Memorandum

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To: Commissioner Anthony Eggert, Presiding Member
Commissioner Jeffrey Byron, Associate Member

From: California Energy Commission – Christopher Meyer, Project Manager
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: **ENERGY COMMISSION STAFF'S ERRATA TO THE SUPPLEMENTAL STAFF ASSESSMENT FOR THE CALICO SOLAR PROJECT (08-AFC-13)**

Energy Commission staff is providing an Errata to the Supplemental Staff Assessment (SSA) to include information referenced in but inadvertently omitted from the Cumulative Scenario section, the Biological Resources section, and Soil and Water Resources section of the SSA. This includes adding the introduction and overview of the project-related future actions section that was included in the various technical areas of the SSA to Section **B.3 Cumulative Scenario**, with changes presented in underline-strikeout form. In addition, Energy Commission staff is also added the missing Appendix A to the **Biological Resources** section (the PWA Geomorphic Assessment of Calico Solar Project Site), and replacing **SOIL AND WATER RESOURCES FIGURE 5** with the updated **SOIL AND WATER RESOURCES FIGURES 5a and 5b** that were analyzed and referenced in the SSA. The three portions of this errata will be referenced by staff in the proceeding as:

- Exhibit 304 – Addition of Project-Related Future Actions language to Section B.3
- Exhibit 305 – Biological Appendix A, PWA Geomorphic Assessment Report
- Exhibit 306 - **SOIL AND WATER RESOURCES FIGURES 5a and 5b**

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Exhibit 304

B.3 – Cumulative Scenario and Project-Related Future Actions

B.3 – CUMULATIVE SCENARIO AND PROJECT-RELATED FUTURE ACTIONS

Testimony of Susan V. Lee

B.3.1 INTRODUCTION

The following section addresses two components. First it addresses the cumulative scenario for the cumulative impact analysis, and secondly it describes a this downstream impacts analysis for the Calico Solar Project to examine the potential indirect impacts of future transmission line construction, line removal, substation expansion, and other upgrades that may be required by Southern California Edison Company (SCE) as a result of the Calico Solar Project. This project-related future action is described in Section B.3.5.

Preparation of a cumulative impact analysis is required under CEQA. Under CEQA Guidelines, "a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts" (14 Cal Code Regs §15130(a)(1)). 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)). Together, these projects comprise the cumulative scenario which forms the basis of the cumulative impact analysis.

CEQA also states that both the severity of impacts and the likelihood of their occurrence are to be reflected in the discussion, "but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion of cumulative impacts shall be guided by standards of practicality and reasonableness, and shall focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact" (14 Cal Code Regs §15130(b)).

B.3.2 RENEWABLE RESOURCES IN CALIFORNIA

A large number of renewable projects have been proposed on BLM managed land, State land, and private land in California. As of January 2010, there were 244 renewable projects proposed in California and in various stages of the environmental review process or under construction. As of December 2009, *49* of these projects, representing approximately 10,500 MW, were planning on requesting American Recovery and Reinvestment Act funds from the Federal government. Solar, wind, and geothermal development applications have requested use of BLM land, including approximately 1 million acres of the California desert. State and private lands have also been targeted for renewable solar and wind projects.

Cumulative Figures 1 and 2 and **Cumulative Tables 1A and 1B** illustrate the numerous proposed renewable projects on BLM, State and private land in California. In addition, nearly 80 applications for solar and wind projects are being considered on BLM land in Nevada and Arizona.

Likelihood of Development. The large renewable projects now described in applications to the BLM and on private land are competing for utility Power Purchase Agreements, which will allow utilities to meet state-required Renewable Portfolio Standards. Not all of the projects listed in **Tables 1A** and **1B** will complete the environmental review, and not all projects will be funded and constructed. It is unlikely that all of these projects will be constructed for the following reasons:

- Not all developers will develop the detailed information necessary to meet BLM and Energy Commission standards. Most of the solar projects with pending applications are proposing generation technologies that have not been implemented at large scales. As a result, preparing complete and detailed plans of development (PODs) is difficult, and completing the required NEPA and CEQA documents is especially time-consuming and costly.
- As part of approval by the appropriate Lead Agency under CEQA and/or NEPA (generally the Energy Commission and/or BLM), all regulatory permits must be obtained by the applicant or the prescriptions required by the regulatory authorities incorporated into the Lead Agency's license, permit or right-of-way grant. The large size of these projects may result in permitting challenges related to endangered species, mitigation measures or requirements, and other issues.
- Also after project approval, construction financing must be obtained (if it has not been obtained earlier in the process). The availability of financing will be dependent on the status of competing projects, the laws and regulations related to renewable project investment, and the time required for obtaining permits.

Incentives for Renewable Development. A number of existing policies and incentives encourage renewable energy development. These incentives lead to a greater number of renewable energy proposals. Examples of incentives for developers to propose renewable energy projects on private and public lands in California, Nevada and Arizona, include the following:

- **U.S. Treasury Department's Payments for Specified Energy Property in Lieu of Tax Credits** under §1603 of the American Recovery and Reinvestment Act of 2009 (Public Law 111-5) – Offers a grant (in lieu of investment tax credit) to receive funding for 30% of their total capital cost at such time as a project achieves commercial operation (currently applies to projects that begin construction by December 31, 2010 and begin commercial operation before January 1, 2017).
- **U.S. Department of Energy (DOE) Loan Guarantee Program** pursuant to §1703 of Title XVII of the Energy Policy Act of 2005 – Offers a loan guarantee that is also a low interest loan to finance up to 80% of the capital cost at an interest rate much lower than conventional financing. The lower interest rate can reduce the cost of financing and the gross project cost on the order of several hundred million dollars over the life of the project, depending on the capital cost of the project.

B.3.3 DEFINITION OF THE CUMULATIVE PROJECT SCENARIO

Cumulative impacts analysis is intended to highlight past actions that are closely related either in time or location to the project being considered, catalogue past projects and discuss how they have harmed the environment, and discuss past actions even if they were undertaken by another agency or another person. Most of the projects listed in the cumulative projects tables (**Cumulative Tables 1, 2, and 3** at the end of this section) have, are, or will be required to undergo their own independent environmental review under either CEQA.

Under CEQA, there are two acceptable and commonly used methodologies for establishing the cumulative impact setting or scenario: the "list approach" and the "projections approach". The first approach would use a "list of past, present, and probable future projects producing related or cumulative impacts." 14 Cal Code Regs §15130(b)(1)(A). The second approach is to use a "summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified, which described or evaluated regional or area wide conditions contributing to the cumulative impact" (14 Cal Code Regs §15130(b)(1)(B)). This Supplemental Staff Assessment (SSA) uses the "list approach" for purposes of state law to provide a tangible understanding and context for analyzing the potential cumulative effects of a Project.

In order to provide a basis for cumulative analysis for each discipline, this section provides information on other projects in both maps and tables. The Energy Commission and the BLM have identified the California desert as the largest area within which cumulative effects should be assessed for all disciplines, as shown in three maps and accompanying tables. However, within the desert region, the specific area of cumulative effect varies by resource. For this reason, each discipline has identified the geographic scope for the discipline's analysis of cumulative impacts. **Cumulative Figures 1, 2, and 3** are on the following pages, and **Cumulative Tables 1, 2, and 3** are presented at the end of this section.

Cumulative Figure 3 (Newberry Springs/Ludlow Area Existing and Future/Foreseeable Projects) and **Cumulative Tables 2 and 3** define the projects in the immediate vicinity of the Calico Solar Project (formerly the Stirling Energy Systems Solar One Project). The area included on these tables consists of an approximate 15 to 20-mile radius around the project site. Table 2 presents existing projects and Table 3 presents future foreseeable projects. Both tables indicate project name, type, location, and status. This data is presented for consideration within each discipline.

B.3.4 APPROACH TO CUMULATIVE IMPACT ANALYSIS

This SSA evaluates cumulative impacts within the analysis of each resource area, following these steps:

1. Define the geographic scope of cumulative impact analysis for each discipline, based on the potential area within which impacts of the Calico Solar Project could combine with those of other projects.

2. Evaluate the effects of the Calico Solar Project in combination with past and present (existing) projects within the area of geographic effect defined for each discipline.
3. Evaluate the effects of the Calico Solar Project with foreseeable future projects that occur within the area of geographic effect defined for each discipline.

Each of these steps is described below.

GEOGRAPHIC SCOPE OF CUMULATIVE ANALYSIS

The area of cumulative effect varies by resource. For example, air quality impacts tend to disperse over a large area, while traffic impacts are typically more localized. For this reason, the geographic scope for the analysis of cumulative impacts must be identified for each resource area.

The analysis of cumulative effects considers a number of variables including geographic (spatial) limits, time (temporal) limits, and the characteristics of the resource being evaluated. The geographic scope of each analysis is based on the topography surrounding the Calico Solar Project and the natural boundaries of the resource affected, rather than jurisdictional boundaries. The geographic scope of cumulative effects will often extend beyond the scope of the direct effects, but not beyond the scope of the direct and indirect effects of the proposed action and alternatives.

In addition, each project in a region will have its own implementation schedule, which may or may not coincide or overlap with the Calico Solar Project's schedule. This is a consideration for short-term impacts from the Calico Solar Project. However, to be conservative, the cumulative analysis assumes that all projects in the cumulative scenario are built and operating during the operating lifetime of the Calico Solar Project.

PROJECT EFFECTS IN COMBINATION WITH FORESEEABLE FUTURE PROJECTS

The intensity, or severity, of the cumulative effects should consider the magnitude, geographic extent, duration and frequency of the effects (CEQ, 1997). The magnitude of the effect reflects the relative size or amount of the effect; the geographic extent considers how widespread the effect may be; and the duration and frequency refer to whether the effect is a one-time event, intermittent, or chronic (CEQ, 1997).

Each discipline evaluates the impacts of the proposed project on top of the current baseline; the past, present (existing) and reasonably foreseeable or probable future projects in the Calico Solar Project vicinity as illustrated in **Cumulative Figure 3 (Newberry Springs/Ludlow Area Existing and Future/Foreseeable Projects)** and **Cumulative Tables 2 (Existing Projects) and 3 (Future/Foreseeable Projects)**.

Reasonably foreseeable projects that could contribute to the cumulative effects scenario depend on the extent of resource effects, but could include projects in the immediate Ludlow area as well as other large renewable projects in the California, Nevada, and Arizona desert regions. These projects are illustrated in **Cumulative Figures 1, 2, and 3**. As shown in the map and table, there are a number of projects in the immediate area around Calico Solar Project whose impacts could combine with those of the proposed project. As shown on **Cumulative Figure 1** and in **Table 1**, solar and wind development applications for use of BLM land have been submitted for approximately 1 million acres of the California Desert Conservation Area. Additional BLM land in Nevada and Arizona also has applications for solar and wind projects.

Cumulative Table 1A
Renewable Energy Projects on BLM Land in the California Desert

BLM Field Office	Number of Projects & Acres	Total MW
SOLAR ENERGY		
Barstow Field Office	18 projects 132,560 acres	12,875 MW
El Centro Field Office	7 projects 50,707 acres	3,950 MW
Needles Field Office	17 projects 230,480 acres	15,700 MW
Palm Springs Field Office	17 projects 123,592 acres	11,873 MW
Ridgecrest Field Office	4 projects 30,543 acres	2,835 MW
TOTAL – CA Desert District	**63 projects 567,882 acres**	**47,233 MW**
WIND ENERGY		
Barstow Field Office	25 projects 171,560 acres	n/a
El Centro Field Office	9 projects (acreage not given for 3 of the projects) 48,001 acres	n/a
Needles Field Office	8 projects 115,233 acres	n/a
Palm Springs Field Office	4 projects 5,851 acres	n/a
Ridgecrest Field Office	16 projects 123,379 acres	n/a
TOTAL – CA Desert District	**62 projects 433,721 acres**	n/a

Source: Renewable Energy Projects in the California Desert Conservation Area identifies solar and wind renewable projects as listed on the BLM California Desert District Alternative Energy Website (BLM 2009)

Cumulative Table 1B
Renewable Energy Projects on State and Private Lands

Project Name	Location	Status
SOLAR PROJECTS		
Solargen Panoche Valley Solar Farm (400 MW Solar PV)	San Benito County	EIR in progress
Maricopa Sun Solar Complex (350 MW Solar PV)	Kern County	Information not available
Panoche Ranch Solar Farm (250 MW Solar PV)	Kern County	Information not available
Gray Butte Solar PV (150 MW Solar PV)	Los Angeles County	Information not available
Monte Vista (126 MW Solar PV)	Kern County	Information not available
San Joaquin Solar 1 and 2 (107 MW Solar hybrid)	Fresno	Under environmental review
NRG Alpine Suntower (40 MW solar PV and 46 MW solar thermal)	Los Angeles	Information not available
Palmdale Hybrid Power Project Unit 1 (50 MW solar thermal, part of a hybrid project)	City of Palmdale	Under environmental review
Lucerne Valley Solar (50 MW solar PV)	San Bernardino	Under environmental review
Lost Hills (32.5 solar PV)	Kern County	Information not available
Tehachapi Photovoltaic Project (20 MW solar PV)	Kern County	Information not available
Sun City Project Phase 1 (20 MW solar PV)	Kings County	Information not available
Boulevard Associates (20 MW solar PV)	San Bernardino County	Information not available
Stanislaus Solar Project I (20 MW solar PV)	Stanislaus County	Information not available
Stanislaus Solar Project II (20 MW solar PV)	Stanislaus County	Information not available
Synapse Solar 2 (20 MW solar PV/solar thermal)	Kings	Information not available
T, squared, Inc. (19 MW solar PV)	Kern County	Information not available
Rancho Seco Solar Thermal (15-17 MW solar trough)	Sacramento County	Information not available
Global Real Estate Investment Partners, LLC (solar PV)	Kern County	Information not available
Recurrent Energy (solar PV)	Kern County	Information not available

Project Name	Location	Status
Man-Wei Solar (solar PV)	Kern County	Information not available
Regenesis Power for Kern County Airports Dept.	Kern County	Information not available
Abengoa Mojave Solar Project (250 MW solar thermal)	San Bernardino County, Harper Lake	Under environmental review
Rice Solar Energy Project (150 MW solar thermal)	Riverside County, north of Blythe	Under environmental review
3 MW solar PV energy generating facility	San Bernardino County, Newberry Springs	MND published for public review
Blythe Airport Solar 1 Project (100 MW solar PV)	Blythe, California	MND published for public review
First Solar's Blythe (21 MW solar PV)	Blythe, California	Under construction
California Valley Solar Ranch (SunPower) (250 MW solar PV)	Carrizo Valley, San Luis Obispo County	Under environmental review
LADWP and OptiSolar Power Plant (68 MW solar PV)	Imperial County, SR 111	Under environmental review
Topaz Solar Farm (First Solar) (550 MW solar PV)	Carrizo Valley, San Luis Obispo County	Under environmental review
AV Solar Ranch One (230 MW solar PV)	Antelope Valley, Los Angeles County	Under environmental review
Bethel Solar Hybrid Power Plant (49.4 MW hybrid solar thermal and biomass)	Seeley, Imperial County	Under environmental review
Mt. Signal Solar Power Station (49.4 MW hybrid solar thermal and biomass)	8 miles southwest of El Centro, Imperial County	Under environmental review
WIND PROJECTS		
Alta-Oak Creek Mojave Project (up to 800 MW)	Kern County, west of Mojave	Under environmental review
PdV Wind Energy Project (up to 300 MW)	Kern County, Tehachapi Mountains	Approved
City of Vernon Wind Energy Project (300 MW)	City of Vernon	Information not available
Manzana Wind Project (246 MW)	Kern County	Information not available
Iberdrola Tule Wind (200 MW)	San Diego County, McCain Valley	EIR/EIS in progress
Padoma Wind Energy (175 MW)	Shasta County	Information not available
Pine Canyon (150 MW)	Kern County	Information not available
Shiloh III (200 MW)	Montezuma Hills, Solano County	Information not available
AES Daggett Ridge (84 MW)	San Bernardino	EIS in progress

Project Name	Location	Status
Granite Wind, LLC (81 MW)	San Bernardino	EIR/EIS in progress
Bear River Ridge (70 MW)	Humboldt County	Information not available
Aero Tehachapi (65 MW)	Kern County	Information not available
Montezuma Wind II (52-60)	Montezuma Hills, Solano County	Information not available
Tres Vaqueros (42 MW wind repower)	Contra Costa County	Information not available
Montezuma Hills Wind Project (34-37 MW)	Solano County	Information not available
Solano Wind Project Phase 3 (up to 128 MW)	Montezuma Hills, Solano County	Under environmental review
Hatchet Ridge Wind Project	Shasta County, Burney	Under construction
Lompoc Wind Energy Project	Lompoc, Santa Barbara County	Approved
Pacific Wind (Iberdrola)	McCain Valley, San Diego County	Under environmental review
TelStar Energies, LLC (300 MW)	Ocotillo Wells, Imperial County	Under environmental review
GEOTHERMAL PROJECTS		
Buckeye Development Project	Geyserville, Sonoma	Under environmental review
Orni 18, LLC Geothermal Power Plant (49.9 MW)	Brawley, Imperial County	Information not available
Black Rock Geothermal 1,2,and 3	Imperial County	Information not available

* This list is compiled from the projects on CEQAnet as of November 2009 and the projects located on private or State lands that are listed on the Energy Commission Renewable Action Team website as requesting ARRA funding. Additional renewable projects proposed on private and State lands but not requesting ARRA funds are listed on the website.

Source: CEQAnet [http://www.ceqanet.ca.gov/ProjectList.asp], November 2009 and CEC Renewable Action Team – Generation Tracking for ARRA Projects 12/29/2009 [http://www.energy.ca.gov/33by2020/documents/2009-12-29/2009-12-29_Proposed_ARRA_Renewable_Projects.pdf]

Cumulative Table 2
Existing Projects in the Newberry Springs/Ludlow Area

ID	Project Name	Location	Agency/ Owner	Status	Project Description
1	Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC)	Morongo Basin (to the south of project site)	U.S. Marine Corps	Existing	The Marine Corps' service-level facility for Marine Air Ground Task Force training. It covers 596,000 acres to the south of the Calico Solar Project site and north of the city of Twentynine Palms
2	SEGS I and II	Near Daggett (17 miles west of project site)	Sunray Energy, Inc.	Existing	Solar parabolic trough facilities generating 13.8 MW and 30 MW, respectively.
3	CACTUS (formerly Solar One and Solar Two)	Near Daggett (to the west of project site)	University of California Davis	Existing	A non-working 10 MW solar power tower plant converted by UC Davis into an Air Cherenkov Telescope to measure gamma rays hitting the atmosphere. The site is comprised of 144 heliostats. This project had its last observational run in 2005. SCE has requested funds from the California Public Utilities Commission to decommission the Solar Two project. (UC Davis 2009)
4	Mine	2 miles west of project site along I-40		Existing	Small-scale aggregate operation (AFC p. 5.3-12)
5	Mine	14 miles west of project site along I-40		Existing	Larger aggregate mining operation that produced less than 500,000 tons per year in 2005 (AFC p. 5.3-12)

Source: These projects were identified through a variety of sources including the project AFC (Section 5.18) and websites of the San Bernardino County Land Use Services Department, BLM, CEC and individual projects.

Cumulative Table 3
Future Foreseeable Projects in the Newberry Springs/Ludlow Area

ID	Project Name	Location	Agency/ Owner	Status	Project Description
A	SES Solar Three (CACA 47702)	T's. 8, 9N., R5E (Immediately west of project site)	SES Solar Three, LLC	BLM received completed amended application June 2007. SES withdrew the application for Solar Three in December 2009. As there was a second-in-line application, this application becomes the project proposed at this location. .	914 MW Stirling solar plant on 6,779-acre site.
B	Broadwell BrightSource (CACA 48875)	Broadwell Valley (T'8N and 9N; R7E) – in northeast direction of project site	Bright-Source Energy, Inc.	Application filed with BLM. Potential conflict with proposed National Monument. Plans withdrawn/put on hold in September 2009.	5,130-acre solar thermal facility using power tower technology.
C	SCE Pisgah Substation expansion	Immediately southeast of project site	Southern California Edison		Substation upgrade from 220 kV to 500 kV

ID	Project Name	Location	Agency/ Owner	Status	Project Description
D	Lugo-Pisgah transmission upgrade	Pisgah Substation (SE side of project site) to Lugo Substation (near Hesperia)	Southern California Edison		The proposed 850 MW Calico Solar Project would require removal of 65 miles of existing 220-kV transmission line and reinstallation with a 500-kV line. The Reduced Acreage Alternative (275 MW) would require an upgrade of the telecommunication facilities serving the existing 200-kV Lugo-Pisgah transmission line. Specifically, it would require: • Replacement of a portion of existing Eldorado-Lugo 500 kV overhead ground wire with new optical ground wire between the Lugo and Pisgah Substations • Installation of a new fiber-optic line between the Pisgah Substation and Cool Water Substation (new fiber to be installed on approximately 20 miles of existing electric distribution poles).
E	Twentynine Palms Expansion	Morongo Basin (south of project site)	U.S. Marine Corps	NOI to prepare EIS to study alternatives published in Oct. 2009. Draft EIS expected September 2010.	400,000-acre expansion on the east, west, and south of the existing 596,000-acre Twentynine Palms Marine Corps base. In June 2009, approximately 60,000 acres in all study areas were removed from further study, leaving 360,000 acres under study (USMC 2009).

