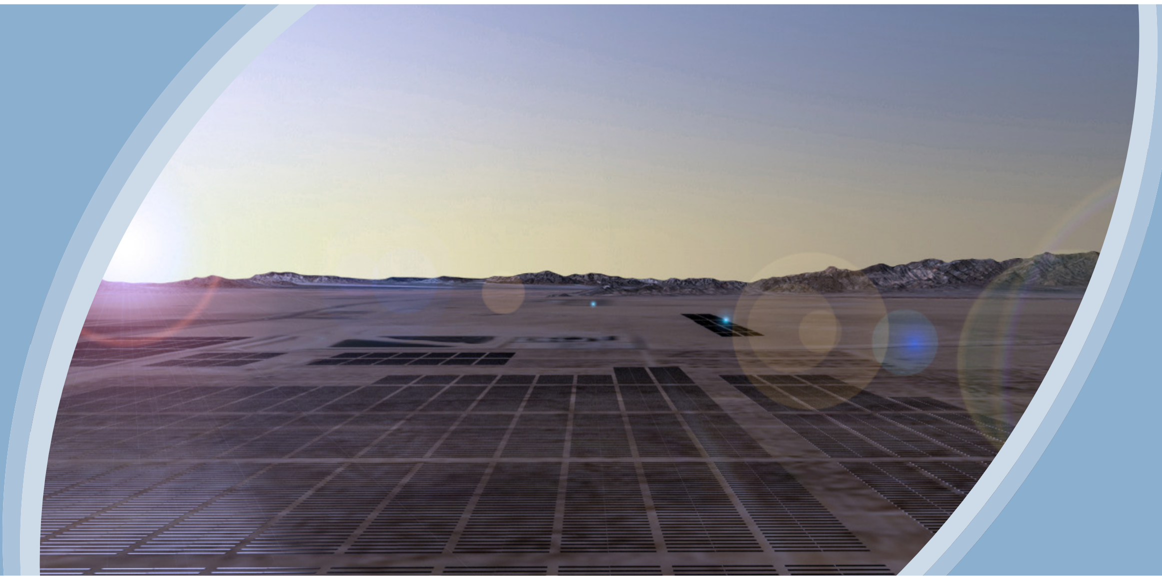
BLYTHE MESA SOLAR PROJECT



Final Environmental Impact Report/Environmental Assessment

Volume V: Technical Appendices

EIR No. 529
EA No. 0021
SCH No. 2011111056
FTA No. 2013-10

March 2015

CEQA/NEPA Lead Agencies:

RIVERSIDE COUNTY
PLANNING DEPARTMENT

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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RESPONSE TO COMMENTS

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RESPONSE TO COMMENTS

Introduction

The Blythe Mesa Solar Project (BMSP or Project) Draft Environmental Impact Report/Environmental Assessment (EIR/EA) review period began on June 17, 2014 and ended August 4, 2014. During this public review period, a total of 16 written comments were received.

According to the California Environmental Quality Act (CEQA) Guidelines Section 15088(a), "the lead agency shall evaluate comments on environmental issues received from persons who reviewed the Draft EIR and shall prepare a written response." This section of the Final EIR/EA contains comment letters received and responses to those comments. The comment letters are numbered and responses are labeled accordingly. For example, response 1-1 refers to the response to the first comment in comment letter 1. Comments were evaluated, and good faith, reasoned responses were prepared for substantive comments referencing significant environmental issues or issues relating to the adequacy of the EIR (CEQA Guidelines, Section 15088). Those comments that did not address the adequacy of the Draft EIR/EA, raise significant environmental issues, or request additional information/analysis did not require a substantive response. Numerous comments closely paralleled other submitted comments. In order to reduce redundancy, some responses refer the reader to a previously provided response to a similar comment.

As indicated in the BLM NEPA Handbook, EAs must have some form of public involvement; however, the CEQ regulations do not require agencies to make EAs available for public comment and review. In certain limited circumstances, agencies are required to make FONSIs available for public review (40 CFR 1501.4(e)(2) (see section 8.4.2, The Finding of No Significant Impact (FONSI)). The CEQ regulations direct agencies to encourage and facilitate public involvement in the NEPA process to the fullest extent possible (40 CFR 1500.2(d), 40 CFR 1506.6). This means that while some public involvement is required in the preparation of an EA, the discretion to determine how much, and what kind of involvement works best for each individual EA. For preparation of an EA, public involvement may include any of the following: external scoping, public notification before or during preparation of an EA, public meetings, or public review and comment of the completed EA and unsigned FONSI. The type of public involvement is at the discretion of the decision-maker. Here, the BMSP Draft EIR/EA document was made available for public review on June 17, 2014 to August 4, 2014. In addition, a public comment meeting was held on July 10, 2014. The verbal comments received during the Draft EIR/EA public meeting held on July 10, 2014 are summarized in the last table of this section. A complete transcript of the public meeting can be found in Appendix S of the Final EIR/EA document.

Written Comments and Responses

The table below lists all the written comments from agencies, organizations, and interested individuals.

WRITTEN COMMENTS FROM AGENCIES, ELECTED OFFICIALS, AND ORGANIZATIONS

LETTER	COMMENTING AGENCY/ORGANIZATION/INDIVIDUAL	DATE OF COMMENT LETTER
Agencies		
1	U.S. Department of Transportation, Federal Aviation Administration *Signed: Victor Globa, Environmental Protection Specialist*	July 29, 2014
2	U.S. Environmental Protection Agency, Region IX *Signed: Kathleen Martyn Goforth, Manager*	August 1, 2014
3	U.S. Department of Interior, Fish and Wildlife Service *Signed: Kennon A. Corey for Assistant Field Supervisor*	August 4, 2014

LETTER	COMMENTING AGENCY/ORGANIZATION/INDIVIDUAL	DATE OF COMMENT LETTER
4	State of California Governor's Office of Planning and Research State Clearinghouse and Planning Unit *Signed: Scott Morgan, Director*	June 20, 2014
5	State of California Governor's Office of Planning and Research State Clearinghouse and Planning Unit *Signed: Scott Morgan, Director*	August 5, 2014
6	Mojave Desert Air Quality Management District *Signed: Alan J. De Salvio*	June 19, 2014
7	Metropolitan Water District of Southern California *Signed: Deirdre West*	July 30, 2014
Organizations		
8	Chemehuevi Indian Tribe *Signed Jay Cravath, Ph.D.*	June 26, 2014
9	Soboba Band of Luiseno Indians *Signed Joseph Ontiveros, Director of Cultural Resources*	July 15, 2014
10	La Cuna de Aztlan Sacred Sites Protection Circle *Signed: Alfredo A. Figueroa, Elder, Historian, Chemehuevi Tribe Monitor* *Signed: Patricia Robles, President*	July 22, 2014
11	Defenders of Wildlife *Signed: Jeff Aardahl, California Representative* Sierra Club, Beyond Coal Campaign *Signed: Sarah Friedman, Senior Campaign Representative* Natural Resources Defense Council *Signed: Helen O'Shea, Director, Western Renewable Energy Project* Audubon California *Signed: Garry George, Renewable Energy Director* National Parks Conservation Association *Signed: David Lamfrom, California Desert Sr. Program Manager* The Wilderness Society *Signed: Sally Miller, Senior Regional Conservation Representative* California Native Plant Society *Signed: Greg Suba, Conservation Director*	July 29, 2014
12	Adams Broadwell Joseph & Cardozo on behalf of Citizens for Responsible Solar *Signed: Meghan A. Quinn* Includes comment letters from:	August 4, 2014
12a	*Scott Cashen, Independent Biological Resources and Forestry Consultant*	
12b	*Matt Hagemann and Anders Sutherland*	
13	Center for Biological Diversity *Signed: Ileene Anderson, Biologist/Desert Program Director*	August 4, 2014
14	Colorado River Indian Tribes *Signed: Dennis Patch, Chairman*	August 4, 2014
Individuals		
15	Bennett Family	July 21, 2014
16	Art Wilson	July 21, 2014
Public Meeting		
PM 1	Art Wilson	July 10, 2014
PM 2	Patricia Pinon	July 10, 2014
PM 3	Alfredo A. Figueroa	July 10, 2014
PM 4	Jesus Rivera	July 10, 2014
PM 5	David Harper	July 10, 2014
PM 6	Mark Bennett	July 10, 2014

Letter 1: U.S. Department of Transportation, Federal Aviation Administration

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U.S Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Los Angeles Airports District Office

Federal Aviation Administration
P.O. Box 92007
Los Angeles, CA 90009-2007

July 29, 2014

Riverside County Planning Department
Attn: Mr. Larry Ross, Principal Planner (lross@rctlma.org)
4080 Lemon Street, 12th Floor
P.O. Box 1409
Riverside, CA 92502-1409

RE: Notice of Availability of the Draft Environmental Impact Report (EIR 529) for the Blythe Mesa Solar Project (CUP 3685)

Dear Mr. Ross:

The Federal Aviation Administration (FAA) Los Angeles Airports District Office (LA-ADO) has received a copy of the Notice of Availability of the Draft Environmental Impact Report (EIR 529) for the Blythe Mesa Solar Project (CUP 3685). The project proposes to construct a solar photovoltaic (PV) electrical generating facility of up to 485 megawatt (MW) and 8.4-mile generation-tie line that would together occupy a total of 3,660-acres located within the City of Blythe.

The FAA LA-ADO has the following comments:

1-1

1) If the document is a Draft Environmental Impact Report/Environmental Assessment why is it referred to as only a Draft Environmental Impact Report?

1-2

2) Page 3-113, Airport Operations – The DRAFT EIR/EA indicates that the proposed project will fall within airport Compatibility Zones B1, C, D, and E. The FAA does not have Land Use Authority, however, encourages that the project sponsor initiate a review of the following FAA solar guidance documents since the proposed site is due east of Runway 26. *Technical Guidance for Evaluating Selected Solar Technologies on Airports* http://www.faa.gov/airports/environmental/policy_guidance/media/airport_solar_guide_print.pdf
and *Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports*
https://www.federalregister.gov/articles/2013/10/23/2013-24729/interim-policy-faa-review-of-solar-energy-system-projects-on-federally-obligated-airports. The second document provides guidance for initiating a glare analysis study and its impacts to the respective airport.

