power Plant
- Riverside Acorn SPPE Project
- Beacon Solar Generating Station
- Stirling 2 Solar Project
- Stirling 1 Solar Project
- City of Palmdale
- eSolar1 Solar Generating Project
- Otay Mesa Generating Project (compliance monitoring)
- Montainview Power Plant Project (compliance monitoring)
- Consumes Power Plant (compliance monitoring)
- Sunrise Power Project (compliance monitoring)
- Niland Power Project (compliance monitoring)
- Panoche Power Plant (compliance monitoring)
- Colusa Generating Station (compliance monitoring)
- Starwood Power Plant (compliance monitoring)
- Los Mendanos Power Plant (compliance monitoring)
- Blythe Combined Cycle Plant (compliance monitoring)
- Roseville Energy Plant (compliance monitoring)

Attended Expert Witness Training Sponsored by CEC.

1978 to 1997: SEA, Incorporated; Geotechnical Manager, Engineering Geologist. Dr. Hunter was in charge of all phases of geotechnical projects for SEA, including project coordination and supervision, field exploration, geotechnical analysis, slope stability analysis, soil mechanics, engineering geochemistry, mineral and aggregate evaluations, and report preparation. Numerous investigations were undertaken on military, commercial, industrial, airport, residential, and roadway projects. He worked on many geothermal power plants, providing expertise in foundations design, slope stability, seismic assessment, geothermal hazard evaluation, expansive clay, and settlement problems. Project types included high-rise structures, airports, warehouses, shopping centers, apartments, subdivisions, storage tanks, roadways, mineral and aggregate evaluations, slope stability analyses, and fault studies.

1977 to 1978: Fugro (Ertec) Incorporated Consulting Engineers and Geologists; Staff Engineering Geologist; Long Beach, California.

Affiliations

- Association of Engineering Geologists

Publications

- Hunter, 1988, *Lime Induced Heave in Sulfate Bearing Clay Soils*, Journal of Geotechnical Engineering, ASCE, Vol. 14, No. 2, pp. 150-167.

- Hunter, 1989, *Applications of Stable Isotope Geochemistry in Engineering Geology*: Proceedings of the 25th Annual Symposium on Engineering Geology and Geotechnical Engineering.

- Hunter, 1993, *Evaluation of Potential Settlement Problems Related to Salt Dissolution in Foundation Soils*: Proceedings of the 29th Annual Symposium on Engineering Geology and Geotechnical Engineering.

DECLARATION OF
SHAHAB KHOSHMASHRAB

I**, SHAHAB KHOSHMASHRAB**, declare as follows:

1. I am presently employed by the California Energy Commission in the **ENGINEERING OFFICE** of the Facilities Siting Division as a **MECHANICAL ENGINEER**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I participated in the preparation of the staff testimony on **Power Plant Efficiency** for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: _____ Signed: _____

At: Sacramento, California

DECLARATION OF
SHAHAB KHOSHMASHRAB

I**, SHAHAB KHOSHMASHRAB**, declare as follows:

1. I am presently employed by the California Energy Commission in the **ENGINEERING OFFICE** of the Facilities Siting Division as a **MECHANICAL ENGINEER**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I participated in the preparation of the staff testimony on **Power Plant Reliability** for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: _____ Signed: _____

At: Sacramento, California

Shahab Khoshmashrab
Mechanical Engineer

Experience Summary

Nine years experience in the Mechanical, Civil, Structural, and Manufacturing Engineering fields involving engineering and manufacturing of various mechanical components and building structures. This experience includes QA/QC, construction/licensing of electric generating power plants, analysis of noise pollution, and engineering and policy analysis of thermal power plant regulatory issues.

Education

- California State University, Sacramento-- Bachelor of Science, Mechanical Engineering
- Registered Professional Engineer (Mechanical), California

Professional Experience

2001-2004--Mechanical Engineer, Systems Assessment and Facilities Siting– California Energy Commission

Performed analysis of generating capacity, reliability, efficiency, noise and vibration, and the mechanical, civil/structural and geotechnical engineering aspects of power plant siting cases.

1998-2001--Structural Engineer – Rankin & Rankin

Engineered concrete foundations, structural steel and sheet metal of various building structures including energy related structures such as fuel islands. Performed energy analysis/calculations of such structures and produced structural engineering detail drawings.

1995-1998--Manufacturing Engineer – Carpenter Advanced Technologies

Managed manufacturing projects of various mechanical components used in high tech medical and engineering equipment. Directed fabrication and inspection of first articles. Wrote and implemented QA/QC procedures and occupational safety procedures. Conducted developmental research of the most advanced manufacturing machines and processes including writing of formal reports. Developed project cost analysis. Developed/improved manufacturing processes.