ID	Project Name	Location	Agency/ Owner	Status	Project Description
F	Solel, Inc. (CACA 04942 4)	Southwest of proposed site, immediately north of Twentynine Palms MCAGCC	Solel, Inc.	BLM received application in July 2007, POD is under review.	600 MW solar thermal plant proposed on 7,453 acres.
G	Wind project (CACA 48629)	Black Lava T2N, R5E, T1N, R5E	Oak Creek Energy	BLM received application December 2006. Issues with partial location in ACEC.	Wind project on 17,920 acres
H	Wind Project (CACA 48667)	South Ludlow T6N/R6E, T7N/R6E, T6N/R7E, T7N/R7E, T6N/R8E, T7N/R8E (In southeast direction of project site)	Oak Creek Energy	Pending	Wind project on 25,600 acres
I	Wind project (CACA 48472)	Troy Lake T9N&10N, R4E (In west direction of project site)	Power Partners SW (enXco)	Pending review of EA.	Wind project on 10,240 acres
J	Twin Mountain Rock Venture	10 miles west of Ludlow and 1 mile south of I-40; APN 0552-011-10-0000	Rinker Materials	Permit granted to extend permit to 2018	Plan to re-permit a cinder quarry on approximately 72 acres of leased land. No development activity has occurred on project site.
K	Solar thermal (CACA 49429)	Stedman (in southeast direction of project site)	Solel, Inc.	Application filed with BLM.	600 MW solar project on 14,080 acres. POD under review.

ID	Project Name	Location	Agency/ Owner	Status	Project Description
L	Proposed National Monument (former Catellus Lands)	Between Joshua Tree National Park and Mojave National Preserve		In December 2009, Sen. Feinstein introduced bill S.2921 that would designate 2 new national monuments including the Mojave Trails National Monument.	The proposed Mojave Trails National Monument would protect approximately 941,000 acres of federal land, including approximately 266,000 acres of the former railroad lands along historic Route 66. The BLM would be given the authority to conserve the monument lands and also to maintain existing recreational uses, including hunting, vehicular travel on open roads and trails, camping, horseback riding and rockhounding.
M	BLM Renewable Energy Study Areas	Along the I-10 corridor between Desert Center and Blythe	BLM	Proposed, under environmental review	The DOE and BLM identified 24 tracts of land as Solar Energy Study Areas in the BLM and DOE Solar PEIS. These areas have been identified for in-depth study of solar development and may be found appropriate for designation as solar energy zones in the future.

Source: Projects were identified through a variety of sources including the project AFC (Section 5.18) and Applicant's Submittal of CAISO Reports, SES 2010e and websites of the San Bernardino County Land Use Services Department, BLM, CEC and individual projects.

B.3.5 PROJECT-RELATED FUTURE ACTIONS

B.3.5.1 Introduction and Purpose

Energy Commission staff has prepared this downstream impacts analysis for the Calico Solar Project to examine the potential indirect impacts of future transmission line construction, line removal, substation expansion, and other upgrades that may be required by Southern California Edison Company (SCE) as a result of the Calico Project.

The SCE upgrades are a reasonably foreseeable event if the Calico Solar Project is approved and constructed. The California Environmental Quality Act (CEQA) requires examination of foreseeable subsequent projects that result from a project under consideration, so Energy Commission staff has analyzed the general impacts of the SCE project based on available information. Because the SCE project itself is not before the Energy Commission for approval and it is in the preliminary planning stages, the level of impact analysis presented for the SCE project is based on available information. The purpose of this analysis is to inform the Energy Commission Committee, interested parties and the general public of the potential indirect environmental and public health effects that may result from the approval of the Calico Project.

This analysis examines the construction and operational impacts of two upgrade scenarios and the nature and scope of the probable impacts of each scenario, should they occur as a result of approval of the Calico Project. The 275 MW Early Interconnection option would include upgrades to the existing SCE system that would result in 275 MW of additional latent system capacity. The 850 megawatt [MW] Full Build-Out option would include replacement of a SCE transmission line, substation expansion and other upgrades to allow for additional transmission system capacity to support the operation of the full Calico Solar Project.

As part of the 850 MW Full Build-Out, SCE will need to file an application for a Certificate of Public Convenience and Necessity (CPCN) with the California Public Utilities Commission (CPUC) to construct the Lugo-Pisgah Transmission Line Upgrade Project. In addition, SCE will apply to the Bureau of Land Management (BLM) for a Right-of-Way Grant. Those agencies will be responsible for compliance with CEQA and NEPA, and preparation of the appropriate environmental documents to fully evaluate the project's impacts. The CPUC and BLM will be the lead agencies for compliance with CEQA and NEPA, respectively.

This analysis identifies potentially significant impacts and identifies types of mitigation measures that could be enacted to reduce impacts or to ensure the project would not cause significant impacts.

Background

As part of the proposed Calico Solar Project, the applicant asked SCE to review how much latent system capacity would be available for use on SCE's existing system prior to completion of the system facilities proposed for interconnection of the 850 MW for the Calico Solar Project. The applicant also applied to the California Independent System Operator (CAISO) for the interconnection of their 850 MW Solar One Project to the CAISO Grid at the existing SCE Pisgah Substation 220 kV bus under the terms of SCE's Transmission Owner (TO) Tariff.

SCE prepared a System Impact Study (SIS) dated March 7, 2006, to analyze the impact of the 850 MW project to SCE's transmission system. In addition, SCE prepared a Technical Study (TAS I) to evaluate transient stability associated with the interconnection of the 850 MW Calico Project. Subsequent to these two studies, a number of queued ahead generation projects withdrew from the CAISO Interconnection Queue resulting in a need to perform a reassessment of the impacts originally identified in the SIS and the TAS I. SCE prepared a new Technical Assessment II (TAS II) dated

June 13, 2008, to analyze the impact of the 850 MW project to the SCE transmission system reflecting the withdrawal of previously-queued projects. The Interconnection Facilities Study dated November 6, 2008, addressed the scope of work and the cost estimate for the construction of all the interconnection facilities and system upgrades required for the interconnection of the 850 MW project.

During the preparation of the several reports discussed above, the applicant requested that SCE investigate the possibility of interconnecting a portion of its 850 MW generation to the existing Pisgah Substation and the related 220 kV system before the completion of the 500 kV upgrades. In compliance with this request, SCE prepared an LGIP Optional Interconnection Study Report (Optional Study) that was submitted to the CAISO in January 2008 and analyzed the maximum amount of generation that could be interconnected to the existing Pisgah 220 kV bus and related 220 kV transmission lines. On January 9, 2008, the CAISO issued the Optional Study Report indicating that that Calico Project could be allowed to interconnect up to 275 MW generation to the existing Pisgah 220 kV bus and related 220 kV transmission system contingent on the installation of a new Special Protection Scheme to drop the Calico Solar Project's generation under certain contingencies.

The intent of the early interconnection of up to 275 MW is that it would be a temporary interconnection until the 500 kV upgrades identified in the Interconnection Facilities Study are in service, and the full requested generation output of 850 MW could be connected to the upgraded transmission system. When completed, the 500 kV upgrades would allow for the export of approximately 1,400 MW of additional generating capacity between the Lugo and Pisgah substations. This will accommodate not only all of the power produced by the Calico Solar Project, but other proposed generation facilities as well.

A second Optional Study Agreement (Interconnection Optional Study) dated October 12, 2009, detailed the scope of work and cost estimate for the early interconnection of 275 MW of the Calico Solar Project generation to the existing Pisgah Substation 220 kV bus and related 220 kV transmission lines. Final engineering has not been performed for the 275 MW Early Interconnection, and it is pending the execution of a Large Generator Interconnection Agreement (LGIA) for the proposed Calico Project. Negotiations for the LGIA are underway and it is expected to be finalized in early 2010.

For the system facilities required to interconnect the 850 MW project, SCE would review what real estate rights would need to be obtained upon completion of the final siting analysis. Such siting analysis would commence subsequent to the execution of the LGIA. SCE also anticipates commencing thorough environmental reviews upon execution of the LGIA. A detailed assessment of the environmental impacts and requirements for mitigation associated with the substation and transmission line upgrades associated with the 850-MW interconnection is expected to be included in the CPCN application and Proponent's Environmental Assessment (PEA) that will be submitted by SCE to the CPUC.

B.3.5.2 Description of Future Actions

Two SCE upgrade options are considered in this analysis based on information included in Appendix EE of the Calico Solar Project's Application for Certification (AFC) and from SCE (SES 2008a; SCE 2009). The **275 MW Early Interconnection Option** includes upgrades to the SCE system that would result in 275 MW of additional capacity, allowing for interconnection of an initial 275 MW phase of Calico Solar Project or incorporation of the Reduced Acreage Alternative facility within the existing transmission system. The Reduced Acreage Alternative would be a 275 MW solar facility located within the boundaries of Phase 2 of the proposed project as defined by the applicant and it is described in the **Alternatives** section of this Supplemental Staff Assessment.

Under the **850 MW Full Build-Out Option**, SCE would construct a new Lugo-Pisgah No. 2 500 kV (single circuit) within the existing right-of-way (ROW) of the existing Lugo-Pisgah No. 2 220 kV transmission line (see Figure 1 (project area map) from Appendix EE of the AFC) for 57.1 miles of the approximately 67 miles of the ROW. The last 9.8 miles south of Victorville would be constructed within a new ROW area. There would also be two new transmission line loops constructed in the vicinity of the existing Pisgah Substation. The existing Pisgah Substation (approximately 5 acres) would be expanded to approximately 40 acres to accommodate new electrical and communication facilities. However, the substation may be sized up to 100 acres to accommodate for future growth.

The proposed 850 MW Full Build-Out option would serve current and projected demand for electricity and maintain electric system reliability in this portion of the Mojave Desert where numerous renewable (solar and wind) projects are being proposed, including Calico Solar. According to the Large Generator Interconnection Agreement, the full build-out is expected to be operational on or before January 1, 2016 to ensure that safe and reliable electric service is available to meet existing and projected customer electrical demands.

Both options are described in detail in the following sections.

B.3.5.2.1 275 MW Early Interconnection Option

The following upgrades to the SCE system would be required for the Early Interconnection Option:

- Expand Pisgah 220 kV bus one position and equip with two circuit breakers;
- At Pisgah Substation, add motor-operated disconnects on existing Lugo-Pisgah 220 kV transmission lines (no circuit breakers are currently installed on these lines);
- New telecommunication facilities:
    a. Install Optical Protection Ground Wire (OPGW) on existing 65-mile portion of Eldorado-Lugo 500 kV transmission line. Approximately 70 towers would need to be retrofitted in order to support the OPGW;
    b. Install digital fiber on mostly existing distribution (new facilities needed) back to Cool Water Substation;
    c. Use Microwave out of Cool Water Substation to Lugo Substation;

- Add proposed the Calico Solar Project to Special Protection System (SPS) under the following contingencies:
    a. Loss of one Lugo AA-Bank;
    b. Loss of Lugo-Pisgah 220 kV transmission line.

Additional details on the Engineering Plan, Description and Location are described below.

Pisgah Substation Expansion

The following upgrades to the Pisgah Substation would be required for the 275 MW Early Interconnection Option (SCE 2009):

- Expand SCE's existing Pisgah 220 kV Substation (northwest area of the substation to create a new area of approximately 270 feet by 100 feet) within SCE's existing 220 kV ROW;
- Install a new double-breaker 220 kV line position to terminate the new Calico Solar Project 220 kV gen-tie line;
- Install motorized disconnect switches on each of the existing SCE Lugo No.1 and No.2 220 kV line positions at the substation;
- Install special protection scheme (SPS) relays inside the existing mechanical electrical equipment rooms (MEER);
- Install new remote terminal unit (RTU) inside the existing MEER; and
- Install miscellaneous telecommunications equipment inside the existing MEER.

SCE 220 kV Gen-Tie Configuration

SCE would build approximately one to two new 220 kV structures within the existing 220 kV ROW and/or within the expanded Pisgah Substation fence line to support the gen-tie line coming from the Calico Solar Project to facilitate the 220 kV service drop from the last Calico Project's gen-tie structure into the Pisgah Substation. Actual structure types, configurations and locations have not yet been determined or engineered and would be subject to further engineering and coordination between SCE and the applicant.

Telecommunications Facilities

Two telecommunication paths would be required for the Calico Solar Project early interconnection of 275 MW. The two separate paths are needed due to 220 kV line protection and SPS requirements. The two separate telecommunications paths would be (SCE 2009):

- **Pisgah-Gale Fiber Optic Cable**. Constructing a new fiber optic communication line on existing poles between SCE's Pisgah and Gale substations; and
- **OPGW Installation on Eldorado – Lugo 500 kV transmission line**. Replacing existing Overhead Ground Wires (OHGW) with new OPGW on a 65-mile segment of SCE's Eldorado-Lugo 500 kV line between SCE's Lugo and Pisgah substations.

With respect to the OPGW installation mentioned above, SCE has stated that it anticipates installing a repeater station shelter within the Eldorado-Lugo 500 kV transmission line ROW, which would require an approximate area of 15 feet by 20 feet. This repeater station shelter would likely require a distribution power connection that could involve the installation of several wood distribution poles. The repeater station and distribution poles would involve minimal permanent ground disturbance in addition to temporary ground disturbance during construction. However, because final engineering has not yet been completed, the exact location for facilities has not been determined.

In addition, two separate telecommunications paths would be required from the Calico Solar Project Substation to SCE's Pisgah Substation. The OPGW path between Calico Solar Project and Pisgah Substation would be constructed by the applicant. The paths are as follows:

- The applicant would install OPGW on its 220 kV gen-tie line between the Calico Solar Project Substation and SCE's Pisgah Substation;
- SCE would install fiber optic cable between the Calico Solar Project Substation and SCE's Pisgah Substation on a combination of existing distribution and new communication poles and/or within new underground conduits.

Additional information regarding the major communications paths (Pisgah-Gale Fiber Optic Cable and OPGW Installation on Eldorado–Lugo 500 kV transmission line), which is based on preliminary engineering, follows below. Detailed project information on the communication paths required between the Calico Solar Project Substation and Pisgah Substation is not yet available.

Pisgah-Gale Fiber Optic Cable

The Pisgah-Gale fiber optic cable would consist of one All-Dielectric Self-Supporting (ADSS) 48 strand single mode fiber optic cable between SCE's Pisgah and Gale substations to provide for telecommunication interconnection between Pisgah Substation and Gale Substation, including protective relay circuits, Supervisory Control and Data Acquisition (SCADA) circuits, data, and telecommunication services.

Approximately 151,141 feet of new fiber optic cable would be installed between the MEER at Pisgah and Gale substations. Portions of the fiber optic cable would be constructed on existing overhead transmission, distribution and communication wood pole structures. In addition portions of the cable would be constructed within newly constructed underground conduit system(s). On average, all existing overhead structures are approximately between 40 feet and 55 feet tall. Any new structures would likely be the same height, but this would be dependent on wind-loading analysis and further engineering.

The proposed Pisgah-Gale fiber optic cable route would begin at the existing Gale Substation in San Bernardino County. The route would proceed east from the MEER building for approximately 200 feet as underground cable in an existing underground cable trench. It would continue east approximately 150 feet as underground cable in existing underground conduit to an existing riser pole located on SCE ROW. The route would transition to overhead cable and would continue south on SCE ROW for approximately 210 feet on existing overhead distribution poles. The overhead fiber optic cable route would continue east on National Trails Highway on existing overhead distribution poles for approximately 16,588 feet before continuing south approximately 90 feet, east for approximately 34,678 feet, north for approximately 110 feet on National Trails Highway/Pioneer Road, and east for approximately 10,935 feet. The route would briefly diverge from National Trails Highway to continue south on Newberry Road for approximately 1,800 feet on existing overhead distribution poles. Turning east on National Trails Highway the overhead fiber optic cable route would continue for approximately 83,200 feet on existing overhead distribution poles. Continuing north, the route would cross Interstate Highway 40 and on the SCE ROW approximately 2,580 feet installing overhead cable on existing overhead distribution poles to pole #429143S. A new riser would be installed on pole #429143S and the cable would transition to underground, continuing northeast for approximately 600 feet in a new underground conduit into the MEER in Pisgah Substation.

OPGW Installation on Eldorado – Lugo 500 kV Transmission Line

Approximately 60 miles of the existing SCE Eldorado-Lugo 500 kV transmission line between Lugo and Pisgah substations would need to have one of the two existing half-inch steel overhead ground wires (OHGW) replaced with OPGW in order to accommodate the early 275 MW interconnection of SES Solar One. The replacement of the OHGW with OPGW on the existing 500 kV steel lattice towers (LST) would require some modifications on the existing LSTs. The loading capacity of modified tower structures with the new OPGW would conform to the California Public Utilities Commission (CPUC) General Order (GO) 95 loading criteria.

Currently, SCE has stated that it anticipates approximately 70 single-circuit LSTs would need to be modified (SCE 2009). Various types of tower modifications would be needed for the various different types of LSTs; however, detailed engineering on the OPGW installation has not yet occurred. The strengthening of the LSTs for the new OPGW could require any combinations of modifications, and that each modification would consist of different steel member bundles or configurations. The modifications of the existing 500 kV LSTs may include the static peaks, tower body reinforcement, body extension, installation of horizontal diaphragms, and tower leg reinforcement. Detailed drawings and procedures for each of the tower modifications would be developed for fabrication and installation. The modifications to be performed on each tower are identified by bundles. Each bundle would contain those components necessary to complete the required modifications, such as new steel angles to form back to back angles to the existing leg diagonals, redundant braces to the longitudinal and transverse faces, oblique braces between leg diagonals, and a new horizontal diaphragm. New redundant members would also be designed and installed at the ground peaks to support the OPGW clip-in hardware. The loading capacity of the upgraded tower structures would be able to support the loads for the new OPGW installation and meets the requirements of CPUC GO 95.

B.3.5.2.2 850 MW Full Build-Out Option

In addition to the upgrades under the 275 MW Early Interconnection option, the scope of work for the full 850 MW of additional capacity in SCE's transmission system would consist of the following:

- Expand Pisgah Substation to 500 kV:
  a. Design for up to four AA-Banks;
  b. Initially install two AA-Banks for proposed Calico Project;
  c. Include new 500 kV and 220 kV switchracks;
- Remove existing Lugo-Pisgah No. 2 220 kV transmission line between Pisgah Substation and Mojave River;
- Construct new 500 kV transmission line in the ROW vacated with removal of 220 kV transmission line;
- Complete 500 kV transmission line into Lugo Substation on new ROW west of the Mojave River;
- Loop existing Eldorado-Lugo 500 kV transmission line into new Pisgah 500 kV Substation;
- Install new telecommunication facilities:
  a. Install OPGW on existing 65-mile portion of Eldorado-Lugo 500 kV transmission line;
  b. Install OPGW on new 67-mile 500 kV transmission line;
- Add Calico Project to Special Protection System under the following contingency:
  a. Trip Calico Project under loss of both new Lugo-Pisgah 500 kV transmission lines.

Pisgah Substation Expansion

The existing 5-acre Pisgah Substation would be expanded to approximately 40 acres to accommodate new electrical and communication facilities, including up to four AA-banks (two AA-banks would initially be installed for the proposed Calico Solar Project) and new 500 kV and 220 kV switchracks. However, once final engineering is completed, the substation may be sized up to 100 acres to accommodate for future growth.

Depending on land availability[1] and engineering, the expanded/new Pisgah Substation would likely be constructed along the existing ROW in the approximately 6-mile area between the existing Pisgah Substation and the mountains to the southwest. However,

[1] On December 21, 2009, Sen. Dianne Feinstein (D-Calif.) introduced legislation to establish the Mojave Trails National Monument, which would prohibit development on 941,000 acres of federal land and former railroad company property along a 105-mile stretch of old Route 66, between Ludlow and Needles. The southwestern boundary this proposed monument would be directly northeast and east of the Pisgah Substation expansion and transmission line upgrades, but the project is not expected to be affected.

the exact location of the new/expanded substation has not been determined and so a full analysis of its impacts is not possible at this time.

Transmission Line Facilities

500 kV Transmission Line Scope (Lugo-Pisgah No. 2)

The proposed 850 MW Full Build-Out option would consist of the construction of a single-circuit 500 kV transmission line on 57.1 miles of existing ROW and 9.8 miles of new ROW. The existing 220 kV Lugo-Pisgah No. 2 transmission line would be replaced with the new 500 kV single-circuit structures.

The Lugo–Pisgah No. 2 500 kV transmission line would begin at the new Pisgah 500 kV/220 kV Substation. The proposed line would exit the substation to the northeast, and then wrap around the south side of the substation for approximately 0.6 miles before joining the existing Lugo-Pisgah No. 2 ROW. The line would then head southwest along the existing Lugo-Pisgah No. 2 ROW for approximately 56.7 miles until it would reach the eastern edge of the Mojave River. The proposed line would then head south on a new ROW along the east side of the river for approximately 1.6 miles before crossing to the west side of the river. The line would then continue west on new ROW for approximately 7.6 miles before rejoining the existing Lugo-Pisgah No. 2 ROW for another 0.4 miles into the existing Lugo Substation where it would terminate.