1-3

3) Page 3-114, Federal Aviation Administration Regulation Part 77 – Change header title to Federal Aviation Regulation Part 77 – Objects Affecting Navigable Airspace. Secondly change first sentence to read as follows: Federal Aviation Regulation (FAR) 14

Code of Federal Regulations (CFR) Part 77 – Objects Affecting Navigable Airspace, establish standards and notification requirements for objects affecting navigable airspace. 1-3

4) Page 3-114, FAA Advisory Circular No. 70/7460-1G – The reference to this advisory circular is incorrect. FAA Advisory Circular No. 70/7460-1G, *Obstruction Marking and* Lighting originally released in 1985, has been updated four times and is now FAA Advisory Circular No. 70/7460-1K, *Obstruction Marking and Lighting* released on 2/1/07. Secondly, this Advisory Circular provides reporting requirements for any type of construction or alteration of a structure that may affect the National Airspace System (NAS). Refer to Chapter 1, Section 1, Reporting Requirements for its purpose. 1-4

5) Page 3-199, Proposed Construction and/or Alteration of Objects that May Affect the Navigable Airspace: FAA Advisory Circular No. 70/7460-2K – See Comments 4 and 5. 1-5

6) Page 4-7, Table 4.1-1, Cumulative Projects List – Identifies the Blythe Solar I Project (on airport 640-acre 100 megawatt (MW) photovoltaic (PV) power plant) by U.S. Solar EA #42340 status as being approved. The Draft EA was initiated and not completed. The FAA as the lead agency for NEPA did not make a final environmental determination. Please correct this error throughout the document. 1-6

7) Page 4-223, Operation and Maintenance/Riverside County Airport Land Use Compatibility Plan refers to "the Glare Study" was presented to the ALUC. What kind of glare study was initiated and completed? See Comment 3. 1-7

8) Page 7-2, Chapter 7, References - Federal Aviation Administration (FAA). 1985. Advisory Circular No. 70/7460-1G. See Comment 5. 1-8

If you have any questions concerning this review, please contact me at (310) 725-3637 or victor.globa@faa.gov.

Sincerely,

Victor Globa
Environmental Protection Specialist

Response to Letter 1

Response 1-1

The commenter asks why the Draft Environmental Impact Report (EIR)/Environmental Assessment (EA) is referred to only as a *Draft EIR*.

The County is the "lead agency" responsible for preparation of the EIR in compliance with CEQA. As the CEQA lead agency, the County is responsible for conducting the CEQA review and has final approval of the Project. The County is responsible for coordinating with the Applicant, public, and associated agencies during the CEQA process. When more than one agency is involved in a project, the agency with primary responsibility for approving a project is the lead agency for purposes of following the CEQA protocol. The Bureau of Land Management (BLM) is the lead federal agency responsible for preparation of the EA in compliance with National Environmental Policy Act (NEPA). The Final EIR/EA document references a Final EIR/EA. The Notice of Availability (NOA), submitted by the County for the Final EIR/EA, references both the CEQA EIR (529) in the top portion of the notice title and EA No. 0021 in the title block.

Response 1-2

The commenter encourages the project sponsor initiate review of FAA solar guidance documents since the proposed site is due east of Runway 26.

The Applicant has coordinated with the Riverside County Airport Land Use Commission (ALUC). In April 2012, the Riverside County ALUC found the Project (Conditional Use Permit No. 3670) to be consistent with the Riverside County Airport Land Use Compatibility Plan (RCALUCP). The ALUC Development Review letter is included as Appendix N of the Final EIR/EA. In addition, the Federal Aviation Administration (FAA) provided a "No Hazard to Air Navigation" determination for the 230 kilovolt (kV) gen-tie line structures.

Photovoltaic (PV) panels are designed to absorb approximately 70 percent of solar energy and convert it directly to electricity. The glare and reflectance levels from a given PV system are decisively lower than the glare and reflectance generated by standard glass and other common reflective surfaces, such as glass and metal in rural environments and water (SunPower Corporation 2009). Potential for glare to affect the key observation points (KOPs) and more distant residences below the mesa was assessed using 3D terrain data and panel placement plans. The lowest angle (+7.59 degrees relative to the horizon, which would occur during the end and beginning of the day during backtracking cycles) of incidence of glare relative to the horizon was determined and compared with the viewing height and location of ground-based viewers.

At the time the Blythe Mesa Solar Project Glare Report was initiated (2010), there were no standards for glare assessment; this was an emerging technology. The FAA was in the process of developing the *Technical Guidance for Evaluating Selected Solar Technologies on Airports* in the Fall of 2010 (FAA 2010). Since this report was being prepared concurrently with the Glare Report, POWER was unaware of the report and developed its own methodology to determine if and when glare would be visible to pilots (a geometric analysis). It is important to note that the methods developed by POWER Engineers were consisted with the 2010 FAA Reports requirements. Specifically, POWER used 3D Modeling software to perform a "geometric analysis" as required by the FAA 2010 solar guide. It is important to note that POWERs Glare Report only determined when and where glare may be visible to pilots. It did not determine intensity, and clearly states this in the report.

Since the time that the 2011 Glare Report and its findings were accepted by the ALUC, the FAA has adopted an Interim policy for assessing glare impacts *Interim Policy, FAA review of Solar Energy System Project on Federally Obligated Airports* (GPO 2013) and has worked closely with Sandia Labs to develop a "Beta" tool for assessing glare impacts for airport operations. This tool uses an integrated geometric analysis tool to determine when and glare may be visible to pilots and other airport personnel. This tool produces comparable results to POWERs geometric tool (used in preparation of the 2011 Glare Report); however, Sandia's Glare tool does not account for backtracking procedures for single axis solar tracking systems. This is a flaw in the Sandia tool, and does not accurately report glare for these systems. Therefore, POWER must rely on in-house geometric analysis process for assessing early morning and end of day impacts for single axis trackers.

Potential solar operations were studied along the six landing approach scenarios. Riverside County ALUC's Planning Staff, as the lead permitting agency, provided the team with a document titled "*45-Vol.3 Blythe Municipal.pdf*" which was used in developing the 3D geometry of the landing approaches. POWER used the information derived from the aforementioned document to develop the glare analysis to perform the Glare Study. Each landing approach is described below:

Runway 35: Northbound approach

- Length: 5,820 feet
- Visual Approach Aid: Rotating Beacon
- Approach: 3 degrees

Runway 8 - existing: Eastbound approach

- Length: 6,562 feet
- Visual Approach Aid: Rotating Beacon
- Approach: 3 degrees

Runway 8 – proposed extension: Eastbound approach and its associated extension of roughly 3,500 lineal feet.

Runway 17: Southbound approach

- Length: 5,820 feet
- Visual Approach Aid: Rotating Beacon
- Approach: 3 degrees

Runway 26: Westbound approach

- Length: 6,562 feet
- Visual Approach Aid: Rotating Beacon
- Approach: 3 degrees
- Instrument Approach Procedures:
  - Circling Approach: 8.4 degrees

Runway 26 – Alternate Approach Angle: Westbound runway with alternate 25-degree offset, right of center.

- Length: 6,562 feet
- Visual Approach Procedures:
    - Rotating Beacon for Visual Aid
    - Approach: 3 degrees
- Instrument Approach Procedures:
    - Straight-in Approach:
      - Approach: 6.9 degrees

  - Approach course aligned 25 degrees right of runway centerline
- Circling Approach: 8.4 degrees

Simulations were developed for each landing approach at the Blythe Airport to study glare from the single-axis solar trackers that are proposed for the Project. Visual analysts studied the 3D simulation under different lighting conditions and at different times of the year, including:

- Summer Solstice (June 21, 2011): Where the length of sunlight hours is at its peak and the sun has reached its northernmost extremes.
- Winter Solstice (December 22, 2011): Where the length of sunlight hours is at its lowest and the sun has reached its southernmost extremes.
- Fall Equinox (September 23, 2011): Where the day and night are equal in length.
- Spring Equinox (March 20, 2011): When the day and night are equal in length.

These simulations were used to evaluate and document when glare may be visible along the various landing approaches. The following processes were simulated and are illustrated in Figure 4.2.1-1 in the Final EIR/EA:

- Tracking: Typical daytime operation when the solar array maintains a 90-degree relationship with the angle of the sun.
- Backtracking: Operation at the beginning and end of the day when the sun is low on the horizon. The solar arrays rotate away from 90 degrees relative to the sun to ensure shading of the adjacent array is not occurring.
- Stow: Operation during evening hours and high wind conditions. The solar arrays move into a position of 5 to 10 degrees off parallel to the ground surface.

The 3D simulations utilized 3D terrain models, runway global positioning system (GPS) coordinates, 3D solar equipment, and a 3D sun system, as well as data on landing approach scenarios and expected cone of vision for pilots. This information was assembled in a 3D computer program to create an accurate virtual representation of the Project and surrounding area as they would be seen from aircraft on landing approach for the airport. Refer to the Glare Study in Appendix K (pages 7-14) of the Final EIR/EA for additional information on the study process.

Response 1-3

The commenter suggests text edits on Page 3-114 of the Draft EIR/EA.

Please refer to page 1 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 1-4

The commenter suggests text edits to Page 3-114 references.

Please refer to page 1 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 1-5

The commenter suggests text edits to page 3-199 references, and refers to FAA Advisory Circular No. 70/7460-1G.

Please refer to page 2 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 1-6

The commenter suggests text edits to address the approval status of a project in the cumulative projects list.

Please refer to page 2 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 1-7

The commenter inquires as to what kind of glare study was initiated and completed.

Refer to Response 1-2. The proposed Project falls within the Blythe Municipal Airport Influence Area (AIA), which is covered by the RCALUCP. A Glare Study was performed for the Project to assess potential impacts from reflection and glare. The findings from the Glare and Reflection Study, as well as simulated animations, were presented to the Riverside County ALUC. In April 2012, the ALUC found the Project is consistent with the RCALUCP (refer to Appendix N of the Final EIR/EA). A confirmation letter from the ALUC Development Review (File No. ZAP1007BL11) was submitted April 25, 2012. In addition, the FAA conducted aeronautical studies (Aeronautical Study Nos. 2012-AWP-551-OE, 2012-AWP-552-OE, 2012-AWP-562-OE, 2012-AWP-566-OE through 2012-AWP-571-OE, 2012-AWP-573-OE, 2012-AWP-1712-OE through 2012-AWP-1725-OE) and determined that neither marking nor lighting of the proposed structure are necessary for aviation safety.