DECLARATION OF
Mark Hesters

I**, Mark Hesters** declare as follows:

1. I am presently employed by the California Energy Commission in the **Strategic Transmission Planning Office** of the Siting, Transmission and Environmental Protection Division as a **Senior Electrical Engineer**.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the staff testimony on **Transmission System Engineering**, for the **Beacon Solar Energy Project** based on my independent analysis of the Application for Certification and supplements hereto, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated:_____ Signed:_____

At: Sacramento, California

Mark Hesters
Associate Electrical Engineer

Mark Hesters has fourteen years of experience in electric power regulation. He worked in the Engineering Office of the California Energy Commission's Energy Facilities Siting & Environmental Protection Division since 1998 providing analysis of California transmission systems and testimony on transmission systems in several Commission power plant certification processes. Prior to that Mark worked in the CEC's Electricity Analysis Office providing lead analysis on Southern California Edison resource issues and modeling support for all areas of California. He holds a B.S. degree from the University of California at Davis in Environmental Policy Analysis and Planning.

DECLARATION OF

Sudath Arachchige

I, Sudath Arachchige declare as follows:

I am presently employed by the California Energy Commission in the Transmission System Engineering Office of the Systems Assessments and Facilities Siting Division as an Associate Electrical Engineer.

A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

I helped prepare the TSE testimony on 07-31-09 for the Beacon Solar Energy Project based on my independent analysis of the Application for Certification and supplements thereto, data from reliable documents and sources, and my professional experience and knowledge.

It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue addressed therein.

I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 07-31-09 Signed: Sudath Arachchige

At: Sacramento, California

Sudath Arachchige
1916 Ackleton Way
Roseville CA 95661-USA Phone 916-786-6468

EDUCATION:

Bachelor of Science in Electrical Engineering at California State University Fullerton

ATTAINMENTS:

Member of the Professional Engineers in California Government
Vice President Electrical Engineering Society-California State University Fullerton.

EXPERIENCE:

November-2001 to Present: - Associate Electrical Engineer, System Assessment and Facilities Siting Division, California Energy Commission.
Conduct and perform planning studies and contingency analysis including power flow, short-circuit, stability, and post-transient analysis to maintain reliable operation of the power system. Investigates and analyzes Grid Planning problems and provides appropriate information to Grid Planning Engineers. Develops automated computer programs and other advance analysis methods for comprehensive evaluation of the operational performance of the transmission system.
Understanding of regulatory and reliability guidelines, WECC and NERC planning and operation criteria, CPUC and FERC requirements. Review technical analyses for WECC/ISO/PTO transmission systems and proposed system additions; provide support and analyses associated with Reliability Must-Run (RMR) contracts and the Local Area Reliability Services (LARS) process; review new generation interconnection studies; provide congestion analyses; and provide support for regulatory filings.

June-1998 to November-2001: - Project Electrical Engineer, Design Electrical Engineering Section, Department of Transportation, California.
Electrical Engineering knowledge and skills in the design, construction and maintenance of California state work projects involving all the public work areas; contract administration, construction management, plan checking, field engineering and provide liaison with consultants, developers, and contractors. Plan review in facility constructions, highway lighting, sign lighting, rest area lighting, preparation of project reports, cooperative agreements, review plans for compliance of construction and design guide lines for national electrical code, standards and ordinance. Review process included breaker relay coordination, detail wiring diagrams, layout details, service coordination, load, conductor sizes, derated ampacity, voltage drop calculations, harmonic and flicker determination.

June-1993 to May-1998:- Substation Electrical Engineer, City of Anaheim, California.
Performed protective relay system application, design and setting determination in Transmission & Distribution Substation. Understanding of principles of selective

coordination system protection and controls for Electric Utility Equipment. Understanding of Power theory and Analysis of symmetrical components. Ability to review engineering plans, specifications, estimates and computation for Electrical Utility Projects. Practices of Electrical Engineering design, to include application of Electro-mechanical and solid state relays in Electrical Power Systems. Software skills in RNPDC (Fuse Coordination Program), Capacitor bank allocation program, and Load Flow Program. Design projects using CAD, Excel spread sheets including cost estimates, wiring diagrams, material specifications and field coordination.

Performed underground service design 12kV and 4kV duct banks; pole riser; getaway upgrade; voltage drop calculation, ampacity calculation and wiring diagrams. Design and maintence of substations in City Electrical Utility System. Upgrade Station Light and power transformers; upgrade capacitor banks; replacement of 12kV-4kV power circuits; Breakers at Metal Clad Switchgear. Design one-line diagrams; three line diagrams; grounding circuits; schematics; coordination of relay settings; conduit and material list preparation. Calculation of derated ampacity; inrush current, short circuit current and fault current.

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 *BEACON SOLAR ENERGY PROJECT*

Docket No. 08-AFC-2

PROOF OF SERVICE
(Revised 4/28/09)

APPLICANT

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DECLARATION OF SERVICE

I, Maria Santourdjian, declare that on October 22, 2009, I served and filed copies of the attached Beacon Solar Energy Project (08-AFC-2) Final Staff Assessment. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[www.energy.ca.gov/sitingcases/beacon]**. The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

FOR SERVICE TO ALL OTHER PARTIES:

__x__sent electronically to all email addresses on the Proof of Service list;

__x__by personal delivery or by depositing in the United States mail at Sacramento with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

__x__sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (***preferred method***);

OR

_____depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. _____
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Original Signed in Dockets
Maria Santourdjian