The existing 220 kV structures on the Lugo-Pisgah No. 2 220 kV transmission line would be removed for the entire length of the ROW.

The new approximately 67 miles of 500 kV transmission line would use two-bundled nonspecular 2156 kcmil aluminum conductor steel reinforced (ACSR) “Bluebird” conductor on single-circuit lattice steel towers (LSTs). It is currently estimated that approximately 220 new dulled galvanized 500 kV towers would be installed in the existing ROW and 38 new dulled galvanized 500 kV towers would be installed in the new ROW. The single-circuit towers would range in height between 91 feet and 194 feet. Within the existing ROW, the new 500 kV structures would be spaced to match the existing 500 kV structures where feasible. Most of the structure sites would require minor to substantial grading and new or re-developed access and spur roads.

500 kV Transmission Line Scope (Eldorado-Lugo)

The existing 500 kV Eldorado-Lugo single-circuit transmission line would be looped into the new/expanded Pisgah Substation. The northern leg of the loop would turn southeast and cross over the existing 220 kV Cima–Eldorado No. 1 and No. 2 circuits before turning into the new Pisgah Substation. The southern leg of the loop would exit the Pisgah Substation and turn northwest over the existing 220 kV Cima–Eldorado No. 1 and No. 2 circuits before rejoining the existing ROW.

The northern leg would be approximately 1,220 feet in length and the southern leg would be approximately 1,000 feet in length. Two existing 500 kV structures on the Eldorado-Lugo transmission line would be removed.

Telecommunication Facilities and Special Protection System

New OPGW telecomm facilities would be installed on an existing 65-mile portion of Eldorado-Lugo 500 kV transmission line and on the new Lugo-Pisgah 500 kV transmission line. The proposed telecomm upgrades would include construction of fully diverse and redundant communication paths to support a special protection system as well as the operating and monitoring of the substation and transmission line equipment.

Calico Project would also be added to the Special Protection System so that the Calico Solar Project would be tripped under loss of both new Lugo-Pisgah 500 kV transmission lines.

B.3.5.3 Construction Activities

B.3.5.3.1 275 MW Early Interconnection Option

SCE 220 kV Gen-Tie Configuration

The interconnection facilities necessary to accommodate the 275 MW Early Interconnection would likely be contained within existing SCE ROWs. However, SCE would upgrade SCE's existing rights or acquire new rights where necessary based upon the proposed final engineering of the 275 MW Early Interconnection. The target operating date for the 275 MW Early Interconnection upgrades is mid-to-late 2011.

Staging Area

The establishment of a marshalling yard would not be necessary for the construction of the transmission structures and the stringing of the conductor to complete the gen-tie circuit from the Calico Solar Project into Pisgah Substation. However, a temporary equipment and material staging area would be established for short-term utilization within the existing SCE ROW near the new transmission structure locations and/or at Pisgah Substation. Equipment and materials to be stored at the temporary equipment and material staging area may include:

- Construction trailer
- Construction equipment
- Conductor/wire reels
- Transmission structure components
- Overhead ground wire/Optical ground wire cable
- Hardware
- Insulators
- Signage
- Consumables, such as fuel and joint compound
- Portable sanitation facilities
- Waste materials for salvaging, recycling, and/or disposal
- Stormwater Pollution Prevention Plan materials, such as straw wattles, gravel, and silt fences

The size of the temporary equipment and material staging area may require 0.5 to 1.5 acres; however, the size would be dependent upon a detailed site inspection and would take into account, where practical, suggestions by the SCE crew foreman or the SCE contractor selected to do the work. Land disturbed at the temporary equipment and material staging area, if any, would be restored to preconstruction conditions following the completion of construction.

Access Roads and Spur Roads

The 275 Early Interconnection Option would involve construction within an existing SCE ROW. It is assumed that existing public roads as well as existing transmission line roads would be used during construction. Transmission line roads are classified into two groups: access roads and spur roads; access roads are through roads that run between tower sites along a ROW and serve as the main transportation route along line ROWs; spur roads are roads that lead from access roads and terminate at one or more structure sites. However, it is also assumed that rehabilitation work may be necessary in some locations for existing transmission line roads to accommodate construction activities.

The construction of the 275 Early Interconnection option may require re-grading and repair of existing access and spur roads and/or new spur roads to access the new transmission line structure locations. Similar to rehabilitation of existing roads, all new spur road alignments would first be cleared and grubbed of vegetation. Roads would be blade-graded to remove potholes, ruts, and other surface irregularities, and re-compacted to provide a smooth and dense riding surface capable of supporting heavy construction equipment. The graded road would have a minimum drivable width of 14 feet (preferably with 2 feet of shoulder on each side), but may be wider depending on final engineering requirements and field conditions. Access and spur road gradients would be leveled so that any sustained grade does not exceed 12 percent. All curves would have a radius of curvature of not less than 50 feet, measured at the center line of the usable road surface. Spur roads would usually have turnaround areas near the structure locations.

Site Preparation

New structure locations would first be graded and/or cleared of vegetation as required to provide a reasonably level and vegetation-free surface for footing and structure construction. Sites would be graded such that water would run toward the direction of the natural drainage. In addition, drainage would be designed to prevent ponding and erosive water flows that could cause damage to the tower footings. The graded area would be compacted, and would be capable of supporting heavy vehicular traffic.

Site preparation for the temporary laydown area required for the assembly of the structure would first be cleared of vegetation and graded as required to provide a reasonably level and vegetation-free surface for footing and structure construction. The area needed for the laydown and the assembly of the structure would be approximately 200 feet by 200 feet (0.92 acre). In locations where the terrain in the laydown area is already reasonably level (for example, at a removed tower location), only vegetation removal would occur to prepare the site for construction. In locations where a level surface is not present (for example, a new tower site), both vegetation clearing and grading would be necessary to prepare the laydown area for construction.

Erection of the structures may also require establishment of a crane pad to allow an erection crane to set up adjacent to and 60 feet from the centerline of each structure. The crane pad would be located transversely from each applicable structure location. The crane pad would be located within the laydown area used for structure assembly. The pad would be cleared of vegetation and also graded as necessary to provide a level surface for crane operation. If the existing terrain is not suitable to support crane activities, a temporary 50 feet by 50 feet (0.06 acre) crane pad would be constructed.

In mountainous areas, benching may be required to provide access for footing construction, assembly, erection, and wire-stringing activities during line construction. It would be used minimally to help ensure the safety of personnel during construction activities.

Foundation Installation

The structure would require drilled, poured-in-place, concrete footings that would form the structure foundation. Actual footing diameters and depths for each of the structure foundations would depend on the soil conditions and topography at the site and would be determined by SCE during final engineering.

The foundation process would begin with the drilling of the hole for the structure. The hole would be drilled using truck or track-mounted excavators with various diameter augers to match the diameter requirements of the structure. The excavated material would be distributed at the structure site or used in the rehabilitation of existing access roads. Alternatively, the excavated soil may be disposed of at an off-site disposal facility in accordance with all applicable laws.

Following excavation of the foundation footing for each structure, steel reinforced rebar cage(s) would be set, survey positioning of the anchor bolts and/or stub angles would be verified, and concrete would then be placed. The steel reinforced rebar cage(s) would be assembled off site and delivered to the structure location by flatbed truck. A typical transmission structure would require approximately 15 to 80 cubic yards of concrete delivered to the structure location depending upon the type of structure being constructed, soil conditions, and topography at each site. The transmission structure footings would project approximately 1 to 3 feet above the ground level.

Foundations in soft or loose soil and that extend below the groundwater level may be stabilized with drilling mud slurry. Mud slurry would be placed in the hole after drilling to prevent the sidewalls from sloughing. The concrete for the foundation would then be pumped to the bottom of the hole, displacing the mud slurry. The mud slurry brought to the surface would typically be collected in a pit adjacent to the foundation, and then pumped out of the pit to be reused or discarded at an off-site disposal facility in accordance with all applicable laws.

Concrete samples would be drawn at time of pour and tested to ensure engineered strengths were achieved. A normally specified SCE concrete mix typically takes approximately 28 days to cure to an engineered strength. This strength would be verified by controlled testing of sampled concrete. Once this strength has been achieved, crews would be permitted to begin the erection of the structure.

During construction, existing concrete supply facilities would be used where feasible. If concrete supply facilities do not exist in certain areas, a temporary concrete batch plant would be set up. If necessary, approximately 2 acres of property would be sub-partitioned from a staging area for a temporary concrete batch plant. Equipment would include a central mixer unit (drum type); three silos for injecting concrete additives, fly ash, and cement; a water tank; portable pumps; a pneumatic injector; and a loader for handling concrete additives not in the silos. Dust emissions would be controlled by watering the area and by sealing the silos and transferring the fine particulates pneumatically between the silos and the mixers.

Conventional construction techniques would generally be used as described above for new footing installation. In certain cases, equipment and material may be deposited at structure sites using helicopters or by workers on foot, and crews may prepare the footings using hand labor assisted by hydraulic or pneumatic equipment, or other methods. Prior to drilling for foundations, SCE would contact Underground Service Alert to identify any underground utilities in the construction zone.

Structure Assembly and Erection

Structure assembly would consist of hauling the structure components from the staging yard to their designated laydown site using semi-trucks with 40-foot trailers. Crews would then assemble portions of each structure on the ground at the structure location, while on the ground, the top section may be pre-configured with the necessary insulators and wire-stringing hardware before being set in place. An 80-ton all-terrain or rough terrain crane would be used to position the base section on top of previously prepared foundation. When the base section is secured, the remaining portions of the structure would then be placed upon the base section and bolted together.

After construction is completed, the transmission structure site would be graded such that water would run toward the direction of the natural drainage. In addition, drainage would be designed to prevent ponding and erosive water flows that could cause damage to the structure footing. The graded area would be compacted and would be capable of supporting heavy vehicular traffic.

Stringing Activities

Wire-stringing includes all activities associated with the installation of conductors. This activity would include the installation of primary conductor and OPGW or ground wire, vibration dampeners, weights, spacers, and suspension and dead-end hardware assemblies. Insulators and stringing sheaves (rollers or travelers) are typically attached during the steel erection process.

A standard wire-stringing plan would include a sequenced program of events starting with determination of wire pulls and wire pull equipment set-up positions. Advanced planning by supervision would determine circuit outages, pulling times, and safety protocols needed for ensuring that safe and quick installation of wire would be accomplished.

Wire-stringing activities would be conducted in accordance with SCE specifications, which would be similar to process methods detailed in Institute of Electrical and Electronics Engineers Standard 524-2003, Guide to the Installation of Overhead Transmission Line Conductors.

Wire pulls are the length of any given continuous wire installation process between two selected points along the line. Wire pulls are selected, where possible, based on availability of dead-end structures at the ends of each pull, geometry of the line as affected by points of inflection, terrain, and suitability of stringing and splicing equipment setups. In some cases, it may be preferable to select an equipment setup position between two suspension structures. Anchor rods would then be installed to provide dead-ending capability for wire sagging purposes, and also to provide a convenient splicing area.

To ensure the safety of workers and the public, safety devices such as traveling grounds, guard structures, and radio-equipped public safety roving vehicles and linemen would be in place prior to the initiation of wire-stringing activities.

The following four steps describe the wire installation activities proposed by SCE:

- **Step 1: *Sock Line, Threading***: Typically, a lightweight sock line is passed from structure to structure, which would be threaded through the wire rollers in order to engage a camlock device that would secure the pulling sock in the roller. This threading process would continue between all structures through the rollers of a particular set of spans selected for a conductor pull.
- **Step 2: *Pulling*:** The sock line would be used to pull in the conductor pulling cable. The conductor pulling cable would be attached to the conductor using a special swivel joint to prevent damage to the wire and to allow the wire to rotate freely to prevent complications from twisting as the conductor unwinds off the reel. A piece of hardware known as a running board would be installed to properly feed the conductor into the roller; this device keeps the bundle conductor from wrapping during installation.
- **Step 3: *Splicing, Sagging, and Dead-ending*:** After the conductor is pulled in, the conductor would be sagged to proper tension and dead-ended to structures.
- **Step 4: *Clipping-in, Spacers*:** After the conductor is dead-ended, the conductors would be secured to all tangent structures; a process called clipping in. Once this is complete, spacers would be attached between the bundled conductors of each phase to keep uniform separation between each conductor.

The dimensions of the area needed for the stringing setups associated with wire installation would be variable and dependent upon terrain. The preferred minimum area needed for tensioning equipment set-up sites would require approximately an area of 150 feet by 500 feet (1.72 acres); the preferred minimum area needed for pulling equipment set-up sites would require approximately an area of 150 feet by 300 feet (1.03 acres); however, crews can work from within slightly smaller areas when space is limited. Each stringing operation would include one puller positioned at one end and one tensioner and wire reel stand truck positioned at the other end.

For stringing equipment that cannot be positioned at either side of a dead-end transmission structure, field snubs (i.e., anchoring and dead-end hardware) would be temporarily installed to sag conductor wire to the correct tension.

Pulling and splicing locations would be determined at a later date, but would generally be located within the existing ROW area. The dimensions of the area needed for the stringing setups associated with wire installation are variable and depends upon terrain. Splicing sites would be strategically located to support the stringing operations; splicing sites include specialized support equipment such as skidders and wire crimping equipment.

The puller and tensioner set-up locations require level areas to allow for maneuvering of the equipment. When possible, these locations would be located on existing level areas and existing roads to minimize the need for grading and cleanup.

The puller and tensioner set-up locations associated with the transmission structures would be temporary and the land would be restored to its previous condition following completion of conductor stringing activities. The final number and locations of the puller and tensioner sites would be determined during final engineering and the construction methods chosen by SCE or its contractor.

An OHGW for shielding or an OPGW for shielding and communication purposes would be installed on the transmission line. Final engineering would determine which configuration is installed. The OHGW/OPGW would be installed in the same manner as the conductor; it is typically installed in conjunction with the conductor, depending upon various factors, including line direction, inclination, and accessibility. Following installation of the OPGW, the strands in each segment are spliced together to form a continuous length from one end of a transmission line to the other. On the last structure at each end of a transmission line, the overhead fiber is spliced to another section of fiber cable that runs in underground conduit from the splice box into the communication room inside the adjacent substation.

Pisgah Substation Expansion

The expansion of Pisgah Substation would require extending the graded substation pad to the west of the existing substation. It is estimated that the grading activities would disturb an area approximately 300 feet by 125 feet (0.9 acre) to provide the proposed 270-foot by 100-foot internal expansion. Because the surface elevation of the new expansion area would be higher than the surface elevation of the surrounding desert floor, it is anticipated that approximately 10,000 cubic yards of new soil would be required to achieve the desired level.

After the area has been graded, new chain-link fencing would be installed and the portion of the old fencing would be removed.

Following the completion of the site improvements, below grade construction would begin with the expansion of the substation ground grid into the new area, followed by the excavation for conduits and for equipment and structure foundations. Above grade construction would include the erection of steel structures, the installation of the new

220 kV circuit breaker and ancillary electrical equipment, the installation of overhead connecting cables and of new control and monitoring devices within the control building.

Once the installation of the substation equipment has been completed, a four-inch thick layer of crushed rock would be placed on the surface of the expansion area. There would be no asphalt concrete paving as part of this project element.

Upon completion of these activities, extensive testing would be required to insure safe and reliable operation prior to the energization of the new position.

Telecommunications Facilities

Pisgah-Gale Fiber Optic Cable

The Pisgah-Gale fiber optic cable would be a newly constructed fiber optic cable line, approximately 151,141 feet in length, on existing overhead SCE distribution wood pole structures between and into SCE's Pisgah and Gale substation MEERs. In addition, as noted earlier, portions of the cable would be constructed on newly constructed underground conduit system(s).

For the attachments (pole framing) to existing and overhead wood pole structures the fiber optic cable will utilize a five foot wood cable arm and Fiberlign high-strength engineered dielectric suspension support block. This suspension support block is oriented vertically and attached to the cable arm. One suspension support block would be required per overhead structure.

For the installation in the new underground conduit and underground structures entering Pisgah Substation, the fiber optic cable would utilize a high density polyethylene smoothwall innerduct, which would provide protection and identification for the cable. The fiber optic cable would be installed in and throughout the length of the new underground conduit structure.

The construction of the fiber optic cable would utilize existing franchise (public ROW) locations, and existing access and spur roads. Access roads are through roads that run between and along overhead wood pole structures form the main transport route along the major extent of the fiber optic cable. Spur roads are roads that lead from the access road and dead-end into one or more overhead structure sites. The existing and new overhead structures that do not have vehicle access would be walked-in to each location by SCE crews.

Fiber optic cable stringing would include all activities associated with the installation of cables onto the overhead wood pole structures. This activity would include the installation of vibration dampeners, and suspension and dead-end hardware assemblies. Stringing sheaves (rollers or travelers) would be attached during the framing process. A standard wire stringing plan would include a sequenced program of events starting with determination of cable pulls and cable pulling equipment set-up positions. At this time, exact locations of the pulling locations have not yet been determined.

Typically, fiber optic cable pulls occur every 6,000 feet to 10,000 feet on flat and mountainous terrain. Fiber optic cable splices are required at the end and beginning of each cable pull. Fiber optic cable pulls are the length of any given continuous cable installation process between two selected points along the overhead or underground structure line. Fiber optic cable pulls would be selected, where possible, based on availability of pulling equipment and designated dead-end structures at the ends of each pull, geometry of the line as affected by points of inflection, terrain, and suitability of fiber optic cable stringing and splicing equipment set ups. The dimensions of the area needed for stringing set ups varies depending upon the terrain, however a typical stringing set up is usually 40 feet by 60 feet. Where necessary due to suitable space limitations, crews can work from within a substantially smaller area.

The crews would utilize Pisgah and Gale Substations as a laydown area for all material for the proposed fiber optic cable which would be delivered by truck. Material would be placed inside the perimeter of the fenced substation in a designated area during construction. The majority of the truck traffic would use major streets and would be scheduled for off-peak traffic hours. All construction debris would be placed in appropriate onsite containers and periodically disposed of in accordance with all applicable local jurisdiction regulations.

The primary marshalling yard for the Pisgah-Gale fiber optic cable component would be established inside Gale Substation, or, if room is not available, a suitable existing manned SCE facility outside the substation would be located. Materials and equipment to be staged to this yard include but are not limited to: fiber optic cable reels and hardware, heavy equipment, light trucks, and portable sanitation facilities. In addition to the materials and equipment already detailed for new construction, the following may be routed through this yard: empty fiber optic cable and innerduct reels, and other debris associated with the installation of the fiber optic cable process.

OPGW Installation on Eldorado–Lugo 500 kV Transmission Line

Modifications to approximately 70 of the existing Eldorado-Lugo 500 kV towers may include the static peaks, structure body reinforcement, body extension, installation of horizontal diaphragms, and structure legs reinforcement. Detail drawings and procedures for each of the structure modifications would be developed for fabrication and installation. All construction work for the 500 k LST modifications to accommodate the new OPGW would be performed within the existing transmission line ROW.

The modifications to be performed on each structure would be identified by bundles. Each bundle would contain those components necessary to complete the required modifications, such as new steel angles to form back to back angles to the existing leg diagonals, redundant braces to the longitudinal and transverse faces, oblique braces between leg diagonals, and a new horizontal diaphragm. New redundant members would also be designed and installed at the ground peaks to support the OPGW clip-in hardware. The loading capacity of the upgraded structure structures would be able to support the loads for the new OPGW installation and meet the requirements of CPUC GO 95. Final structure modification and associated construction activities would be determined once final engineering is completed by the contractor.

Tower modifications and installation of a new OPGW line would require access to each existing tower site for construction crews, materials, and equipment. Because the work would occur in an existing ROW, all of the existing tower sites have existing access and spur roads, which would be used for construction. Although no new roads would be needed to perform the work, where needed, the existing access roads would be improved. After project construction, these roads would continue to be used by maintenance crews and repair vehicles for access to each tower for inspection and maintenance activities. At the end of project construction, these roads would be left in a condition equal to or better than the condition that existed prior to the start of construction. Loose rock and slide material would be removed from existing roads and used to construct dikes, fill washouts, or flatten fill slopes; all washouts, ruts, and irregularities would be filled or obliterated.

During re-grading and repair of existing access and spur roads, the roads would be cleared of vegetation, blade-graded to remove potholes, ruts, and other surface irregularities, and re-compacted to provide a smooth and dense riding surface capable of supporting heavy construction equipment. The graded road would have a minimum drivable width of 14 feet (preferably with 2 feet of shoulder on each side).

Drainage structures such as wet crossings, water bars, overside drains and pipe culverts would be installed to allow for construction traffic usage, as well as prevent road damage due to uncontrolled water flow.

Slides, washouts, and other slope failures would be repaired and stabilized by installing retaining walls or other means necessary to prevent future failures. The type of structure to be used would be based on specific site conditions.

The tower modifications begin with hauling and stacking bundles of steel at tower locations per engineering drawing requirements. This activity requires use of several tractors with 40-foot trailers and a rough terrain forklift. After steel is delivered and stacked, crews would proceed with the structure modification to leg extensions, body panels, boxed sections, bridges, and peaks, as necessary. The various steel components used to reinforce the towers would be lifted into place with a minimum 80-ton all-terrain or rough terrain crane and the tower modification work would be performed by a combined erection and torquing crew.