The Glare and Reflection Study answered the following questions:

- *Will glare from the PV panels be visible to pilots upon their approach on Runways 8, 35, 17, 26 and the planned future expansion of Runway 8?*
- *If the glare is visible, how long will it occur and when will it occur?*
- *If a glare is visible, will it be in the pilots focused view (60 degree intense focus view or the distorted view 60 degrees to 120 degrees)?*
- *If the glare is visible, what is it comparable to?*

The following methodology was used to determine if glare would be visible:

1 Identify Potential Glare Issues – Visual analysts studied the landing approach for all four runways utilized at the Blythe Municipal Airport. Additionally, visual analysts studied the proposed lengthened section of Runway 8, and any potential glare issues that may present themselves.

2. Characterize Glare Behavior – At each landing approach, 3D simulations were developed to accurately create and study glare based on the behavior of the SunPower single axis solar tracker (refer to Section 1.2.2 of the Glare Study, Appendix K of the Final EIR/EA). 3D elements within the digital scene included terrain models, cone of vision, runway GPS coordinates, 3D solar equipment and a 3D sun system. This information was assembled in a 3D computer program to create an accurate virtual representation of the Project and surrounding area.

3. *Evaluate* – Visual analysts studied the 3D simulations under different lighting conditions and at different times of the year. These simulations were used to evaluate and document when glare may be visible along the various landing approaches.

Response 1-8

The commenter suggests text edits to Chapter 7 References and refers to Federal Aviation Administration. 1985. Advisory Circular No. 70/7460-1G and Comment 5.

Please refer to page 2 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

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Letter 2: U.S. Environmental Protection Agency, Region IX

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

AUG 01 2014

Frank McMenimen, Project Manager
Bureau of Land Management
Palm Springs South Coast Field Office
1201 Bird Center Drive
Palm Springs, California 92262

Subject: Joint Draft Environmental Impact Report/Environmental Assessment for the Blythe Mesa Solar Project, Riverside County, California

Dear Mr. McMenimen:

The U.S. Environmental Protection Agency has reviewed the joint Draft Environmental Impact Report/Environmental Assessment for the Blythe Mesa Solar Project. Our comments are provided pursuant to the National Environmental Policy Act and the Council on Environmental Quality regulations (40 CFR Parts 1500-1508).

The EPA continues to support the development of renewable energy resources in an expeditious and well planned manner. Using renewable energy resources such as solar power can help the nation meet its energy requirements while reducing greenhouse gas emissions. We encourage the siting of renewable energy facilities on disturbed lands as a means of reducing impacts to natural habitats.

EPA provided extensive formal scoping comments on the 485 megawatt Blythe Mesa Solar Project on November 2, 2012, including detailed recommendations regarding purpose and need, range of alternatives, cumulative impacts, biological and water resources, air quality, and other resource areas of concern. We were pleased to see that the Draft EIR/EA addresses some of our scoping comments. In particular, we appreciate the comprehensive climate change discussion, air quality analysis, and description of ongoing tribal consultation. Based on our review of the Draft EIR/EA, we are concerned about potential impacts to aquatic, air and biological resources. Our enclosed detailed comments identify additional information regarding these resources that should be included in the Final EA, and provide recommendations to reduce potential impacts.

We are available to discuss our comments. Please send one hard copy and one CD ROM copy of the Final EIR/EA to this office when it is released for public review (mail code ENF-4-2). If you have questions, please contact me at (415) 972-3521, or contact Scott Sysum, the lead reviewer for this project, at (415) 972-3742 or sysum.scott@epa.gov.

Sincerely,

Kathleen Martyn Goforth

Kathleen Martyn Goforth, Manager
Environmental Review Section

Enclosure:
EPA's Detailed Comments

US EPA DETAILED COMMENTS ON THE JOINT DRAFT ENVIRONMENTAL IMPACT REPORT/ ENVIRONMENTAL ASSESSMENT FOR THE BLYTHE MESA SOLAR PROJECT, RIVERSIDE COUNTY, CALIFORNIA, JULY 28, 2014

Aquatic Resources

Geographic Extent of Waters of the United States

The Draft EIR/EA presents conflicting statements describing the extent of Waters of the United States in the project area. For example, Table 1-4 - Anticipated Permits and Approvals - states that a United States Army Corps of Engineers Nationwide Permit would be required because construction of the proposed gen-tie line would occur, in part, within WUS (p. 1-23). Also, on page 3-58, the Draft EIR/EA states that two ephemeral washes could be considered jurisdictional WUS. In contrast, Appendix C5 - Review of Federal Waters - states that, based on current interpretations of the USACE's jurisdictional authority and the definition of WUS, the two ephemeral channels on the project site do not meet the criteria for regulable WUS provided in the Corps' Jurisdictional Determination Form Instruction Guidebook (Appendix C5, p. 15).

Recommendations:
EPA recommends that the Final EIR/EA: (1) document whether the project will require a CWA Section 404 permit based on completed consultation with the Corps, (2) include the findings of the jurisdictional delineation, and (3) identify avoidance and minimization of impacts to WUS to the maximum extent practicable per the Clean Water Act Section 404(b)(1) Guidelines, as necessary. 2-1

Clarify, in the Final EIR/EA, the extent of WUS in the project area, and update references to WUS in the body of the EIR/EA, as needed.

Quantify, in the Final EIR/EA, the acres of jurisdictional waters impacted by each alternative, if applicable.

Ephemeral Washes

There are two discontinuous ephemeral channels on the project site. One channel crosses the transmission line corridor, and the other runs southeast across the solar array site. Natural washes perform a diversity of hydrologic, biochemical, and geochemical functions that directly affect the integrity and functional condition of higher-order waters downstream. Healthy ephemeral waters with characteristic plant communities control rates of sediment deposition and dissipate the energy associated with flood flows. Ephemeral washes also provide habitat for breeding, shelter, foraging, and movement of wildlife. Many plant populations are dependent on these aquatic ecosystems and adapted to their unique conditions. The potential damage that could result from disturbance of flat-bottomed washes includes alterations to the hydrological functions that natural channels provide in arid ecosystems, such as adequate capacity for flood control, energy dissipation, and sediment movement; as well as impacts to valuable habitat for desert species. 2-2

Recommendations:
To the extent any aquatic features that could be affected by the project are determined not to

constitute waters of the U.S., the EPA recommends that the Final EIR/EA characterize the functions of such features and discuss potential mitigation for any impacts to them.

To avoid and minimize direct and indirect impacts to desert washes (such as erosion, migration of channels, and local scour):

- Utilize existing natural drainage channels on site and more natural features, such as earthen berms or channels, rather than concrete-lined channels.
- Commit to the use of natural washes, in their present location and natural form and including adequate natural buffers, for flood control to the maximum extent practicable.
- Configure the project layout, roads, transmission infrastructure and drainage channels, as appropriate, to avoid the two primary ephemeral washes within the project footprint.
- Minimize the number of road crossings over washes and design necessary crossings to provide adequate flow-through during storm events.

2-2

Air Quality

The Draft EIR/EA states that off-road diesel engine idling would be limited to 10 minutes, per Best Management Practice - 16 (p. 2-30). The California Air Resources Board's in-use off-road diesel vehicle regulation states: "No vehicle or engines subject to this regulation may idle for more than 5 consecutive minutes[1]."

Recommendation:
Update, in the Final EIR/EA, Best Management Practice -16 to ensure compliance with the California Air Resources Board's in-use off-road diesel vehicle regulation.

2-3

Water Supply

According to the 2010 Palo Verde Irrigation District report, former agricultural operations within the project area utilized approximately 12,000 acre-feet of water in 2010 from the PVID surface delivery system to irrigate crops on 1,592 acres (p. 3-21). While this surface delivery system may be available for the proposed solar facility (p. 3-21), Section 3.2.9 - Hydrology and Water Quality does not clearly indicate the source of the water, nor the quantity available, for overall construction and project operations.

We do note that the Draft EIR/EA states that the solar panels will be cleaned twice a year and this would require up to 345 AF/yr of non-potable water (p. 2-19). Other solar projects in the area that have proposed photovoltaic module washing have decided to use reverse osmosis water treatment systems and evaporation ponds in order to obtain treated non-potable water to wash the modules. Given that the project design does not include evaporation ponds, to avoid attracting waterfowl (p. 4-101), it is unclear whether untreated non-potable potable water will be used to wash the modules.

Recommendations:
Include, in Chapter 3 of the Final EIR/EA, a discussion of the water supply required for construction and operation of the solar facility, as well as the source and quantity secured to meet

2-4

[1] California Air Resources Board, Advisory Number 377, New Idling Limits for Owners, operators, Renters or Lessees of In-Use Off-Road Diesel Vehicles Revised May 2011; Accessed July 25, 2014; http://www.arb.ca.gov/enf/advs/advs377.pdf

the project's needs. The discussion should clearly identify the source of both the non-potable water and potable water.

Include, in the Final EIR/EA, a discussion of water treatment, if any, for the module wash water. If untreated non-potable water is to be used for module washing, that should be stated. 2-4

Discuss, in the Final EIR/EA, the feasibility of limiting panel washing to once per year or eliminating panel washing altogether. Discuss water needs for panel washing in the context of neighboring PV projects in Riverside County, which have estimated considerably less annual water use for such purposes. Consider adopting a commitment to eliminate water use for panel washing similar to that for BLM's Desert Sunlight Solar Farm in Riverside County.

Biological Resources, Habitat and Wildlife

Best Management Practice 12 indicates that mechanisms to visually warn birds (permanent markers or bird flight diverters) shall be placed on gen-tie lines at regular intervals to prevent birds from colliding with the lines (p. 2-29). This BMP is based on the 2006 Avian Power Line Interaction Committee *Suggested Practices for Avian Protection on Power Lines document: The State of the Art in 2006* and US Fish and Wildlife Service's 2010 Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities, Pacific Southwest Region. 2-5

Recommendation:
Commit, in the Final EIR/EA, to ensure the design of the transmission line would be in compliance with current standards and practices that reduce the potential for avian fatalities and injuries. The EPA recommends including the APLIC *Mitigating Bird Collisions with Power Lines: The State of the Art in 2012* as an important guideline to follow.

Valley Fever

The incidence of Valley Fever (Coccidioidomycosis) has recently increased in much of California, including Riverside County. Large solar construction projects that disturb desert soil may have impacts on the health of nearby residents, including valley fever and other respiratory complaints.

Recommendations:
The Final EIR/EA should assess potential exposures to the fungus *Coccidioides* that could result from soil-disturbing activities of the project, and the susceptibilities of workers and nearby residents to Valley Fever. 2-6

Include, in the Final EIR/EA, an Environmental Awareness Program to be implemented for the workers. The program should include training on the health hazards of Valley Fever, how it is contracted, what symptoms to look for, proper work procedures, how to use personal protective equipment, the need to wash prior to eating, smoking or drinking and at the end of the shift, and the need to inform the supervisor of suspected symptoms of work-related Valley Fever. The training should identify those groups of individuals most at risk and urge individuals to seek prompt medical treatment if Valley Fever symptoms (flu-like illness with cough, fever, chest pain, headache, muscle aches, and tiredness) develop.

Response to Letter 2

Response 2-1

The commenter states the Draft EIR/EA presents conflicting statements describing the extent of the Waters of the United States in the Project area in the document text versus the Review of Federal Waters located in Appendix C5.

As described in the Final EIR/EA document, during large storm events, many of the ephemeral streams and washes in the Project area flow across the mesa and into the canal and drain system of the Palo Verde Valley; from this system, stormwater eventually flows into the Colorado River via the Outfall Drain. The discontinuous ephemeral features in the Project area consist of swales and erosional features including gullies and potential small washes characterized by low-volume, infrequent, or short-duration flow. Specifically, there are two discontinuous ephemeral channels on the project site. The ephemeral channel first crosses the transmission corridor and again southeast across the solar array site as detailed in Figure 3.2.9-3 in the Final EIR/EA document. There is also an agricultural irrigation ditch running close to the eastern edge of the proposed solar array, but it does not cross the Project area and is approximately 75 to 90 feet below the ground surface elevation at edge of the Project area. There are several palustrine open-water wetlands (POWs), likely stock ponds, in an area that is surrounded by the Project site east of the Blythe Airport and north of I-10, but there are no POWs within the Project's boundary.

As described in the Final EIR/EA, a Review of Federal Waters was conducted for potential jurisdictional waters and the preliminary results of the review were presented in Appendix C5. Although the review initially found that the two discontinuous ephemeral channels on the Project site did not meet the criteria for regulated Waters of the U.S., based on current interpretations of U.S. Army Corps of Engineers' (USACE's) jurisdictional authority and the definition of Waters of the U.S., Appendix C5 (page 1), of the Final EIR/EA specifically clarified that the purpose of the document was to provide information to allow the U.S. Army Corps of Engineers (USACE) to determine whether there are water features on the project site that are subject to jurisdiction under Section 404.

As indicated in Section 3.2.9 of the Final EIR/EA document, a field reconnaissance survey later determined that the two discontinuous ephemeral channels within the Project area likely meet the criteria as jurisdictional under Section 404 and the USACE delineated the potential Ordinary High Water Mark (OHWM) of the discontinuous ephemeral channels within Project limits, as illustrated in Figure 3.2.9-3. Section 3.2.9 of the Final EIR/EA states one gen-tie line pole lies within the potential OHWM area (as illustrated in Figure 3.2.9-3) and acknowledges the USACE will be consulted with in the preparation of the 404 permit. In addition, avoidance and minimization measures will be employed for each alternative to the full extent necessary to ensure no significant impacts would result from development of the proposed Project as follows:

<u>Alternative 1 (proposed Project), Alternative 3 (Northern Alternative), Alternative 5 (Reduced Acreage Alternative)</u>

As illustrated in Figure 3.2.9-3, the transmission line has been redesigned to relocate Towers 42 and 44 outside of the discontinuous ephemeral channel area that likely meets the criteria as jurisdictional under Section 404 (feature). The construction of Tower 43 would still be required within the feature and result in a temporary disturbance area of approximately 100 feet by 100 feet (0.023 acres). After temporary construction, the affected area returned to pre-construction elevations and restored to previous conditions except for the addition of supports for Tower 43. The permanent disturbance for Tower 43 transmission pole itself is anticipated to cover an area of approximately 10 by 10 feet (0.002 acres). Long-term maintenance activities for the transmission line would include an annual inspection of the pole structures and conductor components. The inspection would require inspection personnel to travel on access roads in either an all-terrain vehicle (ATV) or pickup truck. The inspector would generally rely on direct line-of-sight or binoculars to inspect the transmission line components. Follow-up maintenance would be scheduled depending on the severity of the problem. For example, climbing surveys may be necessary to inspect hardware or make repairs and personnel generally would access the structure by pickup truck, ATV, or on foot. Structure or conductor maintenance typically occurs from a bucket truck or boom truck. The maintenance activities would be non-frequent and not require any improvements to the ground surface. As with temporary construction activities, any minimal disturbances to the ground surface or elevations within the access corridor during long-term activities would be restored to previous conditions. In addition, as explained in Section 4.2.9 of the EIR/EA, Project design includes Best Management Practices (BMPs) that would minimize the environmental impacts to hydrology and water quality. This would include buffers between Project facilities and natural washes, as described in BMP-11. Any necessary grading would follow existing contours as feasible to minimize alteration of existing drainage patterns (BMP-11). Erosion and sedimentation would be minimized through implementation of the Project Drainage, Erosion, and Sedimentation Control Plan (BMP-1), as well as the required Project Storm Water Pollution Prevention Plan (SWPPP) (BMP-2), and other measures as described in Mitigation Measures Hydrology-1 through Hydrology-4. Implementation of the BMPs, as part of the Project, and mitigation measures would reduce these impacts to less than significant (refer to page 3 of the Errata in Response to Comments section of this Final EIR/EA which reflects these changes to Mitigation Measures Hydrology-1 and Hydrology-3).

Hydrology-1 Existing drainage crossings shall be utilized at streams, washes, and irrigation channels to the full extent necessary to reduce impacts to less than significant levels. New access roads not required for ongoing operation and maintenance shall be permanently closed after construction using the most effective and least environmentally damaging methods appropriate to that specific area, with concurrence of the land manager (e.g., stockpiling and replacing topsoil, rock replacement) in a manner that most closely matches undisturbed conditions of the area.

Hydrology-2 Roads would be built as near as possible to right angles to streams and washes. Culverts would be installed where necessary and sized in accordance with local county regulations. All construction and maintenance activities shall be conducted in a manner that would minimize disturbance to vegetation and drainage channels, including ephemeral stream banks. In addition, road construction would include dust-control measures during construction especially in sensitive areas. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the gen-tie line and other Project components.

Hydrology-3 New impervious areas associated with temporary construction would be restored to existing conditions, including but not limited to revegetation and decompaction, to the full extent necessary to reduce impacts to less than significant levels, after completion of Project construction.

Hydrology-4 Stormwater drainage inside substations would be designed to minimize erosion and increase sediment control. Internal runoff would be released from the switching station by means of surface drainage structures designed to filter contaminants from water flow. Drainage from Project area would be collected and controlled by surface improvements, as detailed in the SWPPP.

Hydrology-5 All new buildings (e.g., substation) shall be flood-proofed by constructing the finished floor a minimum of 24 inches above the highest adjacent ground or 100 year water surface elevation, whichever is greater. Slope protection may be required for buildings on fill. Additionally, the solar panels shall have a minimum clearance of 24 inches above the highest adjacent ground when upright to ensure flows are not obstructed.

Hydrology-6 No flow obstructing fences (chain link, block wall, etc.) shall be constructed along the north and west property lines, since these types of fences obstruct flows causing damage to adjacent properties. Fencing used in these areas shall contain openings of three inches high by six inches wide for first the 18 inches from the bottom, and openings of four inches high by six inches wide for the next eight inches and so forth. This fencing or equivalent shall be provided to allow the free flow of storm or flood runoff. No setback is required with the use of this fencing. A detail of this fencing shall be provided to the County of Riverside.

Alternative 2 (No Project Alternative)

No development of the proposed solar facility or transmission component would take place. Existing uses would persist.

Alternative 4 (Southern Alternative)

The discontinuous ephemeral channel, as defined above, would be avoided by the transmission component under development of Alternative 4. However, BMP-11 would be implemented as part of the Project; therefore, the potential impacts to any drainage areas within the development footprint would be minimized by ensuring a setback between the drainage and access roads and construction areas. Any necessary grading would follow existing contours as necessary to minimize alteration of existing drainage patterns (BMP-11). Erosion and sedimentation would be minimized through implementation of the Drainage, Erosion, and Sedimentation Control Plan (BMP-1), as well as the required SWPPP (BMP-2), and other measures as described in Mitigation Measures Hydrology-1 through Hydrology-4. Implementation of these BMPs and mitigation measures would reduce these impacts to less than significant.

Response 2-2

The commenter states that to the extent any aquatic features that could be affected by the Project are determined to not constitute waters of the U.S., the EPA recommends that the Final EIR/EA characterize the functions of such features and discuss potential mitigation for any impacts to them.

Please refer to Response 2-1 and also to Figure 3.2.9-2 of the Final EIR/EA which notes the ephemeral locations in relation to the Project site. The impact analysis in Chapter 4, Section 4.2.4 of the Final EIR/EA, also analyzed the ephemeral channels on the Project site in relation to the five (5) Alternatives and described specific BMPs that would be implemented to minimize potential impacts to hydrologic features on the Project site during short-term construction. Any necessary grading would follow existing contours as feasible to minimize alteration of existing drainage patterns (BMP-11). Erosion and sedimentation would be minimized through implementation of the Project Drainage, Erosion, and Sedimentation Control Plan (BMP-1), as well as the required Project SWPPP (BMP-2). In addition, Biology-9 (Provide restoration/compensation for affected jurisdictional areas) would be implemented.