The OPGW is typically installed in continuous segments of 19,000 feet or less depending upon various factors including line direction, inclination, and accessibility. Following installation of the OPGW, the strands in each segment are spliced together to form a continuous length from one end of a transmission line to the other.

To ensure the safety of workers and the public, safety devices such as traveling grounds, guard structures, and radio-equipped public safety roving vehicles and linemen would be in place prior to the initiation of OPGW stringing activities.

The following three steps describe the OPGW installation activities proposed by SCE:

- **Step 1: *Pulling*:** To minimize ground disturbance and insure controlled conditions during the OPGW installation activities, the existing static ground wire would be used to pull in the new OPGW. The existing static ground wire would be attached to the OPGW using a special swivel joint to prevent damage to the OPGW and to allow it to rotate freely to prevent complications from twisting as it unwinds off the reel. The existing static ground wire is wound onto "breakaway" reels as it is removed. The existing static ground would be transported to a marshalling yard where it would be prepared for recycling.

- **Step 2: *Sagging, and Dead-ending*:** After the OPGW is pulled in; it would be sagged to proper tension and dead-ended to structures.
- **Step 3: *Clipping-in*:** After the OPGW is dead-ended, it would be secured to all tangent structures; a process called clipping in.

The dimensions of the area needed for the OPGW stringing setups associated with installation are variable and depends upon the terrain, however a typical stringing set up is 75 feet by 100 feet, however, and crews can work from within slightly smaller areas when space is limited.

Each OPGW segment stringing operation would include one puller positioned at one end and one tensioner and wire reel stand truck positioned at the other end. The puller and tensioner set-up locations require level areas to allow for maneuvering of the equipment. When possible, these locations would be located on existing level areas and existing roads to minimize the need for grading and cleanup.

The puller and tensioner set-up locations would be temporary and the land would be restored to its previous condition following completion of pulling activities. The final number and locations of the puller and tensioner sites would be determined during final engineering.

At the towers where the segments terminate, the OPGW cables are routed down a tower leg where the segments are spliced together. For splicing OPGW cables, special splicing lab vehicles would be used to travel to the various splicing locations. The area required for each splicing crew would be 30 feet by 40 feet. The crew would bring the OPGW cable ends into the special splicing lab vehicles and splice together the two ends. The splices are then transferred to and housed in a splice box (a 3-feet by 3-feet by 1-foot metal enclosure) that would be mounted to one of the tower legs some distance above the ground. On the last tower at each end of a transmission line, the overhead fiber would be spliced to another section of fiber cable that runs in underground conduit from the splice box into the communication room inside the adjacent substation.

The retrofitting of the existing 500 kV LSTs, removal of existing OHGW, and installation of the OPGW would require the establishment of approximately 3 to 5 temporary marshalling yards located at strategic points along the route. Each yard would be used as a reporting location for workers and may have offices for supervisory and clerical personnel; the yards would also be used for the storage and staging of materials, the parking of private vehicles, and the parking of construction vehicles and equipment. Each yard would be approximately 2.5 to 5.0 acres in size, depending on land availability and intended use. Preparation of the marshalling yards may include the application of road base, depending on existing ground conditions at the yard site, and the installation of perimeter fencing.

Crews would load materials onto work trucks and drive to the line position being worked on that specific day. At the end of the day, they would return to the yard in their work vehicles and depart in their private vehicles. Materials stored at the marshalling yards would be similar to the items stored at staging areas discussed under the SCE 220 kV gen-tie above.

In addition to the primary marshalling yards, approximately 4 to 8 temporary secondary material staging yards would be established for short-term utilization near construction sites. Where possible, the secondary staging yards would be sited in areas of previous disturbance along and/or adjacent to the transmission line ROW. Typically, an area approximately 1 to 3 acres would be required. Preparation of the secondary staging yards may include installation of perimeter fencing and the application of road base, depending on existing ground conditions at the yard site. Land disturbed at the temporary material staging areas, if any, would be restored to preconstruction conditions or to the landowner's requirements following the completion of construction.

The location, size, and total number of the temporary marshalling yards and temporary secondary material staging yards are not known at this time. The selection of the location and size of these yards would be dependent upon a detailed ROW inspection and would take into account, where practical, suggestions by SCE crew foreman or the SCE contractor selected to do the work, and the availability of appropriately zoned property.

B.3.5.3.2 850 MW Full Build-Out Option

A general description of construction activities is based on information from Appendix EE of the Calico Project AFC and from past SCE transmission and substation projects (SES 2008a). Additional information will be included in SCE's CPCN application and PEA that will be submitted to the CPUC.

Transmission Line Facilities

Construction activities associated with the proposed transmission line facilities would be generally similar to the activities described for the SCE 220 kV Gen-Tie Configuration under the 275 MW Early Interconnection option above.

Work activities would commence upon approval of the proposed project by the CPUC, BLM and other permitting agencies. Terms of the LGIA state that the project would be operational by January 1, 2016; however SCE has a target operating date of 2014 depending on permitting.

Proposed Construction and Restoration Measures

Appendix EE of the Calico Project AFC recommends potential mitigation measures that could be implemented to reduce environmental impacts. However, Applicant Proposed Measures (APMs) dealing with general construction procedures, as well as those dealing with environmental resources and site-specific mitigation measures developed as the result of SCE's environmental analysis of the project, will be presented in SCE's Proponent's Environmental Assessment that will be submitted to the CPUC. In addition, the CPUC and BLM will also develop and implement mitigation measures for the proposed project.

Labor and Equipment

Construction of the proposed transmission line would be performed by contract personnel with SCE responsible for project administration and inspection. Standard construction equipment would be used and at some stages of the project, multiple locations would be under construction simultaneously. This may involve independent construction teams. The following activities would likely be required to construct the 500 kV transmission line:

- Survey (entire existing and new ROW);
- Marshalling Yard;
- Roads and Landing Work;
- Guard Structure Installation;
- Install LST Foundations (258 500 kV structures);
- LST Steel Haul;
- LST Steel Assembly;
- LST Erection;
- Install Conductor & OHGW;
- Guard Structure Removal;
- Remove Existing Conductor & OHGW;
- Remove Existing 220 kV Structures;
- Remove Existing Foundations; and
- Restoration.

ROW and Siting

Depending on final routing, approximately 9.8 miles of new ROW would be required for the Lugo-Pisgah No. 2 500 kV transmission line upgrade project. This includes 0.6 miles around the new/expanded Pisgah Substation and 9.2 miles from the Mojave River to the Lugo Substation. The existing ROW for the Lugo-Pisgah No. 2 220 kV transmission line would be used for the remaining 57.1 miles of the 500 kV transmission line. Approximately 0.3 miles of new ROW would be required for the Eldorado–Lugo loop into Pisgah Substation.

For siting, SCE would conduct a detailed survey, acquire additional ROW, and begin detailed engineering designs. A control centerline would be established based on field survey measurements. Control monuments, consisting of 2-inch-diameter iron pipes sealed with a stamped brass cap would be set at maximum intervals of approximately 2 miles. Visual reference points parallel and perpendicular to the control line would be established so that photogrammetric profiles of the area's topography could be compiled. Approximate structure locations would be spotted on the profiles according to the engineering design criteria. Once approximate structure locations have been selected, exact positions would be field surveyed.

During this phase of the work, site adjustments would be made to avoid an environmental sensitivity or to maintain structure integrity and sustainability. Generally, these site adjustments would only be a few feet. Structure location approval and clearance procedures are discussed in the following section. Survey crews would also locate spur road centerlines, grades, and soil boring locations. Final determinations of road location curvature, cuts and fills, grades and drainage, and necessary erosion controls would be made in accordance with design standards and practices and/or landowner requirements.

Tower Location Approval and Clearance Procedure

An SCE team made up of SCE personnel and their contractors would visit each proposed structure site following the completion of preliminary engineering and prior to the commencement of detailed, final engineering of the structures. Each tower site and associated spur road would be reviewed by the team to assess the suitability of the site and a buffer area along each spur road and around each tower site would be inspected. If no environmental sensitivities are identified and there are no other issues affecting construction, maintenance, or real estate, the site would be marked as approved and the team would move to the next tower site and spur road. Final engineering would proceed on that tower at the approved location. If an environmental sensitivity is identified, SCE would move the proposed structure site in-line to avoid the sensitivity (in general, towers would not be moved side to side, but only in-line). In most cases, SCE would be able to move a tower site away from sensitivities to a new site.

Typically, this could be accomplished with a move of 50 feet or less. The recommended new tower site would then be inspected by the team. If no environmental sensitivities and no construction, maintenance or real estate issues are identified, preliminary engineering for this new site would be checked and the new tower site and associated spur road route would be approved by the team. Once proposed structure sites are approved, final detailed engineering would proceed. During detailed engineering, no further tower site adjustments would occur without consultation with the interdisciplinary team.

The foundations for the 500 kV towers could require up to four drilled, cast-in-place concrete piles or foundations. The size of the excavation for LSTs would depend on the soil conditions at each tower site. With excavations for structure foundations, tower sites may, on rare occasion, need to be moved due to excavation difficulties or discovery of some new sensitivity. During this phase of the work, site adjustments would be made only if necessary to avoid an environmental sensitivity or to maintain structure integrity and sustainability. Generally, these site adjustments would only be a few feet.

Construction Yards

Construction of the project transmission line would begin with the establishment of temporary construction yards located at strategic points along the route. Each yard would be used as a reporting location for workers, and for vehicle and equipment parking and material storage. The yards would have offices for supervisory and clerical personnel. Normal maintenance of construction equipment would be conducted at these yards. The size of each yard would depend on land availability and intended use and would generally vary from a few acres to approximately 30 acres. Expansion of the

Pisgah Substation would not require an additional temporary laydown area outside of the new substation fenced area.

At peak construction, most of the construction and private commuting vehicles usually occupy the existing yards. Crews would load materials onto work trucks and drive to the line position being worked. At the end of the day, they would return to the yard in their work vehicles and depart in their private vehicles.

Materials stored at the construction yards would be similar to what was described to be stored at temporary equipment and material staging areas under the 275 MW Early Interconnection option above.

Guard Structures

Guard structures may be installed at transportation, flood control, and utility crossings. Guard structures are temporary facilities designed to stop the movement of a conductor should it momentarily drop below a conventional stringing height. Temporary netting could be installed to protect some types of under-built infrastructure. Typical guard structures are standard wood poles, 60 to 80 feet tall, and depending on the width of the conductor being constructed, the number of guard poles installed on either side of a crossing would be between two and four. The guard structures would be removed after the conductor is clipped into place. In some cases, the wood poles could be substituted with the use of specifically equipped boom-type trucks with heavy outriggers staged to prevent the conductor from dropping.

Public agencies differ on their policies for preferred methods to public safety during conductor stringing operations. For highway and open channel aqueduct crossings, SCE would work closely with the applicable jurisdiction to secure the applicable ministerial permits to string conductor across the applicable infrastructure. For major roadway crossings, typically one of the following four methods is employed to protect the public:

- Erection of a highway net guard structure system;
- Detour of all traffic off a highway at the crossing position;
- Implementation of a controlled continuous traffic break while stringing operations are performed; or
- Strategic placement of special line trucks with extension booms on the highway deck.

The number of guard structures required would be based on a review of the number of road crossings that would be needed along the currently proposed route. The types of guard structures that would be required for crossings and the number of crossings necessary would be field verified upon completion of final design.

Access Roads and Spur Roads

Where possible, existing access and spur roads would be utilized. At a number of structure sites, access roads, and spur roads would be extended from existing roads to access the new structure locations adjacent to the existing or removed structures.

Drainage structures would be installed where necessary to allow for control of runoff and crossing of large washes.

New spur roads would be constructed to tower locations along the new ROW and to locations that are not nearby to the removed 220 kV structures. As discussed under the 275 MW Early Interconnection option, they are usually a minimum of 14 feet wide. It is anticipated that most of the spur roads constructed to accommodate new construction would be left in place to facilitate future access for operations and maintenance purposes.

Site Preparation

General construction activities related to site preparation are described under the 275 MW Early Interconnection option above.

Foundation Installation

It is currently anticipated that the Lugo-Pisgah No. 2 line would utilize 500 kV four-legged single-circuit towers. Each four-legged LST would be built on four drilled pier concrete footings using truck or track-mounted excavators with various diameter augers to match the diameter requirements of the structure type. The dimensions of each footing are dependent on variables such as topography, tower height, span lengths, and soil properties. LSTs typically require an excavated hole of 3 to 4 feet in diameter and 20 to 45 feet deep. On average, a typical footing would have an above ground projection of approximately 3 feet. Actual footing depths for the structure foundation would depend on the soil conditions and topography at each site and would be determined by SCE during final engineering.

Following excavation of the foundation footings, steel reinforced cages and stub angles would be set, survey positioning would be verified, and concrete would then be placed. Steel reinforced cages and stub angles would be assembled at laydown yards and delivered to each structure location by flatbed truck. Typically, LSTs would require 25 to 100 cubic yards of concrete delivered to each structure location, depending upon the type of structure being constructed.

General construction activities related to foundation installation are described under the 275 MW Early Interconnection option above.

Structure Assembly and Erection

It is currently estimated that approximately 258 single-circuit 500 kV towers would be constructed of dulled galvanized lattice steel angle members connected by steel bolts. The single-circuit 500 kV towers would range in heights between 91 feet and 194 feet.

The tangent and angle 500 kV insulator assemblies would consist of two strings of insulators in the form of a "V." Each leg of the "V" assembly would contain one or two one-piece gray polymer insulators, depending on the load. On dead-end structures, the insulators would be arranged in a "barrel" configuration consisting of four polymer insulators.

At the structure fabrication plant, structural members would be bundled and shipped by rail or truck to the construction yards, and then trucked to the individual sites. LSTs would be assembled at laydown areas at each site, and then erected and bolted to the foundations.

Tower assembly would begin with the hauling and stacking bundles of steel at tower location per engineering drawing requirements. This activity requires use of several tractors with 40-foot trailers and a rough terrain forklift. After steel is delivered and stacked, crews would proceed with assembly of leg extensions, body panels, boxed sections and the bridges. The steel work would be completed by a combined erection and torquing crew with a lattice boom crane. The construction crew may opt to install insulators and wire rollers (travelers) at this time. Ground disturbance would generally be limited to the laydown areas.

Where road access is available, assembled sections would be lifted into place with a minimum 80-ton crane. The crane pad would be would be located transversely and set up approximately 60 feet from the centerline of each structure. The crane would move along the ROW for structure erection purposes.

Where structure sites would be located in terrain inaccessible by a crane, a helicopter may be used for installation of structures and for line stringing. The final decision on helicopter use would be made by SCE and the construction contractor. The use of helicopters for the erection of structures would be in accordance with SCE specifications and would be similar to methods detailed in Institute of Electrical and Electronic Engineers (IEEE) 951-1996, Guide to the Assembly and Erection of Metal Transmission Structures, Section 9, Helicopter Methods of Construction.

Use of helicopters for installation eliminates land disturbance associated with crane pads, structure laydown areas, and the trucks and tractors used for steel delivery to structure sites. All construction work in remote work sites would be completed by hand with the assistance of portable compressors, portable hydraulic accumulators, and portable concrete mixers that would be flown into the tower sites.

The operations area of the helicopters would be limited to helicopter staging areas near construction locations that are considered safe locations for landing. Final siting of staging areas would be conducted with the input of the helicopter contractor, and affected private landowners and land management agencies. The size of each staging area would be dependent upon the size and number of structures to be installed. Staging areas would likely change as work progresses.

Helicopter fueling would occur at staging areas or at a local airport using the helicopter contractor's fuel truck, would be supervised by the helicopter fuel service provider, and SWPPP measures would be followed, as applicable. The helicopter and fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

Stringing Activities

The Lugo-Pisgah No. 2 500 kV transmission line would be strung with two-bundled 2156 kcmil ACSR "Bluebird" conductors with nonspecular finish. Approximately 2,226,000 feet of conductor would be strung. The Eldorado-Lugo 500 kV transmission line loop into Pisgah Substation would be strung with two-bundled 2156 kcmil ACSR "Bluebird" conductors with nonspecular finish. Approximately 13,000 feet of conductor would be strung.

Prior to stringing activities, bucket trucks, wood pole guard structures, or temporary protective netting systems that were erected at the crossings for roads, streets, railroads, highways, or other transmission, distribution, or communication facilities, for 220 kV conductor removal would be inspected or reinstalled. The stringing of conductor and overhead ground wire on new transmission lines typically would commence once a number of structures had been erected and inspected. General construction activities and steps related to stringing activities are described under the 275 MW Early Interconnection option above.

The threading step of wire installation may require helicopter use. While only one small helicopter is needed, additional helicopters may be used to shorten the time for this phase. On average, each helicopter would operate 6 hours per day during stringing operations.

The operations area of the small helicopter would be limited to helicopter staging areas and are considered safe locations for landing. Final siting of staging areas for the proposed project would be conducted with the input of the helicopter contractor, and affected private landowners and land management agencies. The size of each staging area would be dependent upon the size and number of towers to be removed and installed. Staging areas would likely change as work would progress along the transmission lines.

Helicopter fueling would occur at staging areas or at a local airport using the helicopter contractor's fuel truck, and would be supervised by the helicopter fuel service provider. The helicopter and fuel truck would stay overnight at a local airport or at a staging area if adequate security is in place.

OPGW would be installed in the same manner as the conductor, depending upon various factors, including line direction, inclination, and accessibility, and is discussed under construction activities for the telecomm facilities upgrades for the 275 MW Early Interconnection option.

Decommissioning of Existing 220 kV Transmission Facilities

All existing 220 kV structures on the Lugo-Pisgah No. 2 220 kV transmission line would be de-energized and removed prior to construction of the Lugo-Pisgah No. 2 500 kV transmission line. This would include the 57.1 miles of ROW that would contain the new 500 kV transmission line and the section of line that would be bypassed by the new ROW. Two existing 500 kV structures on the Eldorado-Lugo transmission line would be removed.

Transmission line equipment to be removed would include existing lattice steel towers and associated hardware (i.e., cross arms, insulators, vibration dampeners, suspension clamps, ground wire clamps, shackles, links, nuts, bolts, washers, cotters pins, insulator weights, and bond wires), as well as the transmission line conductor. Any access roads not required for access to the new 500 kV transmission line would also be reclaimed per the associated ROW conditions.

SCE would likely remove the existing 220 kV and two 500 kV structures through the following activities:

- **Set Up**: Existing access routes would be used to reach structure sites, but some rehabilitation work on these routes may be necessary before removal activities begin. In addition, grading may be necessary to establish temporary crane pads for tower removal.
- **Structure Removal**: Towers would be dismantled and removed from the ROW area. For each structure, a crane truck or rough terrain crane would be used to support structure during removal; a crane pad of approximately 50 feet by 50 feet may be required to allow a removal crane to be setup at a distance of 60 feet from the structure center line. The crane rail would be located transversely from the structure locations.
- **Footing Removal**: The foundations for the towers would be removed to below grade and the locations of the towers would be reclaimed per the associated ROW grant or easement permit conditions.

The existing 220 kV conductor would be removed through the following activities:

- **Wire Pulling Locations**: Wire-pulling locations would be sited no more than every 15,000 feet along the utility corridor, and would include dead-end towers and turning points. It is anticipated that many of the same locations would be used for installation of the new 500 kV lines that would be used for the removal of existing lines. Wire-pulling equipment would be placed intermittently along utility corridor.
- **Pulling Cable:** A pulling cable would replace the old conductor as it is being removed, this allows complete control of the conductor during its removal. The line would then be removed under controlled conditions to minimize ground disturbance, and all wire-pulling equipment would be removed.
- **Breakaway Reels:** The old conductor wire would be wound onto “breakaway” reels as it is removed. The old conductor would be transported to a marshalling yard where it would be prepared for recycling.

Housekeeping and Site Cleanup

During construction, water trucks may be used to minimize the quantity of airborne dust created by construction activities. Any damage to existing roads as a result of construction would be repaired once construction is complete.

SCE would restore all areas that are temporarily disturbed by project activities (including material staging yards, pull and tension sites, and splicing sites) to preconstruction conditions following the completion of construction. Restoration would include grading and restoration of sites to preconstruction contours and reseeding where appropriate. In addition, all construction materials and debris would be removed from the area and recycled or properly disposed of offsite.

SCE would conduct a final survey to ensure that cleanup activities are successfully completed.

Pisgah Substation Expansion

The existing Pisgah Substation (approximately 5 acres) would be expanded to approximately 40 to 100 acres to accommodate new electrical and communication facilities and future growth.

Foundation Excavation

Foundations of various sizes would be constructed throughout the substation pad to support equipment and steel structures. In addition, a network of partially buried concrete trenches and a buried grounding grid would be installed. Excavations of these foundations and trenches would commence following the completion of grading and other yard improvements, and would continue for several weeks. The estimated total volume of soil that would need to be excavated for foundation and trenches would be determined following project engineering and included in SCE's PEA to the CPUC.