Chapter 4, Section 4.2.9 of the Final EIR/EA notes that the Project design includes buffers between Project facilities and natural washes, as described in BMP-11. Although on-site grading would be minimized, the installation of proposed facilities, including roads, fencing, solar arrays, and towers along the transmission corridor, could interfere with existing drainage patterns on site. Any necessary grading would follow existing contours as feasible to minimize alteration of existing drainage patterns (BMP-11).

Erosion and sedimentation would be minimized through implementation of the Project Drainage, Erosion, and Sedimentation Control Plan (BMP-1), as well as the required Project SWPPP (BMP-2), and other measures as described in Mitigation Measures Hydrology-1 through Hydrology-4.

The proposed Project will implement the measures suggested by the commenter, as follows:

- *Utilize existing natural drainage channels on site and more natural features, such as earthen berms or channels, rather than concrete-lined channels.*

The proposed Project and the action alternatives will implement Mitigation Measure Hydrology-1. Existing drainage crossings will be utilized at streams, washes, and irrigation channels where they exist. No concrete-lined channels are included in the proposed Project or alternatives.

- *Commit to the use of natural washes, in their present location and natural form and including adequate natural buffers, for flood control to the maximum extent practicable.*

In addition to Hydrology-1, as described above, the proposed Project and action alternatives include BMP-11**.** BMP-11 would preserve and maintain the natural washes' hydrological functions in their present location and natural form (see Figure 3.2.9-1 *Floodplain Delineation of* Final EIR/EA document) by locating Project facilities in a manner to ensure that there is adequate space (i.e., setbacks of no less than 100 feet) between solar facilities and natural washes. As such, these setbacks would preserve and maintain the natural washes' hydrological functions, allowing those washes to continue to be used for stormwater flows.

- *Configure the project layout, roads, transmission infrastructure and drainage channels, as appropriate, to avoid the two primary ephemeral washes within the project footprint.*

See Response 2-1.

- *Minimize the number of road crossings over washes and design necessary crossings to provide adequate flow-through during storm events.*

The proposed Project would implement Mitigation Measure Hydrology-2. Roads would be built as near as possible to right angles to streams and washes. Culverts would be installed where necessary and sized in accordance with local county regulations. All construction and maintenance activities would be conducted in a manner that would minimize disturbance to vegetation and drainage channels, including ephemeral stream banks

Response 2-3

The commenter states that the Draft EIR/EA states that off-road diesel engine idling would be limited to 10 minutes, per BMP 16. The California Air Resources Board's in-use off-road diesel vehicle regulation states: "No vehicle or engines subject to this regulation may idle for more than 5 consecutive minutes."

The comment is noted. Please refer to pages 11 and 12 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text and update to BMP-16 to incorporate the five-minute limitation.

Response 2-4

The commenter states that Section 3.2.9 does not clearly indicate the source of the water, nor the quantity available, for overall construction and project operations. The comments suggest that the Final EIR/EA should include:

- A discussion of the water supply required for construction and operation of the solar facility, as well as the source and quantity secured to meet.
- A discussion of water treatment, if any, for the module wash water. If untreated non-potable water is to be used for module washing, that should be stated.
- The feasibility of limiting panel washing to once per year or eliminating panel washing altogether. Discuss water needs for panel washing in the context of neighboring PV projects in Riverside County, which have estimated considerably less annual water use for such purposes. Consider adopting a commitment to eliminate water use for panel washing similar to that for BLM's Desert Sunlight Solar Farm in Riverside County.

The proposed Project and each of the action alternatives will demand far less water than is used in baseline circumstances. Thus, the proposed Project and action alternatives will have only beneficial impacts on water supply, there is no adverse impact that would be avoided or reduced by limiting panel washing, and no nexus for imposing such a requirement. The commenter is directed to the *Water Supply Assessment for the Blythe Mesa Solar Project* provided in Appendix G of the Final EIR/EA for an in-depth analysis of water requirements for the Project and sources of water supply. Please also refer to pages 12 and 13 of the Errata in Response to Comments section of this Final EIR/EA document which reflects the suggested changes to the text and expands the discussion in Chapter 3 to include the source of water and the quantity available for overall construction and project operations.

Based on the 2010 PVID report, the agricultural operations in Project area utilized approximately 12,000 acre-feet (ac-ft) of water from the PVID surface delivery system to irrigate crops on approximately 1,592 acres. This surface delivery system would also be available to the proposed solar facility. The proposed Project and action alternatives, in contrast, are projected to demand about 451 ac-ft/yr during construction and about 345 ac-ft/yr plus 150 gallons/day for the operations and Maintenance (O&M) buildings, during operation.

Water for the Project would be taken from existing PVID water entitlements that support the agricultural operations currently on the proposed solar facility site rather than evaporation ponds common to other solar developments in this region; current operations are not supported by groundwater wells. Riverside County Community Service Area #122 (CSA #122) has issued a will-serve letter for the Project’s limited potable water needs. Less than one ac-ft of groundwater per year would be required for potable use in the two O&M buildings. The water supply from PVID sources and CSA #122 is sufficient to meet requirements of the proposed Project, including the minor potable groundwater demand under average-year, single-dry year, and multiple-dry year conditions over a 20-year future projection (refer to Appendix G, *Water Supply Assessment*).

A commitment to eliminate water use for panel washing similar to that for BLM's Desert Sunlight Solar Farm in Riverside County would not reduce or eliminate any adverse impacts, since the proposed Project has no adverse impact on water supply. Furthermore, the installation of PV systems for optimum yield is primarily dictated by its geographic location and installation design (tilt, orientation and altitude) to maximize solar exposure. However, once these parameters have been appropriately established, there are other depending factors that arise in determining the system performance (efficiency and output). Dust accumulation influences the performance of the PV installations. An effective way to address the issue of dust accumulation is periodic cleaning of the solar collectors (including PV) so light is permitted into the solar cells to maintain maximum solar efficiency. The more light that hits a panel, the more power it will generate. Due to the upward angle of solar panels, they are more prone to build-up of general dust and dirt that does not wash off with just rain. This build-up reduces the amount of light hitting the panel and reduces its output.

As the projected energy output is based on the optimum performance of clean solar panels, this build-up of dirt can adversely affect the panel's ability to meet those projections. As such, to maintain the projected energy MW output, panel washing is required. Without panel washing, panel efficiency would be reduced and the need to expand the Project footprint would be required to maintain the same projected energy MW output.

Response 2-5

The commenter asks the Project proponent to commit, in the Final EIR/EA, that the design of the transmission line would be in compliance with current standards and practices that reduce the potential for avian fatalities and injuries. The EPA recommends including the Avian Power Line Action Committee's (APLIC) *Mitigating Bird Collisions with Power Lines: The State of the Art in 2012* as an important guideline to follow.

As a Condition of Approval of the Conditional Use Permit for the Project, the Applicant will be required to commit to ensuring the design of the transmission line is in compliance with current standards and practices that reduce the potential for avian fatalities and injuries. The Applicant will use, the APLIC *Mitigating Bird Collisions with Power Lines: The State of the Art in 2012* as a guideline for the design of the transmission line. Please refer to page 13 of the Errata in Response to Comments section of this Final EIR/EA which reflects these changes to the text and update to BMP-12.

Response 2-6

The commenter recommends that the Final EIR/EA include an Environmental Awareness Program to be implemented for the workers with regards to Valley Fever.

Coccidioidomycosis, commonly known as Valley Fever, is primarily a disease of the lungs that is common in the southwestern U.S. and northwestern Mexico. Valley Fever is caused by the fungus *Coccidioides*, which lives in the top 2 to 12 inches of soil and dirt, particularly in areas with dry dirt and desert-like weather conditions that allow the fungus to grow. Valley Fever infection can occur year-round. Cases of Valley Fever have been reported from most counties in California. Over 75 percent of cases have been in people who live in the San Joaquin (Central) Valley. In California, the number of reported Valley Fever cases has increased greatly since 2000, with more than 4,000 cases reported in 2012 (CDPH 2013).

As detailed in the Final EIR/EA, while the potential for a direct impact could occur during construction in association with exposure of workers to Valley Fever spores, the Project would comply with the Mojave Desert Air Quality Management District (MDAQMD) Rules and Regulations, including those adopted from the State Implementation Plan (SIP) and those required under MDAQMD Rule 403 relative to fugitive dust. As such, the Project would implement MDAQMD Rule 403 (Fugitive Dust Control Measures) to minimize impacts from dust as a result of Project construction and operation. Measures would include applying dust suppression in sufficient quantity and frequency to maintain a stabilized surface; applying chemical stabilizers within five working days of grading completion; and during construction, applying water to at least 70 percent of all inactive disturbed areas on a daily basis when there is evidence of wind-driven fugitive dust. The Project also would employ the following measures to reduce fugitive dust-generating activities:

a) Require the application of non-toxic soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for ten days or more);
b) On-site roadways used for fire access, site security, regular site maintenance, public parking, and employee parking will be graveled or otherwise stabilized;
c) Install wheel washers where vehicles enter and exit the construction site onto paved roads or wash off trucks and any equipment leaving the site;
d) Require all trucks hauling dirt, sand, soil, or other loose materials to be covered;
e) Suspend all excavating and grading operations when wind gusts (as instantaneous gusts) exceed 25 miles per hour;
f) Appoint a construction relations officer to act as a community liaison concerning on-site construction activity including resolution of issues related to PM10 generation; and
g) When sweeping streets to remove visible soil materials, use street sweepers or roadway washing trucks.

The Project would also comply with BMP 3 (Fugitive Dust Abatement Plan) as a requirement of existing policies, practices, and measures required by law, regulation, or local policy; and ongoing, regularly occurring practices. All BMPs identified in the Final EIR/EA are inherently part of the proposed Project and Alternatives. A Fugitive Dust Abatement Plan would minimize the spread of fungal spores, thereby reducing potential for contracting Valley Fever during construction.

As detailed in BMP 3, the plan would include measures to minimize fugitive dust emissions from wrecking, excavation, grading, clearing of land, and solid waste disposal operations, and would take every reasonable precaution to prevent visible particulate matter from being deposited upon public roadways as a direct result of operations. During construction, all unpaved roads, disturbed areas (e.g., areas of scraping, excavation, backfilling, grading, and compacting), and loose materials generated during Project construction activities would be watered as frequently as necessary to minimize fugitive dust generation. However, the amount of water will be minimized each time to prevent temporarily ponding water that may occur as a result of the fugitive dust plan. In water-deprived locations, water spraying would be limited to active disturbance areas only, and non-water-based dust control measures would be implemented in areas with intermittent use or use that is not heavy, such as stockpiles or access roads. Alternatively, chemical dust suppressants or durable polymeric soil stabilizers could be used. The dust suppression measures would consider the sensitivity of wildlife to the windborne dispersal of fugitive dust containing dust suppressants and the potential impact on future reclamation.