Drainage

Site drainage is an integral component of grading. Therefore, during final engineering measures to control drainage off the improved pad would likely be developed that would be in compliance with regulations regarding the alteration of natural drainage patterns. All new site drainage installations would be consistent with the National Pollution Discharge Elimination System (NPDES) and the Storm Water Pollution Prevention Plan (SWPPP) prepared for the site. Typical drainage improvements usually consist of concrete swales, ditches and culverts.

Access

If the substation is located adjacent to the existing Pisgah Substation then the existing access road could be utilized. If the expanded Pisgah Substation is constructed in a new location along the existing ROW then the existing access roads may be able to be improved and utilized. For a new 220/500 kV substation, SCE generally constructs a 24-foot wide road with asphalt concrete paving over a compacted aggregate base over compacted sub-grade with compacted shoulders on each side; however, an exact description of access to the substation site would be included in SCE's PEA to the CPUC.

Geotechnical Testing

Soils testing would be conducted and analyzed by a professional, licensed Geotechnical Engineer or Geologist, to determine existing soil conditions. Borings in a sufficient quantity to adequately gather variations in the site soils would be conducted to remove sample cores for testing. The type of soils, soil pressure, relative compaction, resistively and percolation factor are among the items that are usually tested for. If contaminants are encountered, special studies and remediation measures in compliance with environmental regulations would be implemented by qualified professionals. The results of the geotechnical investigation are applied as needed by various engineering disciplines during the course of final engineering design.

Paving

Asphalt concrete paving would be applied to all designated internal driveways over an aggregate base material and a properly compacted sub-grade as recommended by the geotechnical investigation during final engineering. Asphalt concrete paving would be installed after all major construction had been completed.

Rock Surfacing

All areas within the substation perimeter that are not paved or covered with concrete foundations or trenches may be surfaced with a 4-inch layer of untreated, 0.75-inch nominal crusher run rock. The rock would be applied to the finished grade surface after all construction has been completed.

Spill Prevention Control and Countermeasures (SPCC)

The presence of oil in a quantity greater than 1,320 gallons invokes SPCC regulations. The quantity of oil contained in any one of the planned 500/220 kV transformers would be in excess of the minimum quantity required by law.

The control of oils spills through secondary containment would be designed by a licensed California Registered Professional Engineer. The permanent or temporary SPCC measures would be in place prior to the delivery of transformers to the site. Improvements may consist of, but not be limited to, trenches, holding areas, retention basins and curbs.

An SPCC plan would be prepared and maintained onsite. Substation operating personnel would be trained in the execution of the plan.

Storm Water Pollution Prevention Plan (SWPPP)

During construction activities, measures would likely be in place to insure that contaminates are not discharged from the construction site.

An SWPPP would be developed that would define areas where hazardous materials such as concrete are to be stored; where trash will be placed; where rolling equipment shall be parked, fueled and serviced and where construction materials such as reinforcing bars and structural steel members are staged.

Erosion control during grading of the unfinished site and during subsequent construction shall be in place and monitored as specified by the SWPPP. A silting basin(s) would be established to capture silt and other materials which might otherwise be carried from the site by rainwater surface runoff.

Perimeter Security

The entire expanded substation area would be enclosed by perimeter gates and fencing as determined during project engineering by SCE. Perimeter chain link fencing would conform to the requirements for electrical substations and have a minimum height of 8 feet above the adjacent finished grade to the outside of the substation. All perimeter fences and gates would be fitted with barbed wire. A motion sensing system would be attached to the fence chain link fabric to detect attempted unauthorized entry.

Telecommunications Facilities: Optical Ground Wire Installation on Structures

An OPGW would be installed on the existing 65-mile portion of Eldorado-Lugo 500 kV transmission line as well as on the new Lugo-Pisgah No. 2 500 kV transmission line for communication purposes. The OPGW would be installed in the same manner as the conductor discussed under the 275 MW Early Interconnection above. It is typically installed in continuous segments of 19,000 feet or less depending upon various factors including line direction, inclination, and accessibility.

Following installation of the OPGW, the strands in each segment are spliced together to form a continuous length from one end of a transmission line to the other. At a splice structure, the fiber cables are routed down a structure leg where the splicing occurs. The splices are housed in a splice box (typically a 3-foot by 3-foot by 1-foot metal enclosure) that is mounted to one of the structure legs some distance above the ground. On the last tower at each end of a transmission line, the overhead fiber is spliced to another section of fiber cable that runs in underground conduit from the splice box into the communication room inside the adjacent substation.

B.3.5.4 Operation and Maintenance

Following the completion of project construction, operation and maintenance of the new lines would commence. Inspection and maintenance activities would include the following:

- Routine line patrols by both aircraft and truck;
- Routine, patrol identified, tower and wire maintenance;
- Routine line washing;
- Routine, patrol identified, earth and sand abatement from footings; and
- Routine right-of-way road maintenance.

The frequency of inspection and maintenance would depend on various conditions, including length of the line and weather effects. Inspection and maintenance activities typically include senior patrolman, foreman, lead lineman, journeyman lineman, apprentices, groundmen, helicopter pilots, equipment operators, and laborers. If the magnitude of repairs identified by routine patrols is substantial, other specialized employees such as surveyors, engineers, clerical personnel, and technicians would be attached to maintenance crews, as required, to address any unique problem that may arise due to such variables as substantial storm damage or vandalism.

In general, SCE operates two types of helicopters for patrols of transmission lines: American Eurocopter AS-350D (B-2) (B-3) and Hughes 500. During a typical patrol, a helicopter would fly at or near the elevation of the point of support of the conductor. In populated areas, patrols would fly at higher elevations or away from the centerline of the transmission lines, in order to avoid flying close to houses or penned animals.

In cases where flying near a populated area cannot be avoided, the patrolman would use gyrobinoculars so as to increase the inspection distance between the structures and the helicopter to the greatest extent possible. In rural areas, unless designated otherwise, proximity to the ground is not restricted with the exception of safety and environmental concerns.

The entire Lugo-Pisgah No. 2 transmission line corridor would likely be patrolled every year. The yearly patrol alternates each year between helicopter and truck. In one year, the patrol would be by helicopters and would take approximately one day (8 hours) to accomplish. The next year, the patrol would be performed by truck and would take several days. A yearly patrol is a minimum patrol requirement. Increases in pollution and population density in the vicinity of the proposed transmission line corridor may cause SCE to increase the patrol frequency of the line. Currently, there is no consistency between helicopter and truck patrol for these additional patrols, although patrols are handled by each approximately 50 percent of the time. In some cases crews prefer to use a helicopter and in other cases, the preference is to use a patrol truck. This decision would be made based on availability of resources and criticality of time.

Starting approximately 15 years after the operational date, maintenance on the proposed line would be expected to increase. Initial additional corridor maintenance would be due principally to weather and vandalism to the new line. As insulators and steel age on the line, the frequency of lattice steel tower hardware maintenance activities such as bolt torquing would increase. However, no significant increase in patrols or grading would be required.

B.3.5.5 Removal and Restoration

Prior to removal or abandonment of the facilities that would be permitted to be constructed on BLM lands or within a reasonable time following termination of the BLM ROW grant, SCE would prepare a removal and restoration plan. The removal and restoration plan would address removal of SCE facilities from the permitted area, and any requirements for habitat restoration and revegetation. The removal and restoration plan would then be approved by the BLM before implementation.

B.3.5.6 Analysis of Reasonably Foreseeable Actions

This analysis of Reasonably Foreseeable Impacts, which is included under each issue area in Sections C and D of this SSA, is based on best available routing and project information provided in Appendix EE of the Calico Solar Project AFC, SCE's Project Description for SES Solar One 275 MW Early Interconnection Facilities, and on descriptions of other recent similar projects proposed by SCE (SES 2008a; SCE 2009).

The final project design for the 850 MW Full Build-Out Option has not been engineered. While the majority of the new 500 kV transmission line alignment would be proposed along existing transmission lines with existing access roads, portions of the route would require new ROW and access roads as part of the project. Likewise, depending on land availability and engineering, the expanded/new Pisgah Substation would likely be constructed along the existing Lugo-Pisgah ROW in the approximately 6-mile area between the existing Pisgah Substation and the mountains to the southwest. However, the exact size and location of the new/expanded substation has not been determined and so a complete analysis of its impacts is not possible at this time.

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Exhibit 305

Biological Resources Appendix A, PWA Geomorphic Assessment Report

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MEMORANDUM

Date:	June 18h 2010
To:	Scott White and Rick York
CC:	
From:	Andrew Collison, Setenay Bozkurt and James Gregory
PWA Project #:	2006.04 CEC Calico
Subject:	**Impacts of the proposed Calico Solar project on sediment yields to sand-dependent species**

PWA has conducted a sediment yield assessment for the Calico Solar Power Project site in order to estimate the impacts of proposed detention basins on habitats that are dependent on fine, wind blown sand. This memo reports reductions in sediment supply to several areas of White Margined Beardtongue (Penstemon albomarginatus) and Mojave Fringe Toed Lizard.

Background and Methods

Species found on and adjacent to the Calico site are often associated with fine sand deposits that are deposited by a combination of fluvial and aeolian (wind transport) processes. Sediment originates in the Cady Mountains and the Lava Bed Mountains and is transported to the valley floor by ephemeral channels crossing the alluvial fan. The proposed Calico drainage plan includes detention basins in the middle sections of the alluvial fan that will cut off much of the sediment supply from the Cady Mountains to the habitat areas of concern. In addition, desert tortoise exclusion fences with one inch by two inch mesh located around the property boundary will likely clog with debris and reduce sediment supply from ephemeral channels during high flow events. In order to assess the impact of the drainage plan on sediment delivery to the habitat areas PWA conducted a sediment assessment for the watersheds draining into the project boundary. The channel drainage lines and watersheds were delineated in Arc GIS using a 10-m resolution Digital Elevation Model and the delineation tools in Arc Hydro. Combining these delineations with data on the location of the species of interest (supplied by the applicant as shapefiles) allowed us to identify the drainage areas contributing sediment to each. We then calculated the mean annual sediment yield based on a relationship between watershed area and sediment yield developed by Griffiths et al. (2006). The relationship is as follows:

$$SY = 275 * A^{\wedge -0.13}$$

where SY is sediment yield in kg/ha/yr and A is watershed area in hectares.

The inverse relation between sediment yield per unit area and drainage area is typical since sediment weathered and eroded within small watersheds is more likely to be transported to the outlet and less likely to be stored internally than sediment generated in larger watersheds, which is often eroded and then stored downslope of the source area.

Caveats

Note that while we report estimated sediment yields based on watershed area, the correlation on which we are basing our analysis is subject to a high degree of variability and uncertainty due to the variability in source sediments and topography. Sediment yield in the drainage basins analyzed in the Griffiths et al. (2006) study ranged from 90 to 480 kg/ha/yr. The mean sediment yield was 280 kg/ha/yr with a standard deviation of ±110 kg/ha/yr. It is therefore more appropriate to look at the with- and without-project change in estimated sediment yield rather than focus on the absolute volumes of sediment. In addition, watershed delineation on an alluvial fan using the resolution of terrain data available is challenging since the drainage divides are often too subtle to be detected by the 10-m topographic grid. In a few cases we were able to note from aerial photo interpretation that the watershed boundaries did not agree with the flow paths. For two habitat areas (P1 and P4) we hand delineated the proportion of a watershed draining to the habitat area to account for observed discrepancies between watershed area and flow paths.

Analysis

The applicant's drainage plan was overlaid onto the project area to assess the area of watershed that was upstream of either a detention basin or a debris basin, and the watershed area upstream of a habitat area impacted by sediment traps was calculated. We assumed that all sediment came from the headwaters area rather than the body of the alluvial fan (which is generally a depositional area rather than a source of sediment). Two assessments were conducted based on different assumptions regarding the effects of the boundary fences. Table 1 presents results assuming that the tortoise exclusion fences have no effect on sediment delivery (i.e. assuming that 100% of sediment transported to the fence and boundary road is able to pass through without any disruption). Table 2 presents results assuming that 50% of sediment reaching the fences would be blocked. Our basis for this rough estimate is that events greater than approximately a 5-10 year recurrence interval flood will tend to carry debris (sediment larger than 1 inch in diameter and brush from the watershed) that will clog the fences, while events that are smaller than this largely pass sediment through the fence. Cumulatively, events larger than the 5-10 year flood carry approximately half the total sediment load in desert systems.

Habitat area	Sediment Yield (t/yr)		% Reduction
	Pre project	Post project	
MFTL	497	452	9%
P1	59	54	9%
P2	80	-	100%
P3	564	437	22%
P4	149	104	30%
P4b	26	-	100%
P5	114	114	0%
P6	348	348	0%

Table 1. Reduction in sediment delivery to habitat areas assuming the boundary fence does not impede sediment delivery.

Habitat area	Sediment Yield (t/yr)		% Reduction
	Pre project	Post project	
MFTL	497	226	55%
P1	59	54	9%
P2	80	-	100%
P3	564	219	61%
P4	149	52	65%
P4b	26	-	100%
P5	114	57	50%
P6	348	232	33%

Table 2. Reduction in sediment delivery to habitat areas assuming the boundary fence reduces sediment delivery by 50% where drainage lines are fenced.

Figures 1 and 2 show the habitat areas coded by sediment reduction, assuming that the fence does not reduce sediment supply.

Conclusions

Sediment delivery to the Mojave Fringe Toed Lizard area MFTL1 is largely unaffected by the proposed detention basins because most of its sediment is supplied by watersheds to the south, but it is very sensitive to the function of the boundary fence on the south and east property lines: if the fence passes sediment successfully then the reduction in sediment delivery will be small, but if the fence clogs and blocks sediment the reduction will be high.

For the White Margined Beardtongue habitat areas, P1 and P3 are only slightly to moderately affected by the detention basins but are more sensitive to the effects of the fence on sediment delivery, with moderate to high reductions possible. P2 and P4 will be completely cut off from sediment delivery by the detention basins regardless of assumptions made about the fence. P5 and P6 should not be affected by the detention basins but are moderately to highly sensitive to the effects of the fence on disrupting sediment delivery.

Several habitat areas outside the project site will not be affected by the propose project since they are supplied by sediment that is transported on paths that are unaffected. These areas are not labeled but are shown in Figure 2.

In addition to showing the potential for the project drainage plan to greatly reduce the sediment supply to several habitat areas, the analysis highlights the need to ensure that the fence passes sediment to the project site.

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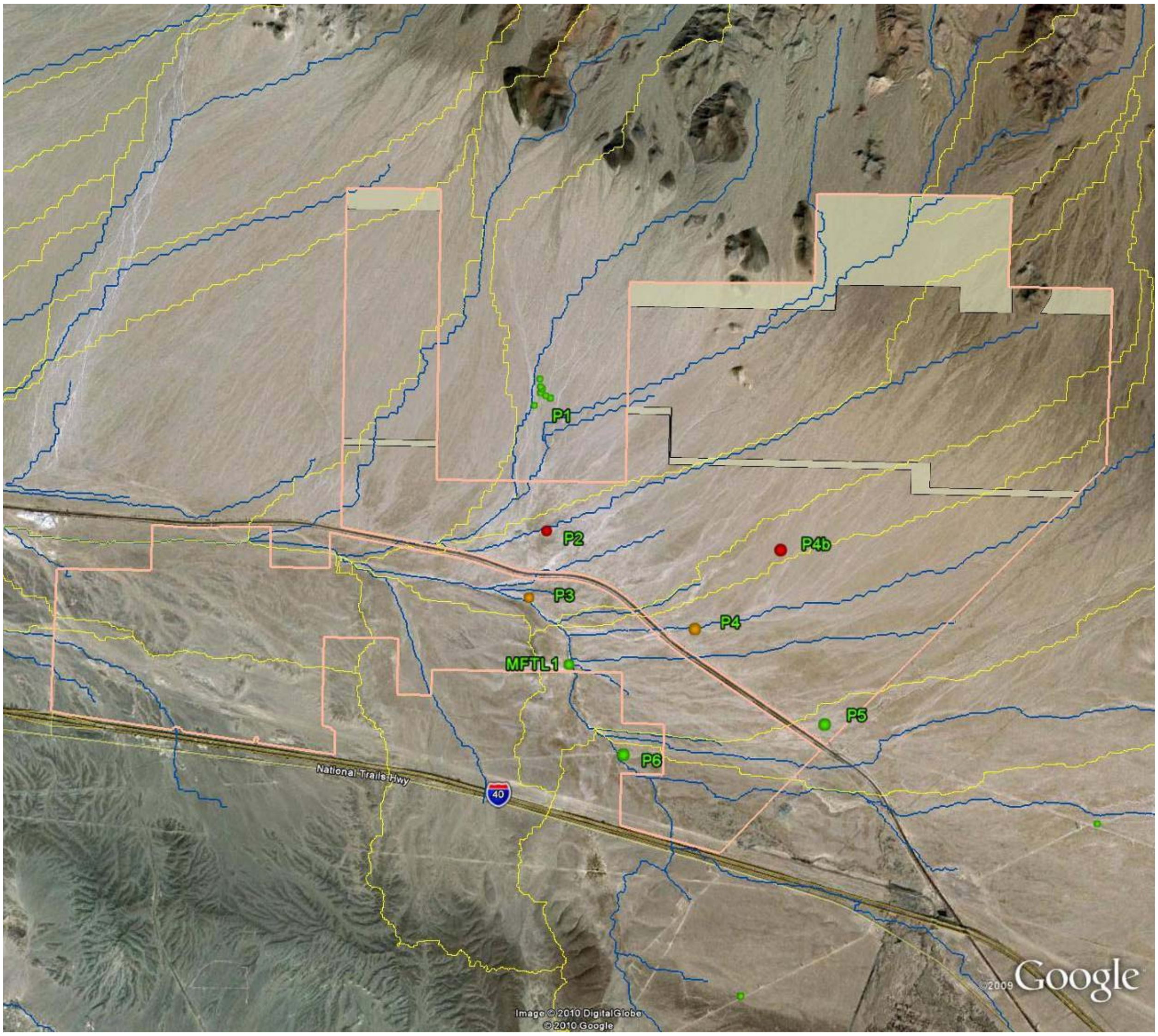

Figure 1. Project footprint (pink line), watershed boundaries (yellow lines) and drainage lines (blue lines) showing sediment supplies and pathways for the habitat areas. Colors of habitat areas represent sediment reduction assuming no impact from the fencing: green = <10% reduction, orange = 10-50% reduction, red = >50% reduction in sediment supply. Assuming the fence results in a 50% sediment reduction MFTL1 and P5 would be classified as red and P6 would be classified as orange.

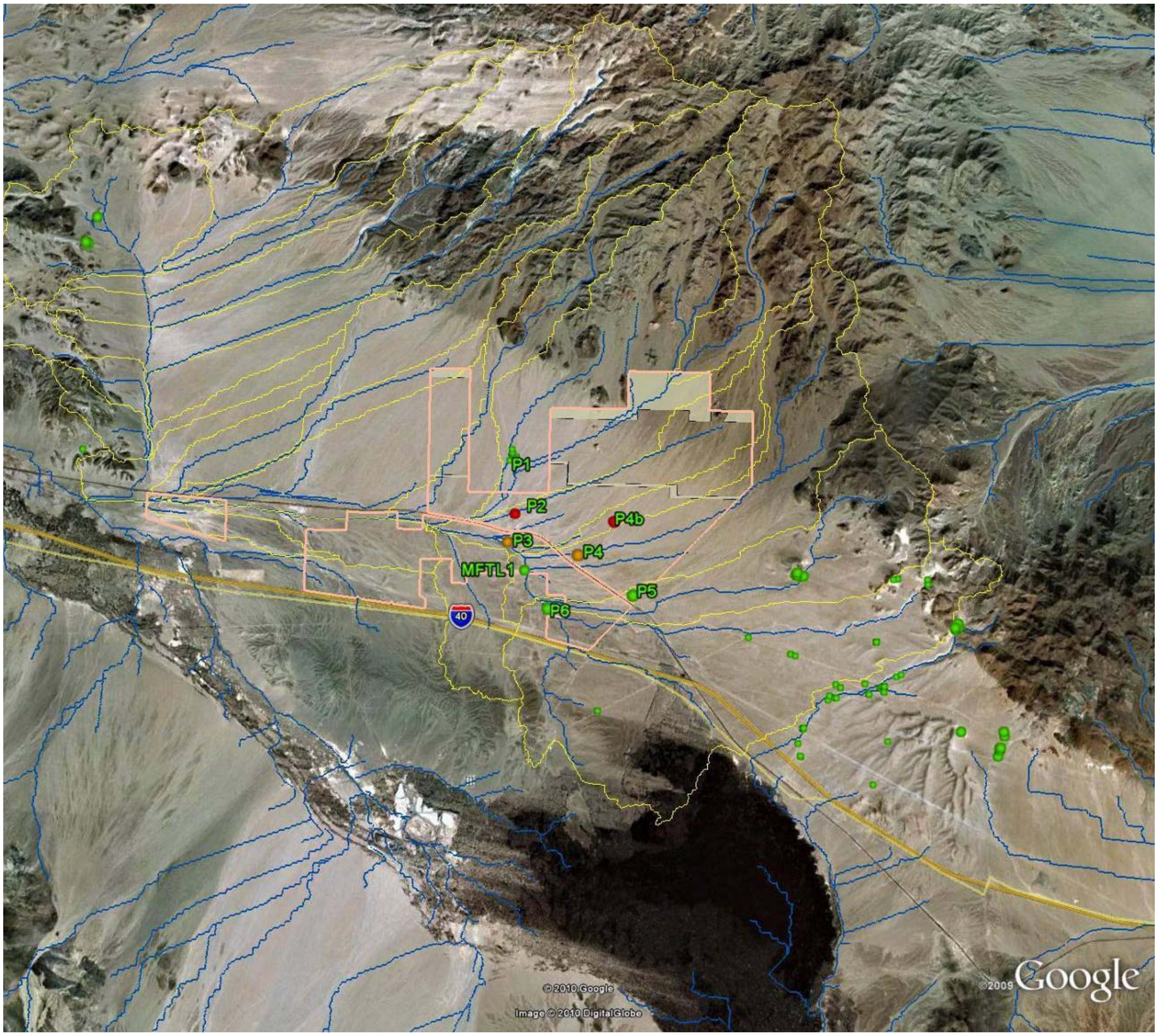

Figure 2. Wider view of the project footprint showing the surrounding habitat areas that are unaffected by the proposed project. Same key and assumptions as Figure 1.

Geomorphic Assessment of Calico Solar Project Site

Appendix A (Biology Report)

Prepared for | CALIFORNIA ENERGY COMMISSION

Prepared by | PWA Philip Williams & Associates, Ltd.

May 12, 2010 (finalized July 9, 2010)

Geomorphic Assessment of Calico Solar Project Site

APPENDIX A (BIOLOGY REPORT)

Prepared for | California Energy Commission

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PWA Ref. # 2006.04
CEC WA # 1920.184

May 12, 2010 (finalized July 9, 2010)

TABLE OF CONTENTS

1. OBJECTIVES OF THIS APPENDIX

1. Provide a brief description of the project area's sand dunes and a discussion of the sand transport processes that created and now maintain the existing dunes.

2. Discussion of potential direct and indirect impacts of the proposed project and its alternative on the existing sand dune system and the processes that support them.

3. Provide a discussion of potential mitigation for those impacts, or a well-supported conclusion that those impacts cannot be mitigated.

2. SUMMARY OF KEY FINDINGS

PWA conducted a geomorphic reconnaissance of the proposed Calico solar energy project site. The focus of the reconnaissance was to determine whether the proposed project will have impacts on geomorphic processes relating to sediment transport, with a particular emphasis on whether sand transport to biological resources on- and off-site is likely to be disrupted. Sand dunes both within the project footprint and around the site provide valuable habitat for Mojave Fringe Toed Lizards (MFTL) and other species. This habitat relies upon the input of fine sand by a combination of upwind aeolian (wind) transport and upstream fluvial (water-based) transport. Large infrastructure projects have the potential to disrupt or block such sediment pathways, leading to degradation of dune habitat over time.

PWA staff reviewed reports and aerial photos, and conducted 'ground truthing' reconnaissance to correlate geomorphic processes and landforms on the ground with aerial features on April 30th. The project site encompasses a series of coalesced alluvial fans that drain the Lava Bed Mountains to the south and the Cady Mountains to the north. The valley formed between these mountains drains west to Troy Dry Lake and ultimately to the Mojave River. Most of the site is made up of Quaternary alluvial fan deposits (poorly sorted sand, gravel and cobble) that become finer downslope towards the valley floor, where the sediment has been reworked to form a series of vegetated sand dunes overlaying the fan surface. The primary mode of sediment transport in the project site appears to be fluvial, with sediment washing down the many alluvial fan channels to the valley floor and then draining west off the site towards Troy Dry Lake, which is a local sediment sink. Sand transported to the valley floor is then locally redistributed by wind to form a series of vegetated sand dunes that lie adjacent to the larger washes, and that form habitat for MFTL and other species. Based on the orientation of dunes found in the project site the sand is being transported in an approximately easterly direction, driven up the valley axis by the prevailing winds from the west. The dunes found during the field reconnaissance were all adjacent to washes and did not appear to have formed independently as part of a regional wind transport corridor, as is the case for many other dune fields in the region. Review of literature on regional sand transport corridors, backed by aerial photo and field investigations, indicates that the site is not located in a major area of wind transport, supporting the observation that the sand source is fluvial in origin.

Review of the applicant's drainage plan shows a proposed series of debris basins at the headwaters of the main alluvial fan channels draining to the valley floor, as well as a series of detention basins closer to the dune areas. Over time these basins will cut off new supplies of fluvial sediment from reaching the sand dune area, reducing the amount of fine sediment available for wind transport adjacent to the valley floor. This will likely lead to habitat degradation in which the dunes lose sand to wind and water erosion while not replacing the sand that is lost. There is also a moderate risk that the alluvial fan channels will incise (erode vertically) downstream of the basins in response to the reduction in sediment supply. This may cause further loss of dune habitat around the channels as they cut into the alluvial fan surface and become more hydraulically efficient, reducing sediment and water connectivity to the floodplain. It is not clear how these impacts to on-site dune habitat could be mitigated unless the drainage plan is revised to eliminate all in-channel detention and retention facilities (debris basins and detention basins).

In addition to the on-site dunes there are several sensitive dune areas off-site. Two areas of MFTL habitat have been identified, one approximately 1.5 miles east of the eastern project boundary and a second area 3.9 miles southeast of the eastern boundary. These were examined by aerial photos to assess whether the project was likely to impact the wind-blown sands forming the dunes. Both areas appear to obtain their wind-borne sand from fluvial sources that flow locally and that will not be affected by the proposed project.

Although this report is focused on geomorphology not biology, field checking of the sand dunes mapped by the applicant suggested that they may have underestimated the area of potential dune habitat for MFTL and other species. Field checks of the mapped MFTL habitat area agreed regarding the southern boundary, but found additional areas of sand dunes north of the mapped area that appeared similar to those mapped as MFTL habitat. Additional dune areas that appeared similar to the one mapped by the applicant as MFTL habitat were found adjacent to several of the larger washes (for example around the Edison substation on the eastern project boundary), but were also not shown on the applicant's maps. We recommend that a biologist review the site to determine whether the mapped dune area is accurate.

3. RELATIONSHIP BETWEEN HYDRO-GEOMORPHIC PROCESSES AND BIOLOGICAL RESOURCES

This Appendix focuses on several hydro-geomorphic processes that play a significant role in the health of the ecosystem of the project site and its surroundings. The ecosystem in question is sand dunes that support lizards (including Mojave Fringe Toed Lizard - MFTL) and other flora and fauna. The geomorphic processes are wind transportation of sand relative to the creation, preservation and destruction of sand dunes, and water transport of sediment through the alluvial fan drainage system.

3.1 WIND TRANSPORT

Sand dune fauna such as MFTL rely on a regular supply of fine wind blown sand for their habitat (Figure 1). Active sand dunes (dunes that have an active layer of mobile sand) exist in a state of dynamic equilibrium: they are continuously losing sand downwind due to erosion and transport, but that is offset by supplies of new sand from upwind (see Figure 2). If the sand supply is cut off the dunes *deflate*; that is to say they lose sand downwind and shrink in size and depth (see Figure 3 for an example). The finest sand (which is most easily transported) is lost first with coarser sand and gravel being left behind to form an armor or lag. This combination of lag and thin sand deposits does not support many dune-dependent species. For example, Turner et al (1984) conducted experiments on paired plots of sand dunes up and downwind of wind barriers to look at abundance of MFTL. They showed that downwind sand dunes experienced deflation within 4-17 years of the erection of a relatively small wind barrier (a single line of tamarisk trees) and that while MFTL were abundant upwind of the barriers they were virtually absent downwind. Thus barriers pose a direct threat to sand transport and habitat.

Figure 1. Mojave Fringe Toed Lizard showing its preferred habitat of fine, loose sand. Source: Southwest Images.

Figure 2 (right). Potential MFTL habitat showing ‘plump’, vegetated dunes connected by relatively deep, loose sand sheets with active sand movement.

Figure 3. Deflated former vegetated dune showing remnants of eroding dune under creosote bushes surrounded by shallow, compacted sand. This habitat does not support MFTL.

3.2 FLUVIAL TRANSPORT

In addition to direct transport of sand by wind, dunes can form when sand is transported by fluvial action and then sorted and fined (fine sand is selectively transported) by wind action (Figure 4). Alluvial fan channels transport sediment from the mountain range across the fan to the fan toe. As the channels transport sediment it becomes finer by three processes; sorting, loss of competency, and abrasion. Sorting refers to the selective transport of finer sediment greater distances, so that coarse gravel and cobbles are deposited close to the mountain front and finer sand is moved further downstream before being deposited. Loss of competency refers to the fact that alluvial fan channels become less hydraulically efficient with increasing distance away from the mountain front, as the channels tend to bifurcate and spread out into more, smaller, shallower channels with less sediment transport capacity. As a channel loses competency it is only able to transport finer materials downstream, with coarser particles settling out. Abrasion refers to the process whereby as a particle moves downstream it collides with other particles, becoming smaller. As a result of these processes alluvial fans deliver fine sediment (sand size) at their toes where they reach the valley floor. Sand is deposited directly in the channel, as well as being both washed and blown out of the channel and onto the surrounding floodplain and slopes. Sand dunes are more likely to form around depositional alluvial channels as opposed to eroding channels, for several reasons. Depositional channels tend to be wide, shallow, well connected to their surrounding floodplain, and have fine material lining their beds. All these attributes make it easy for the wind to pick up sediment from the bed and transport it to adjacent dunes. Eroding channels tend to be narrow, deep, poorly connected to their floodplains, and do not store fine sediment, making it unlikely that the wind will redistribute material to adjacent dunes.

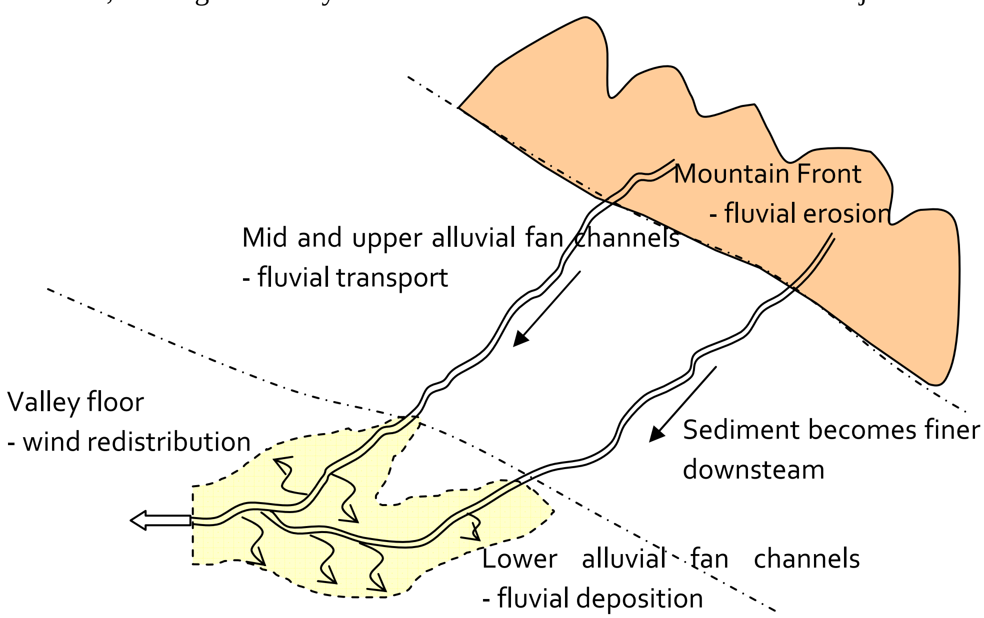

Figure 4. Conceptual model of sediment transport processes supporting dunes

3.3 INTERRELATIONSHIP BETWEEN FLUVIAL AND WIND TRANSPORT

Fluvial and wind transport processes occur episodically, take place at different times from each other, and have different relative rates. In their study of sediment delivery to MFTL habitat in the Coachella Valley, Griffiths et. al. (2002) found that approximately 80% of sediment on the valley floor was delivered by fluvial sources on alluvial fans, with most delivery occurring during El Nino events (wet winters that occur approximately every 3-7 years). The fluvial sediment is then eroded and transported down the wind transport corridor by wind action during La Nina events (dry winters occurring approximately every 3-7 years). Griffiths et. al. (2006) studied the relationship between runoff frequency and sediment yield for small drainage basins in the Mojave Desert and found that events with a recurrence interval of 2.6 to 7.3 years were required to transport sediment on alluvial fans; events that occurred more frequently were too small to entrain sediment.

4. DESCRIPTION OF THE CALICO PROJECT SITE

The project site is located north of Interstate 40, forty miles east of Barstow in San Bernardino County. The project site is bisected by the Burlington Northern Santa Fe Railroad (BNSF). It is located on a series of alluvial fans that drain the Lava Bed Mountains to the south and the Cady Mountains to the north. The alluvial fan channels coalesce to form a braided channel that drains west two miles from the western project block to Troy Dry Lake.

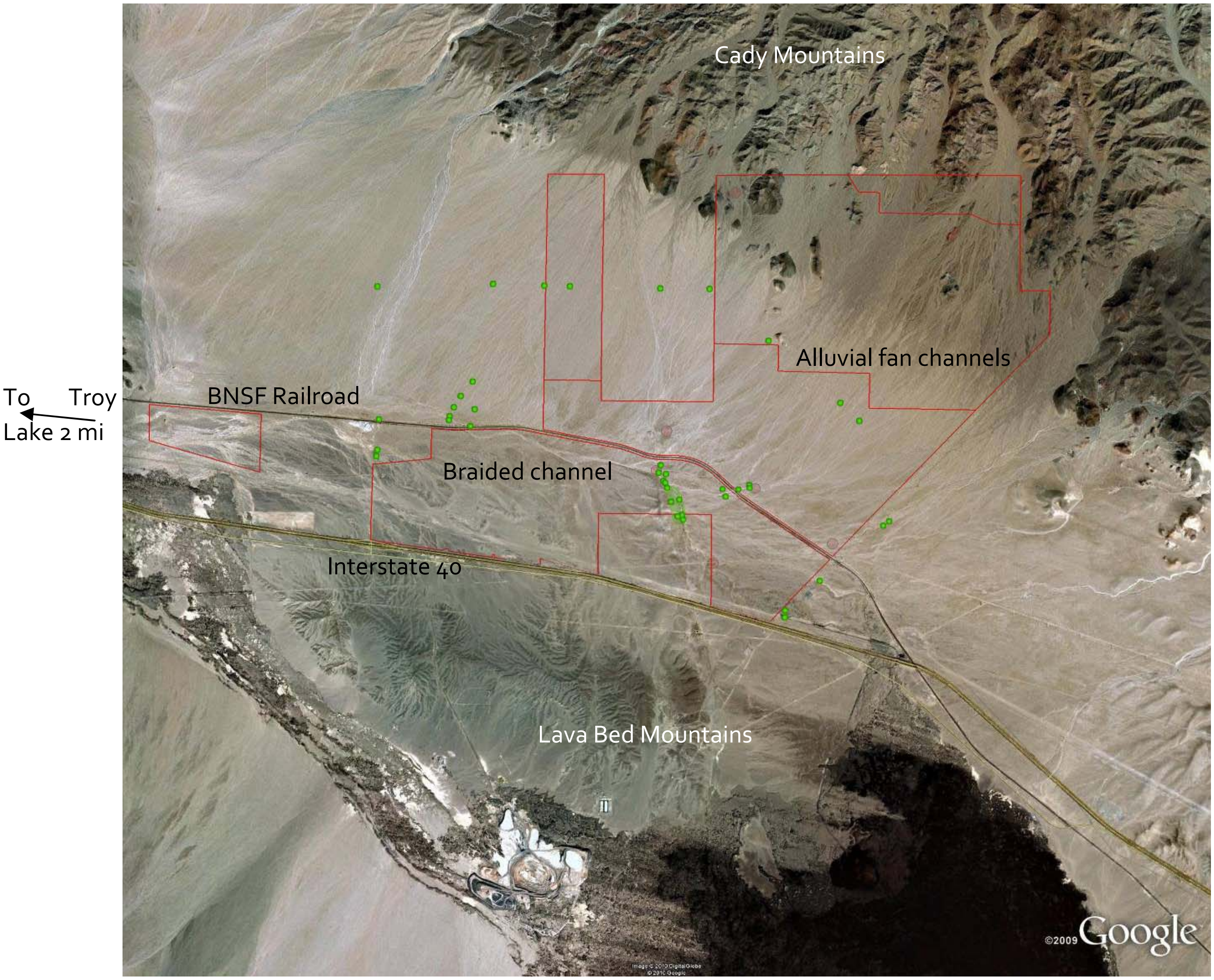

Figure 5. Project boundary (red) and main project landmarks. Green dots are PWA GPS points.

5. FIELD GEOMORPHIC ASSESSMENT

PWA staff (Dr. Collison and Ms. Bozkurt) visited the Calico project site on April 30th 2010. Conditions were warm and dry. We traversed the project site along the BNSF railroad, Hector Road, Pisgah Crater Road and Power Lane, hiking off these access roads at a series of locations. GPS waypoints showing where PWA made observations are shown in Figure 5.

The project site is located on a series of alluvial fans that drain the Lava Bed Mountains to the south and the Cady Mountains to the north. The fan surface is composed of poorly sorted sand, gravel and cobbles, and exhibits downstream fining (the fan sediment is dominated by coarse gravel and cobble at higher elevations, with a higher percentage of sand and fine gravel approaching the valley floor). Most of the fan surface away from the main drainage channels is covered by partially-developed desert pavement. (Desert pavement is a lag or armored layer of sediment on the ground surface that is coarser than the overall sediment mixture beneath it, indicating that fine sediment has been selectively scoured away by wind or water action over time.) In a few places this has developed into complete desert pavement (indicating a relatively long period when sediment inputs and outputs were minimal or in equilibrium) while for most of the project site the pavement is not fully established, indicating that the fans are still actively receiving sediment. Typical alluvial fan units are shown in Figures 6 and 7. Examples of incomplete and complete desert pavement are shown in Figures 8 and 9.

The fans are covered in numerous ephemeral distributary channels of varying size, ranging from subtle swales 5-10 feet wide by 3-6 inches deep to features that are 30-40 feet wide and 3-4 feet deep. The channels are typically located less than one hundred feet apart, forming a dense network over the fan surface. The channels also display downstream fining, with a transition from gravel-cobble to sand-gravel sediment. Typical channels are shown in Figures 10-13. The channels show evidence of active sediment transport, with erosion and scoured banks in the upper reaches and fresh sediment deposits in the bed and banks of the lower reaches. Combined with the relative lack of complete desert pavement this suggests the fan system is still quite active, with migrating channels and frequent channel avulsions.

Both the alluvial fan channels and the main valley channel deliver large quantities of sand to the valley floor. The fan surface around the main channels (Figure 14) is finer than elsewhere on the project site, and there is an increase in the density and thickness of vegetated sand dunes approaching the valley floor (Figure 15). Dunes close to the largest channels display evidence of wind transport (ripples and coppice dunes – Figures 16-18). Further away from the valley floor or the larger channels the dunes become thinner and more degraded, with the furthest dunes appearing to be relict features (Figures 19-20). They appear to have been larger in previous times, but to then have deflated. Similarly, whereas the vegetated dunes in the valley floor are connected by bare sand sheets, with increasing distance away from the washes the sheets become thinner and then absent. The presence of relict dunes suggests that in the past more sand has been transported by wind action in the valley, but that at present sediment removal by wind has exceeded the rate of sediment delivery in some locations.

The distribution of dunes and their proximity to the ephemeral washes suggests that the primary mechanism for sand transport is fluvial, with poorly sorted sediment being eroded in the Cady and Lava Bed Mountains, sorted and fined down to sand as it is transported down the alluvial fans, and deposited in the valley floor. From here it can either be transported west to Troy Lake by fluvial processes, or redistributed by wind transport processes (Figure 21). Several coppice dunes found on site were oriented facing west, suggesting that wind transport is from west to east (approximately up the main valley axis). However, the area of dunes mapped by the applicant, as well as several areas of off-site habitat, were located on east-facing slopes suggesting local wind dispersion in this direction (down the valley axis). It is also possible that sand dunes are preserved in lee areas (east facing) where wind erosion is less severe.

PWA examined the potential for regional sand transport by wind as a site process. We reviewed Muhs et. al. 2003 paper which reviews the main regional sand transport corridors in Southern California (Figure 22), and reviewed aerial photos and ground conditions. Muhs et. al. shows an inferred sand transport corridor that moves sediment from the Mojave River (located 12 miles north of the project site) east to the Devils Playground. There is no aerial or ground evidence for a regional wind transport corridor in the project site or vicinity. Based on these lines of evidence we conclude that the project is not likely to cause disruptions to regional sand transport patterns, though this conclusion does not extend to include local sand transport processes (discussed below).

5.1 ALLUVIAL FAN SURFACE BETWEEN CHANNELS

Figure 6. Typical middle and upper alluvial fan surface looking south to the valley floor. Note coarse sediment (coarse gravel to fine cobbles with sand matrix).

Figure 7. Finer gravel and sand typical of the lower portions of the alluvial fans (view southwest from the Cady Mountains fan).