In addition, the Applicant will commit to including a Worker Environmental Awareness Program (WEAP), as Mitigation Measure Hazards-3, to be implemented to ensure worker safety and minimize worker hazards during construction and operation. The program addresses all issues identified by the commenter and would include a personal protective equipment (PPE) program, an Emergency Action Plan (EAP), and an Injury and Illness Prevention Program (IIPP) to address health and safety issues associated with normal and unusual (emergency) conditions. Construction-related safety programs and procedures would include a respiratory protection program, among other things. Construction would be undertaken sequentially in accordance with a Construction Plan that would include the final design documents, work plan, health and safety plans, permits, project schedule, and operation and maintenance manuals. Construction Plan documents would relate at least to the following:

1. Environmental health and safety training (including, but not limited, to training on the hazards of Valley Fever, including the symptoms, proper work procedures, how to use PPE, and informing supervisor of suspected symptoms of work-related Valley Fever)
2. Site security measures

3. Site first aid training
4. Construction testing (non-destructive examination, hydro, etc.) requirements
5. Site fire protection and extinguisher maintenance, guidance, and documentation
6. Furnishing and servicing of sanitary facilities records
7. Trash collection and disposal schedule/records
8. Disposal of hazardous materials and waste guidance in accordance with local, state, and federal regulations

Mitigation Measure Hazards-3 has been added to the Final EIR/EA to ensure worker safety and minimize worker hazards during construction and operation of the proposed Project. This change represents a correction to the Final EIR/EA which does not alter or change the conclusion of the Project's environmental analysis. Section 4.2.8, *Hazards and Hazardous Materials*, (pages 4-239 and 4-240) of the Final EIR/EA is hereby revised. Please refer to pages 13 and 14 of the Errata in Response to Comments section of this Final EIR/EA.

The fact that inhalation of dust could adversely affect human health is discussed in Section 4.2.8 of the Final EIR/EA. However, in light of the Applicant-proposed dust control measures (dust abatement plan, BMP-2) and Mitigation Measures Hazards-1 through Hazards-3, the risk of potential dust-related health impacts to construction workers, including the risk of contracting Valley Fever, would be less than significant.

Letter 3: U.S. Department of Interior, Fish and Wildlife Service

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Palm Springs Fish and Wildlife Office
777 East Tahquitz Canyon Way, Suite 208
Palm Springs, California 92262

In Reply Refer To:
FWS-RIV-12B0299-14CPA0246

AUG 0 4 2014

Riverside County Planning Department
Attn: Mr. Larry Ross, Principal Planner
4080 Lemon Street, 12 Floor
P.O. Box 1409
Riverside, CA 92502-1409

Subject: Comments on the Draft Environmental Impact Report (EIR 529) for the Blythe Mesa Solar Project (CUP 2685), Riverside County, California

Dear Mr. Ross:

The U.S. Fish and Wildlife Service (Service) has reviewed the Environmental Assessment/draft Environmental Impact Report (EA/draft EIR), dated June 17, 2014, for the subject project. The proposed 485-megawatt (MW) photovoltaic (PV, on single-axis trackers) project is located on a 3,587-acre solar farm site west of the City of Blythe, and along 8.4 miles for the 230 kilovolt (kV) gen-tie line on 73 acres (4.8 miles outside the generating station) connecting to the Southern California Edison Colorado River Substation, about 5 miles west of the electrical generation site. The project is located on several parcels north and south of Interstat-10 in the City of Blythe and unincorporated Riverside County. The project life would extend at least 20 years; other project details can be found in the EA/draft EIR, dated June 2014.

We offer the following comments on the EA/draft EIR as they relate to potential impacts on public trust resources. The primary mandate of the Service is the conservation, protection and enhancement of fish and wildlife resources and their habitats for the continuing benefit of the American people. The Service has legal responsibility for the welfare of migratory birds, anadromous fish, and threatened or endangered animals and plants listed under the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*). These comments are based on the information provided in the EA/draft EIR, our knowledge of sensitive and public trust resources, and our participation in regional renewable energy conservation planning efforts.

We preface our comments by recognizing the need for development of renewable energy and the challenge of balancing solar energy development with conserving natural resources in the Lower Colorado River Valley. We look forward to working with the agencies involved and offer our assistance in helping develop consistent renewable energy goals and policies at the local, State, and Federal levels.

One of the Service's goals is to encourage development of renewable energy facilities on degraded and less environmentally valuable sites to minimize impacts to biological communities and ecological processes. As such, we agree with and support the use of the proposed site as an appropriate location for the project, provided the issues discussed below are addressed and impacts mitigated to minimize adverse effects. Accordingly, we offer the following comments and recommendations to help avoid and minimize adverse impacts to public trust resources that may be impacted by the proposed project, including sensitive species, migratory birds, and the federally endangered Yuma clapper rail (*Rallus longirostris yumanensis*), recently renamed Yuma Ridgway's rail (*Rallus obsoletus yumanensis*) by the American Ornithologists Union (http://aoucospubs.org/doi/full/10.1642/AUK-14-124.1).

Migratory Birds

The Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. The MBTA protects most native species of birds in the United States, including those likely to occur in the project area; a list of species protected by the MBTA can be found at 50 CFR 10.13. The MBTA prohibits the "take" or possession of protected species of migratory birds; "take" means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempts to do so (50 CFR 10.12). The MBTA does not specifically authorize the incidental take of migratory birds. The State Fish and Game Code contains similar prohibitions.

The project site occurs in the Lower Colorado River Valley, which forms a major branch of the Pacific Flyway. The diverse aquatic, wetland, riparian, agricultural, and desert habitat types provide permanent and seasonal refuge to hundreds of resident and migratory birds (Shuford et al. 2002), and is a major wintering grounds for numerous species and diverse groups of water-associated birds.

Because utility-scale solar development has not been developed until recently, systematically-collected mortality monitoring data are limited and the magnitude of potential mortality has not been accurately quantified, and most avian mortality information has been collected incidental to construction monitoring. However, utility-scale photovoltaic, parabolic trough, and power tower projects that are currently under construction or recently put into operation are reporting fatalities and injuries to a wide range of avian species, including numerous species of water-associated birds, passerines, and raptors involving various project features, including solar panels or heliostats, evaporation ponds, fencing, distribution lines within the facility, and gen-tie lines. This growing evidence of what is commonly referred to as a "lake effect" or "polarized light pollution" (Horvath et al. 2009), presents a particular hazard to water-associated birds and other species seeking migratory stopover habitat typically found along rivers and lakeshores (Service 2014a). Based on the species composition of avian fatalities found at the dominant technologies currently in use--power tower, solar thermal trough, solar thermal power tower—all three technologies create these effects, as evidenced by up to about 40 percent of all birds killed composed of water-associated birds, including ducks, grebes, loons, rails, pelicans, etc. at three utility-scale solar projects using these different technologies (Service file information, available upon request). The magnitude of impact from the lake effect is potentially location specific and may tie to migratory flyways or the availability of other appropriate migratory stopover habitat. Projects along the Interstate-10 corridor (Desert Sunlight and NextEra Genesis) are among those reporting the highest mortality of water-associated bird (Service 2014a), likely related to the large number of species migrating through and wintering along the Lower Colorado River Valley and in the Salton Sea Basin.

Though the project site is mostly located on degraded agricultural lands and generally desirable from the standpoint of impacts to terrestrial wildlife, the EA/draft EIR did not adequately address the potential significance for bird collisions on project-specific and cumulative scales. The EA/draft EIR concludes there will be little attraction to waterfowl (and presumably other water-associated species) to the site because of surrounding human development and disturbance. However, the southwestern-most parcel (discussed below) is largely surrounded by relatively undisturbed lands and is unlikely to be avoided because of human-related disturbance or development. The EA/draft EIR also did not acknowledge adequately analyze the potentially significant cumulative effects of bird fatalities at utility-scale solar facilities throughout Riverside County and beyond. Based on the available information regarding bird fatalities cited above, the cumulative effects to migratory birds, potentially would be significant, and therefore, would warrant project-specific systematic monitoring, as proposed under the BBCS process. Please see the Enclosure to this letter for more detail on our interim guidelines for bird mortality monitoring. The Bird and Bat Conservation Strategy (BBCS) discussed in the Enclosure is not a surrogate for a take permit under the MBTA; therefore, it does not limit or preclude the Service from exercising its authority under any law, statute, or regulation, nor does it release any individual, company, or agency of its obligations to comply with Federal, State, or local laws, statutes, or regulations. 3-1

To develop effective best management practices and adaptive management measures to reduce avian mortality at utility-scale solar energy facilities, and for planning future project development, the EA/final EIR should include an adaptive management program of avoidance, minimization, and mitigate measures based on bird mortality monitoring consistent with our interim approach described in the Enclosure. The extent of funding required for bird mortality mitigation should be scaled to more effectively offset impacts commensurate with the results of post-project mortality monitoring. The enclosure to this letter includes specific information on the recommended content of this monitoring program and additional measures to help avoid and minimize direct, indirect, and cumulative effects. To help the applicant reduce potential adverse effects to avian species, we recommend the development and implementation of a statistically robust, systematic bird and bat fatality and injury monitoring program. The monitoring program should be developed for the construction and operations phases, and revised as needed, to minimize and mitigate impacts while learning more about the causes of avian mortality. 3-2

Additionally, because the project is segmented on different land parcels, an opportunity exists to generate important information regarding the effects of the different technologies on various bird species. Currently, available information is lacking on which solar technologies and configuration of panels may reduce bird mortality rates. With implementation of a robust, systematic avian and bat mortality monitoring program and different technologies for the 3-3 different parcels, information could be derived that would increase our knowledge of technology-specific collision rates. Some potential design considerations could include thin film versus crystalline solar PV; dual-axis tracking systems; and multi-layer anti-reflection coating. We are available to help the County and applicant in designing a suite of various technologies and configurations amenable to comparative monitoring for adaptive management purposes. 3-3

We also recommend that mitigation for fatality impacts be directed toward those species and groups that suffer higher mortality as a result of the project. We recommend that resources mentioned under adaptive mitigation be directed to the Sonoran Joint Venture (http://sonoranjv.org/) or to the Migratory Bird Conservation Fund. The Sonoran Joint Venture would help offset impacts to resident Sonoran Desert species, and the Migratory Bird Conservation Fund would benefit water birds that breed in more northerly latitudes and winter in the project area. The Sonoran Joint Venture is a multi-agency Federal, State, and non-governmental partnership with the mission of conserving the unique birds and habitats of the southwestern United States and northwestern Mexico. The Migratory Bird Conservation Fund, managed by the Department of Interior, provides financing for the acquisition of migratory bird habitat. In addition, the National Fish and Wildlife Foundation is another venue that would be well suited to direct conservation funding for migratory birds in the region of the project. 3-4

Yuma clapper rail

Breeding Yuma clapper rail populations in the project vicinity are primarily restricted to freshwater marshes along the lower Colorado River Valley and near the Salton Sea, with a few additional small and scattered locations along the Gila River in Arizona and refuges in Nevada (Service 2009, 2014b). Since few, if any, marsh/water-associated birds were reported in pre-project avian surveys for the projects mentioned above with bird mortality data, and suitable habitats were not present on or in proximity of these project sites, available evidence suggests these solar technologies pose an attractive nuisance to which various rail species and other water-associated birds are particularly vulnerable. To date, two Yuma clapper rails are known to have been killed on solar PV projects, one at the Desert Sunlight project in May 2013 near Desert Center, and one in Imperial County in April 2014. Both projects were using thin film PV technology, though the Imperial County bird may have collided with the fence surrounding the project. Vulnerability of clapper rails also is evidenced by multiple incidentally observed fatalities to sora and Virginia rail at solar projects along the I-10 corridor and in the Imperial Valley, which suggest a problem for all rail species. Additionally, construction monitoring along transmission lines in Imperial County documented Virginia rail and sora fatalities, and construction monitoring for the DPV2 transmission line documented a Virginia rail collision with the facility near the proposed project site. Collectively, these data indicate there is a mortality risk to all rails posed by many project-related facilities, including gen-tie lines, solar panels, and perimeter fencing. Details on these and other mortality data can be provided upon request. To minimize collision risk with transmission lines, we recommend the BLM and County require the most up to date guidelines adopted by the Avian Power Line Interaction Committee (see for example APLIC 2006, 20012). 3-5

The evidence summarized above documents that Yuma clapper rails are vulnerable to project-induced mortality posed by most or all solar energy projects in the desert. Solar and transmission projects within the resident and dispersal range of Yuma clapper rail are likely to kill multiple individuals over the life span of these projects, given the (1) two clapper rail fatalities occurred during the first year of project construction (soon after the hazards were first built), (2) observed pattern of regular long distance dispersal across the Mojave and Sonoran deserts, and (3) the large cumulative disturbance footprint of all existing and planned solar projects. Because of the large size of these projects, the numerous projects approved and proposed within the range of the species, and lack of opportunity for effective adaptive management measures and other design modifications sufficient to avoid the risk of incidental take[1], we anticipate recurrent but low levels of take at multiple project sites, with higher levels anticipated with increasing proximity to breeding centers in the lower Colorado River Valley and Salton Sea basin. The proposed project is much closer to Yuma clapper rail breeding populations in the Lower Colorado River Valley than the documented fatality near Desert Center on the Desert Sunlight project. Therefore, we recommend the EA/final EIR address the direct, indirect, and cumulative effects of the project on Yuma clapper rail, and appropriate mitigation measures. 3-5

The Service is also concerned about the limited discussion and regarding the likelihood of fatality events to other rare/sensitive species (e.g., willow flycatcher and yellow-billed cuckoo), which are known to move through the Lower Colorado River Valley during spring and fall migration. Because of the observed mortalities of special status species at other existing solar facilities, an analysis that improves the level of rigor and adequacy for determining the different degrees of vulnerability across all avian taxa and a risk assessment that includes the quantification for take of listed and rare species is warranted. Post-construction monitoring should be designed to account for fatality events of rare species. 3-6

If the County or applicant anticipates that incidental take of Yuma clapper rail is anticipated over the 30-year life of the Project, we recommend the EA/Final EIR include a mitigation measure requiring that the applicant apply for an incidental take permit through the development of a Habitat Conservation Plan (HCP) that satisfies the permit issuance criteria stipulated under section 10(a)(1)(B) of the Act. HCPs provide for partnerships with non-Federal parties to conserve the ecosystems upon which threatened and endangered species depend for survival and recovery and permit the take of listed species incidental to otherwise lawful activities.Alternatively, the Desert Renewable Energy Conservation Plan (DRECP), which is currently in development, is intended to serve as a multiple species HCP providing similar incidental take coverage for a wider array of species proposed for conservation under that planning effort. Under the DRECP alternative, Imperial County could apply for and obtain County-wide incidental take authority for covered species and could extend take authorization to projects requiring County permits subject to defined obligations under the plan. Lastly, the BLM may consult with the Service under section 7 of the Act to obtain an exemption from the Act's 3-7

[1]"Take" is defined by the Act as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct.

take prohibitions. Any of these three alternative approaches could be used to authorize and offset 3-7
the incidental take of the Yuma clapper rail.

Mojave fringe-toed Lizard

This species is designated as a Sensitive Species by BLM and a Species of Special Concern by the State. These designations recognize the general rarity of this species, which is vulnerable because a proportionally small amount of suitable habitat is scattered in a relatively few, small, isolated patches of sand dune habitat across the Sonoran and Mojave deserts in California.

The southwestern-most parcel of the electrical generating station and gen-tie line are located
within the Chuckwalla Valley sand transport corridor. The active eolian sand transport in this
zone provides periodic pulses of loose blowsand from upwind sand sources within the transport
corridor west of the project site and along the length of the proposed gen-tie line to the Colorado
River Substation. The lizard is specially adapted to blowsand habitats, such as the sand 3-8
sheets/fields, which characterize this southwestern-most parcel, and across which sands are
transported to larger accumulations, such as sand dunes and sand hummocks that accumulate
around shrubs and other obstructions. Though mitigation measures are proposed to reduce direct
effects to the lizard by salvaging individuals to reduce lizard fatalities, the EA/draft EIR did not
quantify to direct loss of lizard habitat or acknowledge the indirect effects to offsite lizard habitat
adjacent to and downwind (east) of the southwestern-most generation site parcel.

Indirect effects would be caused by the disruption of eolian sand transport processes to blowsand
habitat east (downwind) of the southwestern-most parcel on the project site. As can be observed
on the small existing solar plant just north of this parcel, the solar panels create turbulence to the
laminar wind flow, which slows wind velocity and causes wind-entrained sands to drop out and
settle in eddies created by the solar panels. Thus, the wind obstruction created by the solar panels
intercepts and accumulates sands on the project site, which reduces the amount of sand available
to downwind habitat east of the project. Though the accumulation of sand can potentially 3-9
improve habitat conditions for the lizard on the project site, any operations and maintenance
(O&M) requirements to remove sand accumulations also would kill and injure the lizards that
colonize the artificially created habitat on the project site. As such, construction of the proposed
project would initially eliminate suitable habitat and lizards from the site, but as eolian sand
transport delivers fresh sand supplies from the west that accumulate on site, suitable habitat and
lizards that move onto the project site would be periodically eliminated if required by O&M
practices.

Therefore, to minimize direct and indirect impacts to the lizard and downwind habitat east of the
project, the southwestern-most parcel of the generation station in the sand transport corridor
should be eliminated. If this does not occur, the sand-starved, degraded habitat downwind of the
project should be quantified and mitigated by the acquisition of suitable habitat elsewhere with 3-10
the Chuckwalla Valley sand transport corridor. In addition, if O&M practices require the
periodic removal of sand accumulations on the project site, the final project approvals also
should require the acquisition of suitable habitat elsewhere in the sand transport corridor to offset

the direct loss of habitat. Consistent with BLM's Northern and Eastern Colorado Coordinated Management Plan, direct and indirect habitat losses should be mitigated at a 3:1 loss to replacement ratio. 3-10

We appreciate the opportunity to provide comments on the EA/draft EIR. We have attached specific recommendations to further assist in avoidance and minimization of impacts to migratory birds. Should you have any questions regarding these comments, or provide further technical assistance, please contact Tera Baird of my staff at 760-322-2070.

Sincerely,

for Kennon A. Corey
Assistant Field Supervisor

Enclosure

cc:
Magdalena Rodriguez, California Department of Fish and Wildlife, Ontario, CA
Greg Miller, Renewable Energy Coordination Office, BLM, Moreno Valley, CA
Holly Roberts, Southcoast-Palm Springs Field Office, BLM, Palm Springs, CA

Enclosure

U.S. Fish and Wildlife Service
Migratory Bird and Bat Avoidance and Minimization
Interim Recommendations for the
Blythe Mesa Solar Plant Project

Avian Recommendations

1. Prepare and implement a Bird and Bat Conservation Strategy (BBCS) in consultation with the County, BLM, California Department of Fish and Wildlife (CDFW), and the Service for review and comment. The interim BBCS should include the following:

    - A description and assessment of the existing habitat, risk characterization, and avian risk minimization measures.
    - A statistically robust, systematic avian and bat mortality and injury monitoring program to: (1) estimate annual mortality by taxa and season using appropriate models and appropriate estimators (this estimate should include mortality associated with all features of the project that are likely to result in injury and mortality - e.g., fences, ponds, solar panels, gen-ties); (2) identify collision and other mortality during diurnal and nocturnal times of the day; and (3) assess the spatial distribution and abundance of mortalities [species composition (including rare and sensitive species), abundance, and distribution] on the project site.
    - An adaptive management and decision-making framework for reviewing, characterizing, and responding to monitoring results. 3-11
    - Specific conservation measures and/or programs to avoid, minimize, reduce, or eliminate avian and bat injury or mortality over time and evaluation of the applicability and effectiveness of those measures using results from the monitoring program.