5.2 DESERT PAVEMENT AND FAN SURFACE

Figure 8. A rare patch of relatively well developed desert pavement on the alluvial fans. The insert shows the finer underlying sediment with the armor layer cleared away. The relatively pale clasts suggest a young deposit (too young for desert varnish to form).

Figure 9. Typical partial armoring on the middle and upper fan surface. This presence of fine sediment and the absence of strong weathering suggest an active fluvial deposit. The insert shows the underlying sand substrate once the armor has been swept off.

5.3 SMALL EPHEMERAL CHANNELS

Figure 10. Small channel on the upper fan surface showing coarse sediment characteristics

Figure 11. Small channel low on the alluvial fan close to the valley floor, showing the finer sediment and higher sand content (downstream fining).

5.4 LARGE EPHEMERAL CHANNELS

Figure 12. Large wash on the upper alluvial fan surface showing actively eroding banks.

Figure 13. Large wash on the lower fan surface. The channel has eroded in the past but more recently has filled in with fine sediment.

5.5 THE MAIN VALLEY CHANNEL COMPLEX

Figure 14. The main channel system running west down the valley axis.

5.6 SAND DUNES ADJACENT TO LARGE CHANNELS

Figure 15. Wind blown sand dunes adjacent to the main channel showing the local influence of sand redistribution. Note the sharp boundary between the dunes and the surrounding hillslope (yellow line).

Figure 16. View north over the main channel showing the zone of vegetated sand dunes around the channel.

Figure 17. Close up of vegetated dunes showing ripples from wind transport and drag marks from lizards.

Figure 18. Wind-blown sand dunes close to the main wash passing into the project site from the east side. Note ripples and dunes oriented east-west with the prevailing wind direction.

5.7 DIMINISHING SAND DUNES AWAY FROM THE CHANNELS

Figure 19. Shallow vegetated sand dunes on the valley floor further from the channel. Note ripples as evidence of wind transport.

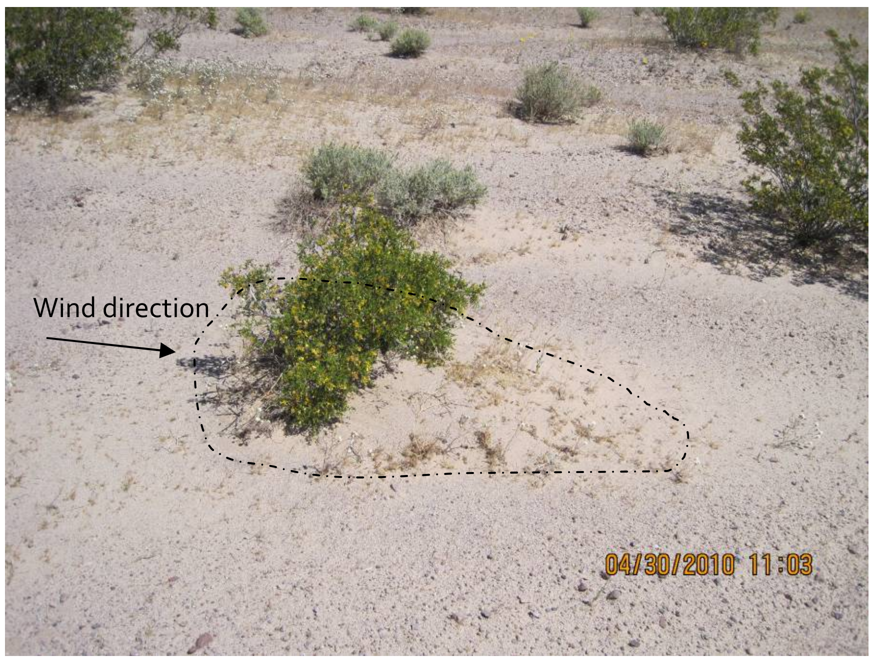

Figure 20. Thin, remnant coppice dunes further away from the channels on the valley floor. The dune is oriented facing west in a teardrop form (dashed line). Note absence of wind blown sand between individual bushes: deflation has removed sand leaving a coarser gravel lag.

5.8 CONCEPTUAL GEOMORPHIC INTERPRETATION

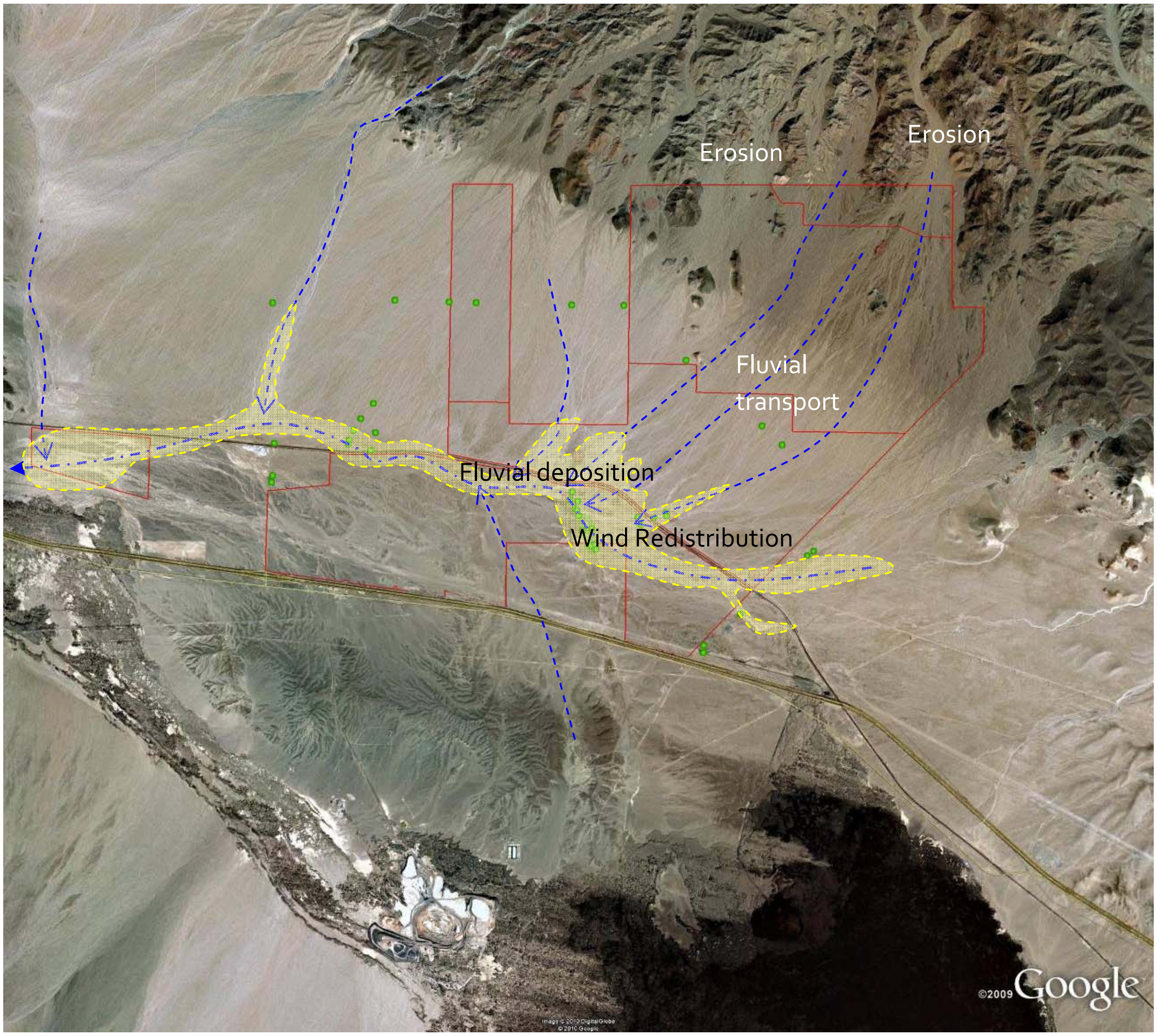

Figure 21. Conceptual geomorphic map of the project site showing main sediment sources and paths affecting the site. Blue lines are fluvial washes bringing sediment from the mountains to the valley floor. Yellow area is wind-blown sand redistributed around the lower portions of the main channels. Boundary of the wind-blown sand area is approximate, and encompasses dunes with different thicknesses of sand.

5.9 REGIONAL SAND TRANSPORT CORRIDORS

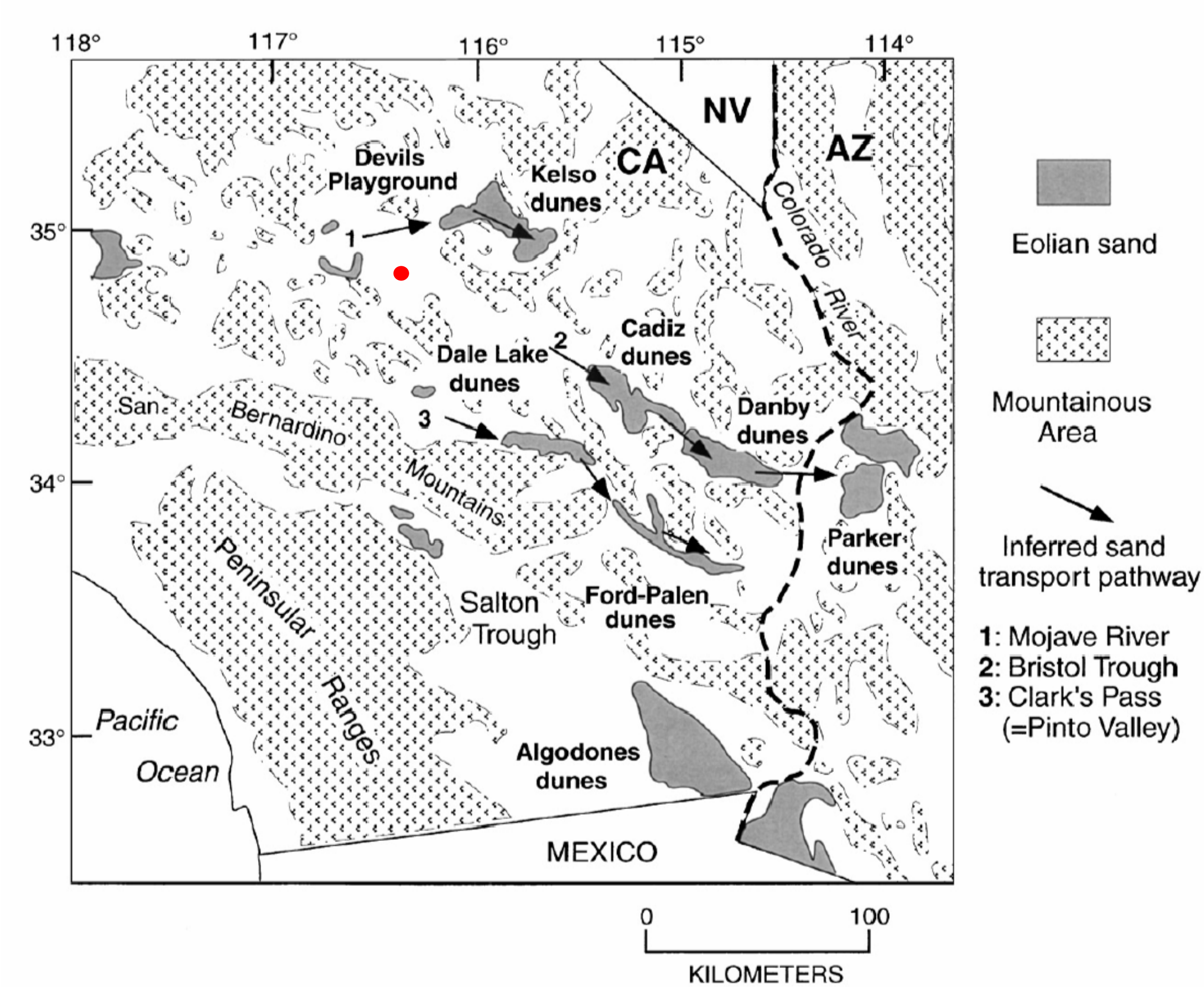

Figure 22. Sand transport corridors of southern California (original figure from Muhs et. al., 2003). Approximate project location shown in red.

5.10 EFFECTS OF EXISTING INFRASTRUCTURE ON SAND TRANSPORT

The transport lines (the railroad and I40) form a pair of berms that are a barrier to overland flow and sediment as it approaches the valley floor. The main drainage lines appear to have been brought under the transport lines in bridges or large box culverts. Several smaller drainage lines terminate at the railroad berm, at which point they flow parallel down the valley axis until they find a culvert to pass through. The culverts appear to provide only a small disruption in sediment supply to the large channels. Several of the culverts are aggraded (partially filled with sediment) though this could either be a sign that they are inducing deposition or simply that they were constructed in a depositional reach at the toe of the fan. Most sediment delivered from upstream appears to pass through the culverts but some deposition occurs upstream of the railroad where the channels are forced to go round acute bends to conform to the culvert location. The smaller channels are more likely to be impacted by the railroad berm since most terminate at the berm and then have to flow at a much lower gradient down the valley axis to find the next channel that has a culvert.

The berm is likely to be a relatively effective barrier to sand transport. Approximately 90% of sand transport occurs within 6 feet of the ground through the process of saltation and rolling. Since the berm is steep sided and more than 10 feet high it should intercept most of this. However, the berm is mostly oriented in the same direction as the prevailing wind and is also towards the outer edge of the wind blown sand transport zone, so the volume of sand intercepted may be relatively low.

6. POTENTIAL PROJECT IMPACTS AND MITIGATION MEASURES

6.1 POTENTIAL PROJECT IMPACTS

The project proposes to avoid direct impacts to the mapped sand dune area, and assumes that there will not be indirect impacts to the dunes due to changes in the drainage plan. The direct impacts are not addressed in this report except to note that the area of sand dunes found in the field appears to be greater than the area mapped by the applicant. If this is found to be so the project will either need to avoid a greater area of dunes than proposed or will result in a higher than stated direct impact to dune habitat.

The applicant's drainage plan (Figure 23) calls for a series of debris basins located where alluvial fan channels enter the project site from the mountains, and detention basins on channels closer to the project site. These basins are designed to trap sediment that would otherwise pass down into the project site and reach the valley floor, as well as to attenuate flows (further reducing sediment transport capacity). Under existing conditions the fine sediment from the mountain ranges is redistributed to the adjacent dunes by wind action. Under proposed project conditions sediment basins are likely to have three effects: directly reducing the volume of sand supplied from the mountain area to the valley floor dunes; potentially triggering channel incision and erosion of existing dune areas on the valley floor due to the 'hungry water effect'; and potentially reducing sand supply off-site (Figure 24).

Direct reduction of sand supply means that less sand will reach the valley floor to replace sand that is lost from the dunes due to wind and water erosion. Over time as sand is lost to wind and water erosion the dunes will become thinner and coarser, reducing their habitat potential. As the research paper by Turner et. al. found, dunes that do not receive replacement sand can degrade to the point that they do not support Fringe Toed Lizards within 4-12 years.

Cutting off sediment from upstream could also trigger channel incision that could erode existing adjacent dunes (by bank erosion and expansion of the gully network around an incising channel). This is referred to as the 'hungry water effect', in which sediment-starved channels erode their banks to regain sediment transport equilibrium. In addition, formerly depositional channels that are now either eroding or in transport equilibrium will tend to transport sand past the dune network rather than deposit it on the bed where it can be redistributed by wind action. Eroding channels also tend to be deeper and narrower than depositional channels, making wind transport less effective (Lancaster et. al., 1993).

These effects are cumulatively likely to have a significant impact on dune habitat in the project site. In addition to the on-site impacts, there is potential to impact dunes off-site that receive their sediment from the site watershed. This would require more site specific analysis that was not conducted as part of this study.

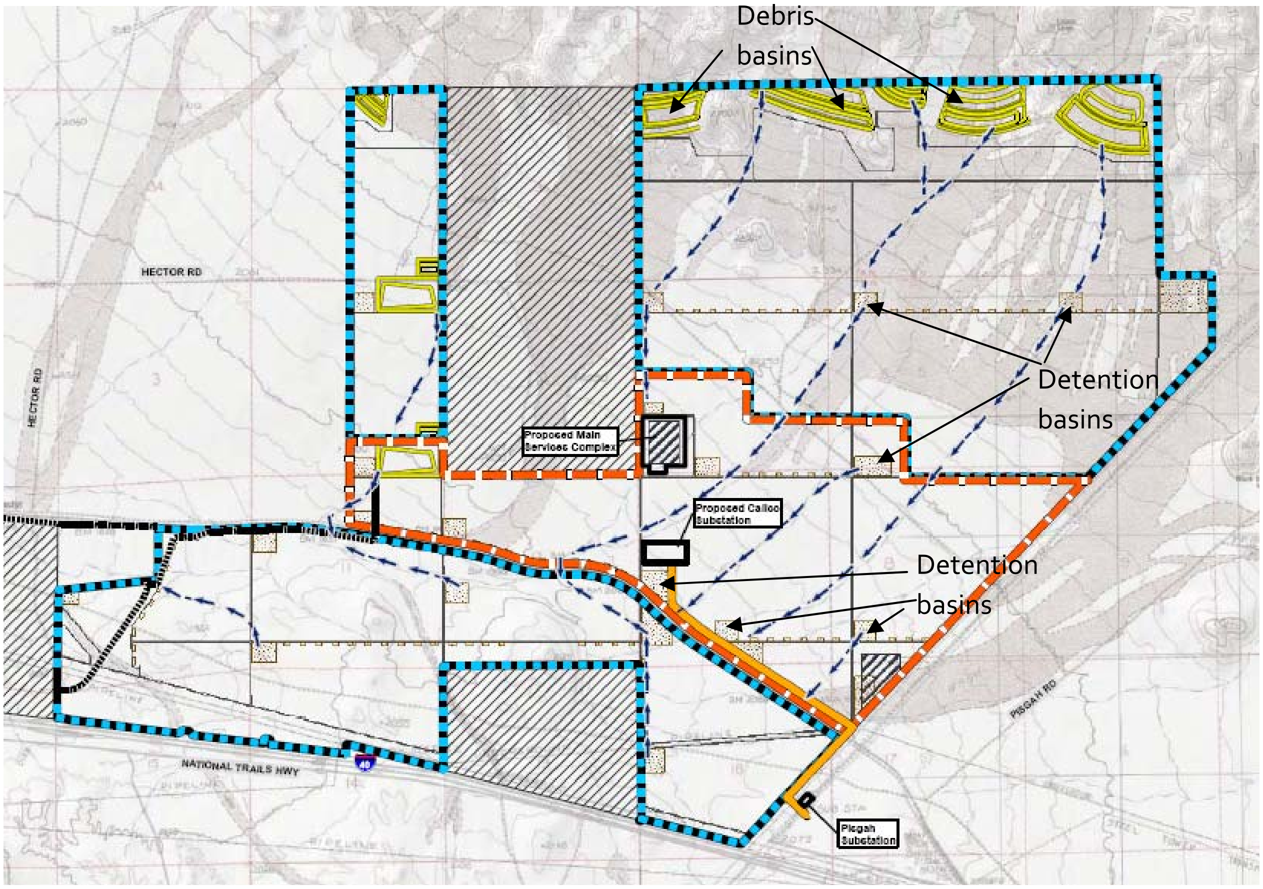

Figure 23. Detail from applicant's proposed drainage plan showing the debris basins (green blocks) and detention basins (brown blocks). Source: URS, 2010.

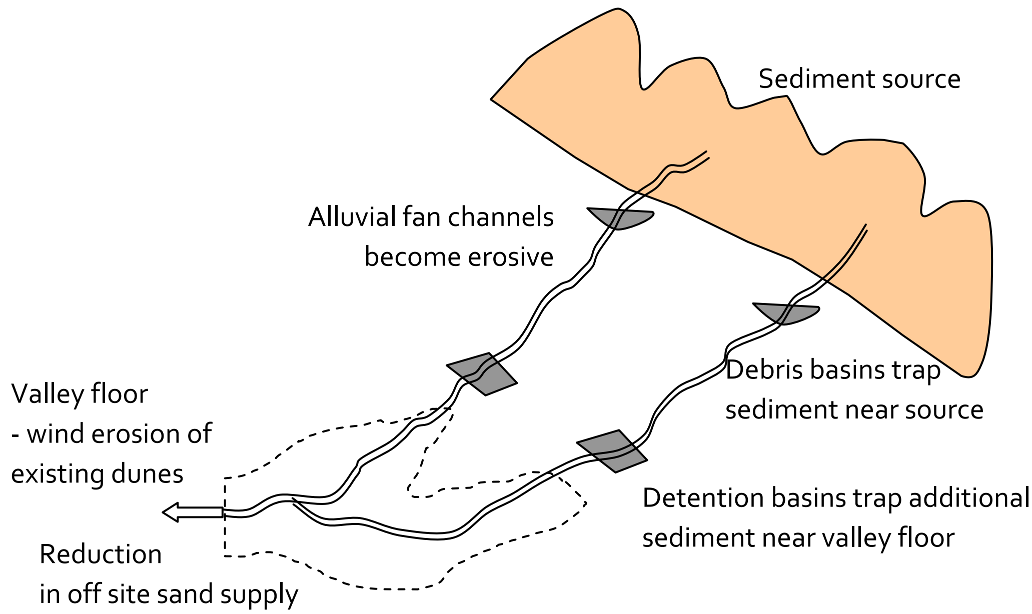

Figure 24. Conceptual response of geomorphic system to the proposed drainage plan

6.2 POTENTIAL MITIGATION MEASURES

Maintenance of the sand dune system requires an ongoing supply of fine sand of a size that can be transported by wind to the existing dunes. It is unclear how mitigation could be accomplished for the reduction in sediment supply in a way that is compatible with the current drainage and sediment management plan. The presence of additional dispersed dunes that were not mapped but which are believed to exist within the valley floor further increases the challenge of maintaining sediment supply. In order to continue supplying sediment for the dune area the drainage plan would need to be revised to leave the natural drainage system intact, allowing sediment to be delivered to the dune system. It should also be noted that while such a plan revision would likely meet the geomorphic goals of sediment transport, it may not meet the biological goals (e.g. may still have impacts to habitat from other project activities).

6.3 POTENTIAL OFF-SITE IMPACTS

Two areas of MFTL habitat were identified by the applicant to the east of the project site. PWA was asked to evaluate whether on-site reductions in sediment supply could impact the off-site habitat. The location of the two sites is shown in Figure 25 and oblique aerial photos are shown in Figures 26 and 27.

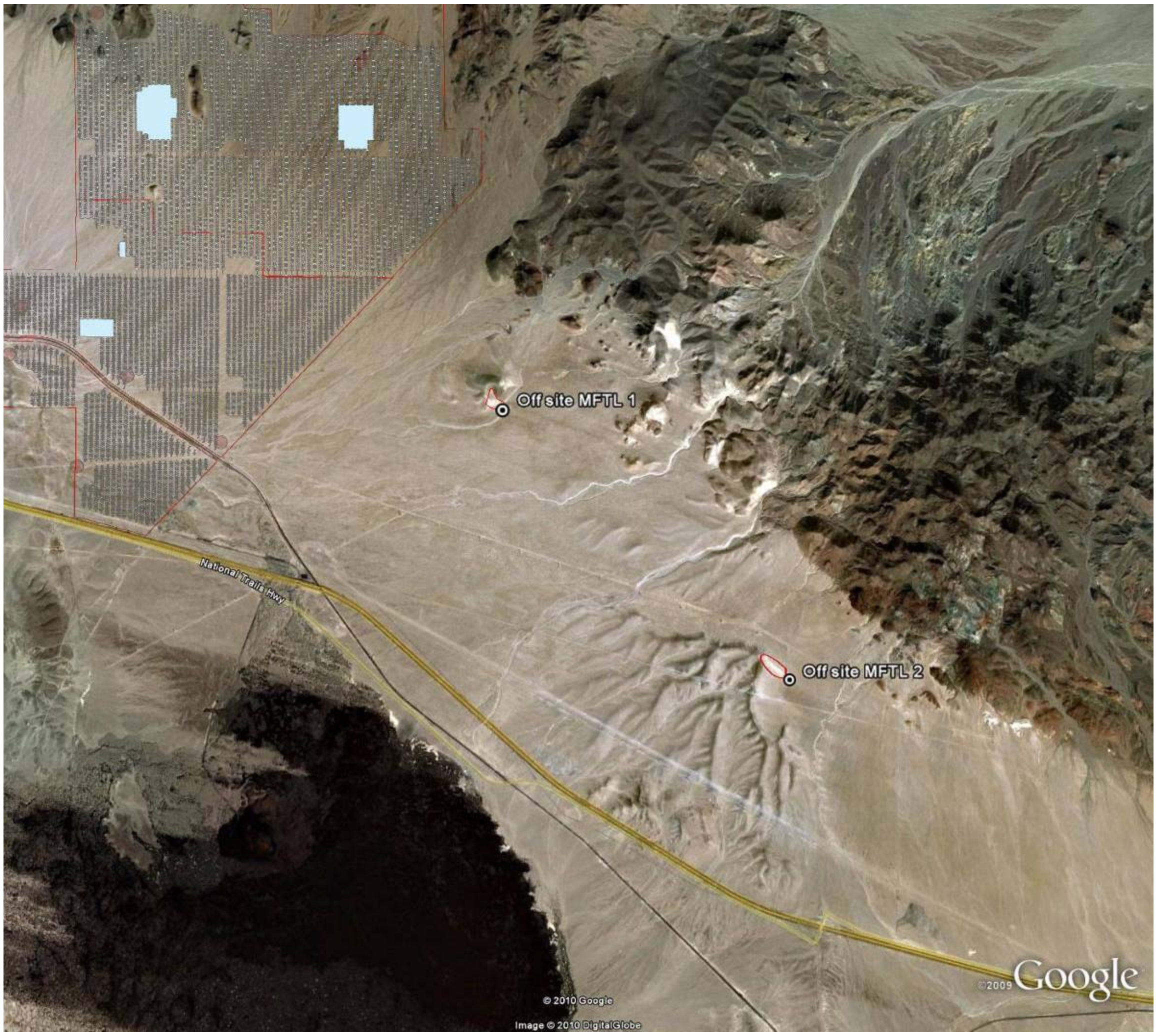

Figure 25. Location of two off-site MFTL habitat areas relative to the project footprint.

The sites are located 1.5 miles east and 3.9 miles southeast of the eastern boundary of the project, and some distance away from the valley axis where most of the wind-blown sand in the project area is located. In the absence of a regional wind transport corridor it appears unlikely that either site is currently gaining much wind-blown sand from the project area, and fluvial sediment on the project site is traveling away from the two areas.

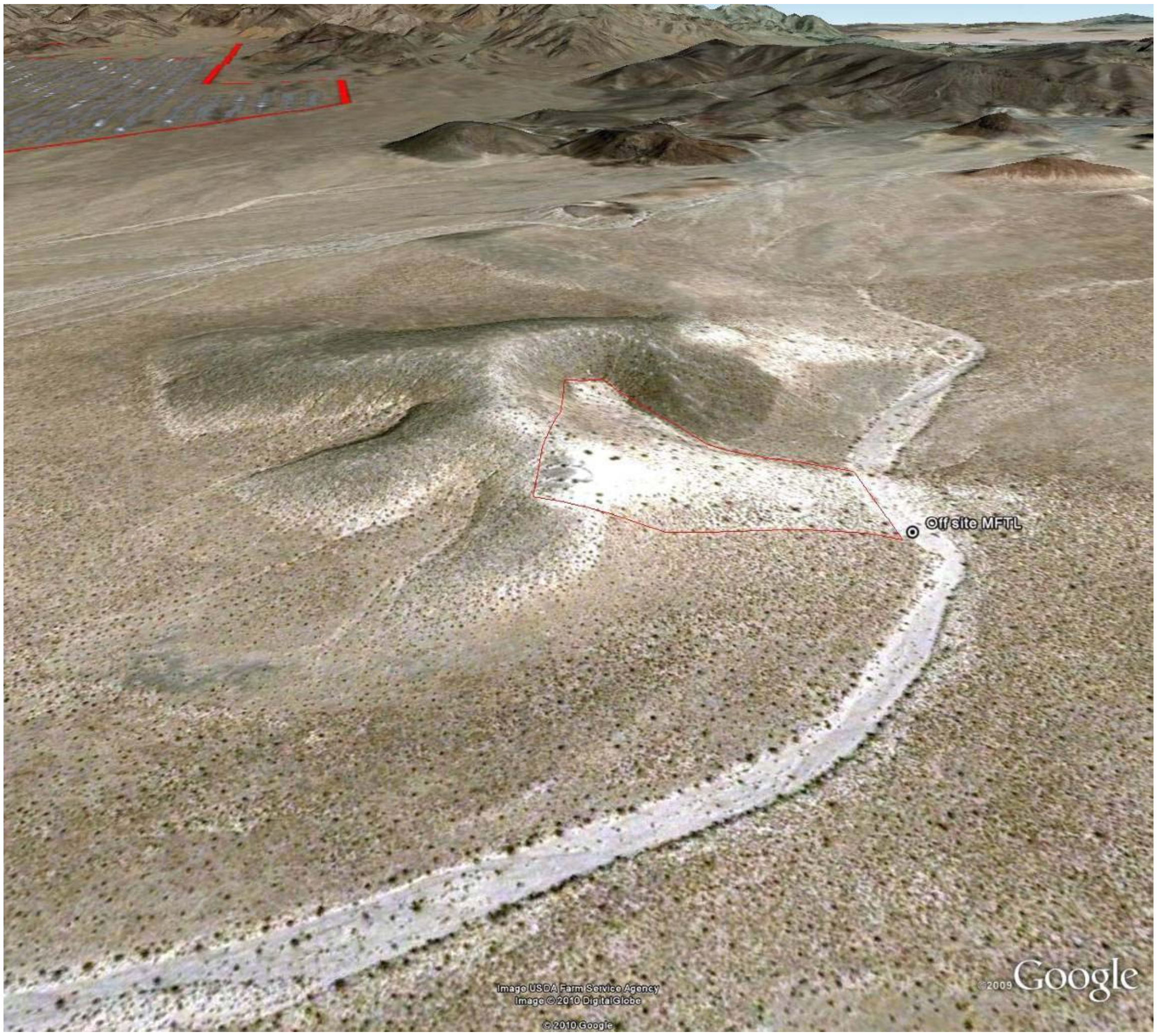

Figure 26. Oblique aerial photo showing relationship between Off-Site Area 1 and its likely sediment source, an ephemeral channel draining from the north. Project site is visible in the upper left side of the image.

Figure 26 suggests that the closest site is gaining its sand from the ephemeral channel that drains south, to the east of the site. Interestingly it appears that the wind direction is from the east, counter to the prevailing wind. It is possible that wind flows up the valley axis under some weather patterns and then deposits in the lee of the prevailing wind direction in this location. It is interesting to note that the main MFTL area mapped by the applicant on site is also in the lee of the main valley and appears to be gaining its sediment from a wash immediately to the east.

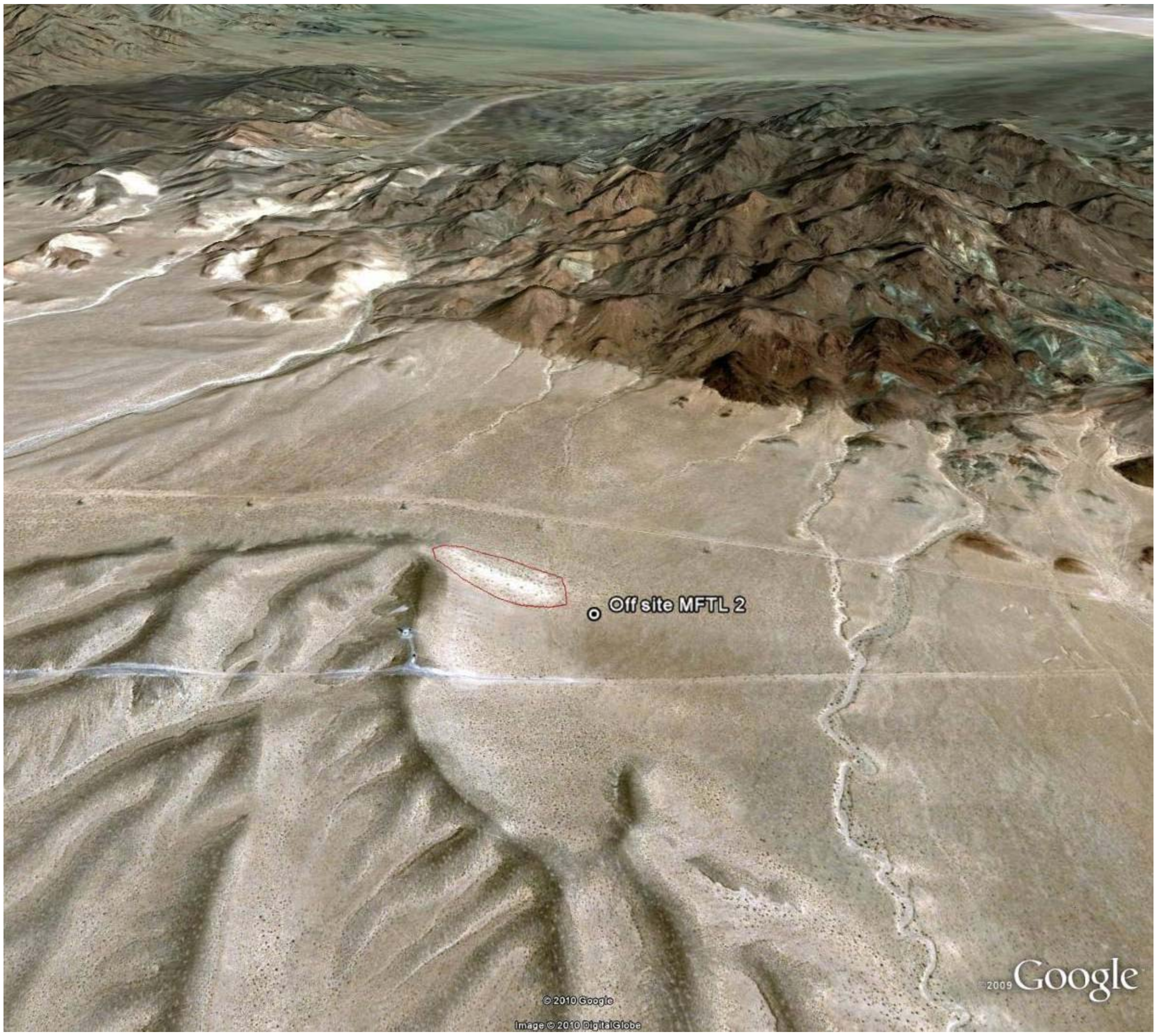

Figure 27. Oblique aerial photo of Off-Site Area 2. Source of sediment is not as clear as for Area 1, but appears to be the local washes rather than the project site (located almost 4 miles to the west).

Figure 27 shows the dune area to the east. Here the sediment source is less clear, and again there is the interesting possibility that sand is moving westwards from the wash to the east. A second possibility is sand transport from the truncated channels to the north of the site. As with Area 1 it appears highly unlikely that the sand source is the project site.

7. REFERENCES

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Muhs, D.R., Reynolds, R.L., Been, J. and Skipp, G. Eolian sand transport pathways in the southwestern United States: importance of the Colorado River and local sources. Quaternary International Volume 104, pages 3-18, 2003.

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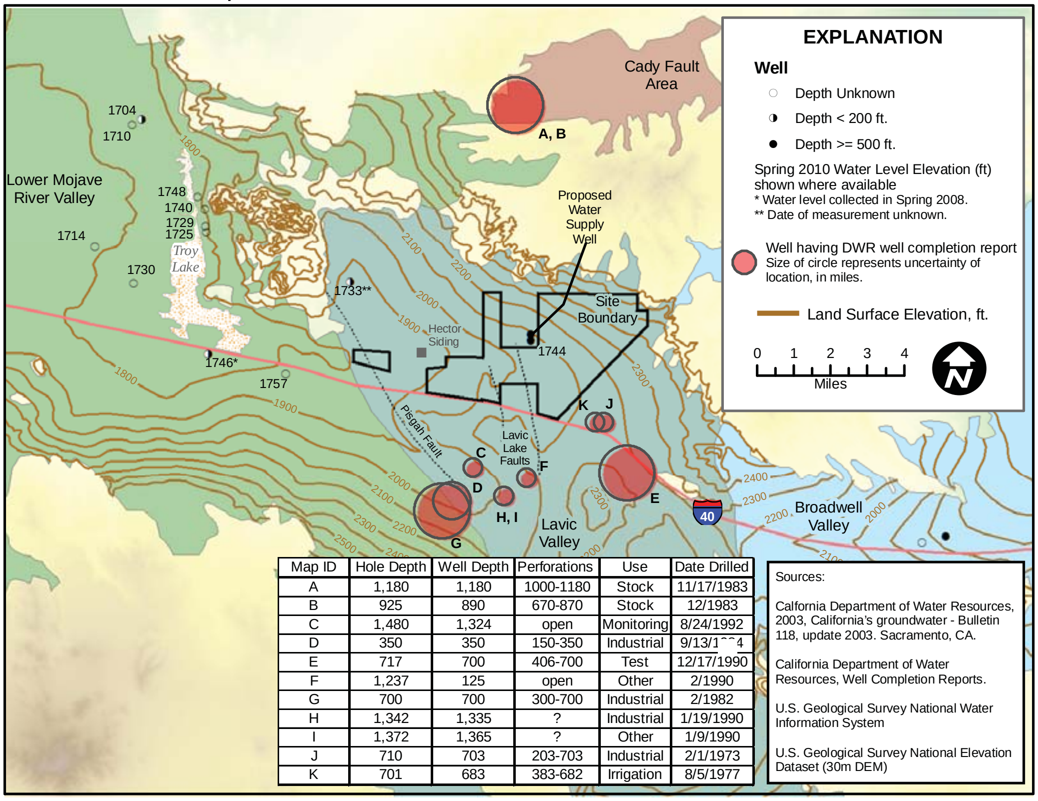
Exhibit 306

SOIL AND WATER RESOURCES
FIGURES 5a and 5b

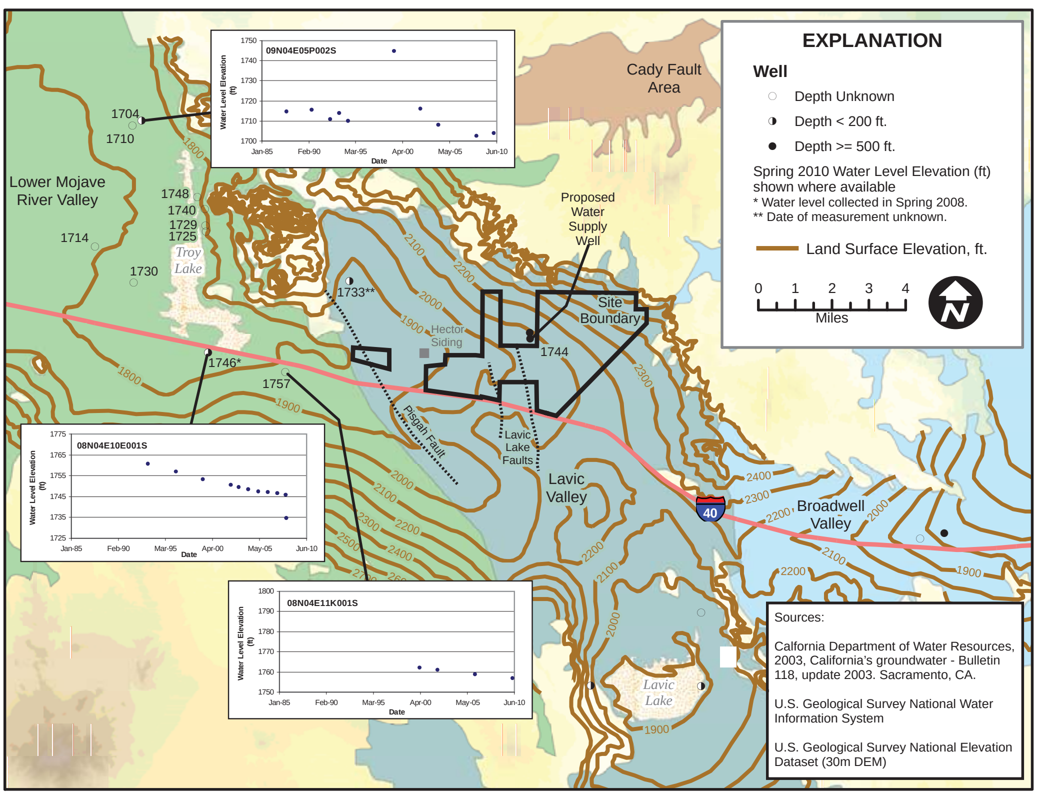
SOIL AND WATER - FIGURE 5
Calico Solar Project - Area Wells

5A
Reported Well Locations and Construction Information



Map ID	Hole Depth	Well Depth	Perforations	Use	Date Drilled
A	1,180	1,180	1000-1180	Stock	11/17/1983
B	925	890	670-870	Stock	12/1983
C	1,480	1,324	open	Monitoring	8/24/1992
D	350	350	150-350	Industrial	9/13/1[illegible]4
E	717	700	406-700	Test	12/17/1990
F	1,237	125	open	Other	2/1990
G	700	700	300-700	Industrial	2/1982
H	1,342	1,335	?	Industrial	1/19/1990
I	1,372	1,365	?	Other	1/9/1990
J	710	703	203-703	Industrial	2/1/1973
K	701	683	383-682	Irrigation	8/5/1977

5B
Well Locations and Recent Water Level Data



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: HydroFocus, Inc.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
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APPLICATION FOR CERTIFICATION	**Docket No. 08-AFC-13**
For the CALICO SOLAR (Formerly SES Solar One)	**PROOF OF SERVICE** *(Revised 8/3/10)*

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DECLARATION OF SERVICE

I, Sabrina Savala, declare that on August 04, 2010, I served and filed copies of the attached Energy Commission's Staff Errata to the Supplemental Staff Assessment, dated August 04, 2010. 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/solarone].

The documents have 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;

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x____ by delivering on this date, for mailing with the United States Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses NOT marked "email preferred."

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x____ sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (*preferred method*);

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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, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Original Signed by:
Sabrina Savala

*indicates change