    The avian and bat mortality and injury monitoring program should include:

    - Onsite monitoring to systematically survey representative locations within the facility, at a level that will produce statistically robust data. The monitoring effort will account and correct for potential spatial bias and allow for the extrapolation of survey results to non-surveyed areas within the solar plant site boundary and to tailor the survey interval seasonally based on carcass removal rates.
    - Statistically robust carcass removal and searcher efficiency trials pre and post construction to document the extent to which avian or bat carcasses remain over time (hours/days) and how well searchers can detect carcasses within the project area. The results from these trials will be used to adjust the survey frequency and to improve mortality estimates to reflect bias from carcass removal rates and searcher efficiency.

- Accepted statistical methods from the peer-reviewed literature to generate facility estimates of potential post-construction avian and bat impacts based on the observed number of injury/fatality detections during standardized monitoring.
- Handling and reporting requirements according to applicable state or federal permits.
- Development of an injured bird response plan that delineates care and curation of any and all injured birds, and funding for rehabilitation centers for the care and treatment, and eventual release or permanent storage of injured birds.

Post-construction monitoring studies should be conducted by a third-party independent contractor for at least 3 years following commencement of commercial operation of each individual unit. At the end of the 3-year period, the County, in consultation with CDFW and the Service, will determine whether the survey program will be continued based on whether the data are sufficient to answer monitoring objectives within a predetermined level of statistical certainty.

2. Avoid using lattice-type structures and placing external ladders and platforms on towers to minimize perching and nesting. 3-11

3. Ensure panels used at this facility are dual axis tracking panels to allow for maximum flexibility to minimize bird impacts.

4. Minimize use of outdoor lighting. If additional lighting is necessary, it should be focused downward to reduce skyward illumination. Lights should be equipped with motion detectors to reduce continuous illumination.

5. Where feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds. Use the most recent recommendations of the Avian Power Line Interaction Committee (APLIC 2006, 2012) for any required above-ground lines, transformers, or conductors to reduce collisions and electrocutions. When transmission lines must be above-ground, avoid placing lines within wetlands and over canyons.

6. Install and replace flight diverters, as needed on the proposed transmission line to render the line more visible to both resident listed and migratory birds, including night-migrating birds.

7. Install fence markers or other devices on perimeter fences to render the fence more visible to both resident listed and migratory birds to reduce collision risk.

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Response to Letter 3

Response 3-1

The U.S. Fish and Wildlife Service (USFWS) states that the Final EIR/EA does not adequately address the potential significance for bird collisions on project-specific and cumulative scales. The USFWS goes on to state that based on the available information regarding bird fatalities, the cumulative effects to migratory birds potentially would be significant and, therefore, would warrant project-specific systematic monitoring, as proposed under the Bird and Bat Conversation Strategy (BBCS) strategy.

Potential impacts from polarized light pollution (PLP) on a cumulative scale cannot be fully known. The Blythe Solar Power Project EIS/EIS identified that some migratory birds may be affected from collisions with solar panels or other infrastructure but such impacts could not be known with certainty. Post-construction monitoring data that is available from the Genesis Solar Energy Project and the Desert Sunlight Project document avian mortality. The Desert Sunlight Project recorded a total of 19 waterfowl mortalities. Only one was confirmed as caused by collision with a solar panel. Three waterfowl drowned or were reported caught in pond netting, there was one reported case of illness as a cause of death, two waterfowl deaths were caused by predation, and there were 11 unknown causes of mortality (Ironwood Consulting, Inc. 2012). The California Energy Commission (CEC) website publishes information about a total of 93 avian fatalities that were reported at the Genesis Solar Energy Project from July 2013 through October 2013 (AECOM 2014). Of the 93 fatalities reported from July through October, two species are listed as California Department of Fish and Wildlife (CDFW) species of special concern and one species is listed as a CDFW fully protected species. No federally or State-listed species were reported among the avian mortalities for the July-October 2013 monthly compliance reports. No fatalities of any bird species, including waterfowl, were reported as a result of collision with the solar trough mirrors (AECOM 2014). Given the little data to support PLP and collision risk, the potential cumulative impact from PLP can only be speculative at this time.

PV solar facilities can cover large areas of the landscape. Habitat fragmentation would clearly be an important consideration for solar developments proposed to occur within large, intact, contiguous natural vegetation communities. The Project array areas are sited on agricultural land (irrigated crops and orchards) and disturbed land with very little breeding and foraging habitat suitable for avian or bat species (except as noted above). The gen-tie line traverses more natural habitats of desert scrub and some displacement of breeding or foraging bird could occur during construction. However, permanent habitat loss would be minimal within the gen-tie right-of-way (ROW) because once completed, the transmission lines would be passive structures and would not restrict avian or bat use in the area. Some potential for habitat fragmentation exists at the Project site, such as the southwestern most parcel, but the potential risk does not appear to be high, due to the nature of the development and the history of land use in the area (i.e., agricultural land, residential development, interstate highway, transmission line corridor, and energy development).

Appendix C4 of the Final EIR/EA includes a BBCS. The BBCS has been developed with consideration and guidance from the data and suggestions presented in the USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities and the Avian Power Line Interaction Committee's Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines, and Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. The USFWS provided additional details on the interim guidelines for bird mortality monitoring. As part of the adaptive management process outlined in the BBCS, Appendix C4 of the Final EIR/EA, BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk. As progress is made through the program or challenges are encountered, the BBCS may be reviewed, modified, and updated. Appendix C4 will be updated to include the additional avian recommendations provided by USFWS. The changes to Appendix C4 do not affect the overall conclusions of the environmental analysis relative to the significance of impacts.

The commenter further discusses its authority to manage migratory birds under the Migratory Bird Treaty Act (MBTA) and other authorities of the Department of Interior. The Project acknowledges these authorities.

Response 3-2

The commenter, USFWS, states that for the Final EIR/EA an adaptive management program for avoidance, minimization, and mitigation based on bird mortality monitoring consistent with USFWS interim approach provided should be included. The interim approach includes species information on the recommended content of this monitoring program and additional measures to help avoid and minimize direct, indirect, and cumulative effects. USFWS goes on to state that the monitoring program should be developed for the construction and operation phases, and revised as needed, to minimize and mitigate impact while learning more about the causes of avian mortality.

As mentioned in Response 3-1, Appendix C4 of the Final EIR/EA includes a BBCS. The BBCS currently includes an adaptive management program based on guidance from the data and suggestions presented in the *USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities*, and the Avian Power Line Action Committee's *Mitigating Bird Collisions with Power Lines: The State of Art in 1994*, *Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State if the Art in 2006*. The BBCS located within Appendix C4 of the Final EIR/EA will be updated and refined based on the adaptive management program information provided by USFWS. As mentioned in the response above the BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk. Appendix C4 will be updated to include the additional avian recommendations provided by USFWS. The changes to Appendix C4 do not affect the overall conclusions of the environmental analysis relative to the significance of impacts.

Response 3-3

The commenter states that an opportunity exists to generate important information regarding the effects of the different technologies on various bird species because the proposed Project is segmented on different land parcels. The USFWS recommends implementation of a robust systematic avian and bat mortality monitoring program and offers to be available to help the County and applicant in designing a suite of various technologies and configurations amendable to comparative monitoring for adaptive management purposes.

The Project acknowledges this recommendation and will continue to work with USFWS to help develop and refine the BBCS to include the requested monitoring program.

Response 3-4

The USFWS recommends that mitigation for fatality impacts be directed toward those species and groups that suffer higher mortality as a result of the proposed Project. USFWS recommends that resources mentioned under adaptive mitigation be directed to the Sonoran Joint Venture or the Migratory Bird Conservation Fund or the National Fish and Wildlife Foundation.

The Project acknowledges this recommendation and will update the BBCS Adaptive Management Program within Appendix C4 of the Final EIR/EA to include funding for fatality impacts to migratory species and groups that suffer higher mortality as a result of the proposed Project.

Response 3-5

The USFWS states that although the proposed Project did not identify marsh/freshwater-associated birds and suitable habitat is not present on or in proximity of the Project sites, available evidence suggests these solar technologies pose an attractive nuisance to which various rail species and other water-associated birds are particularly vulnerable. The commenter, USFWS, recommends the BLM and County require the most up to date guidelines adopted by the Avian Power Line Interaction Committee.

See Response 14-24. As mentioned in the responses above, Appendix C4 of the Final EIR/EA includes a BBCS. The BBCS currently includes an adaptive management program based on guidance from the data and suggestions presented in the USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities, and the Avian Power Line Interaction Committee's Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines, and Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.

The USFWS also states that Yuma clapper rails are vulnerable to project-induced mortality posed by most or all solar energy projects in the desert. The USFWS goes on to mention that since the proposed Project is much closer to Yuma clapper rail breeding populations in the Lower Colorado River Valley than the documented fatality near Desert Center on the Desert Sunlight project; it is recommended that the Final EIR/EA address direct, indirect, and cumulative effects of the Project and appropriate mitigation measures. A review of available databases and onsite biological surveys confirmed that there is no suitable Yuma clapper rail habitat within the study area of the proposed Project and action alternatives, and that local occurrences are primarily constrained to the Colorado River (see Table 3.2.4-3 in the Final EIR/EA). Yuma clapper rail are not expected to be nesting within or in areas adjacent to the Project. Construction activity is not expected to affect Yuma clapper rail nesting or foraging activities. Therefore, the proposed Project and action alternatives would not substantially affect the residential or dispersal range of Yuma clapper rail.

As the commenter notes, Yuma clapper rail mortality was experienced at the Desert Sunlight project and at the project in Imperial County despite similar findings regarding lack of suitable habitat. Fatalities also occurred along the I-10 corridor, and along transmission lines and at perimeter fencing for other rail species. However, there is no evidence to suggest that these fatalities occurred as a result of the solar projects. Migrating birds may potentially be affected by the presence of the solar field, which may produce a PLP, indirectly impacting individuals to by causing them to veer away from appropriate habitat or attempt to land in an inappropriate place, possibly resulting in injury or mortality.

Please also note, current Mitigation Measure Biology-7 would apply to this species, and protect any nesting birds.

Biology-7 If Project construction activities cannot occur completely outside the bird breeding season, then pre-construction surveys for active nests shall be conducted by a qualified biologist within 1,200 feet of the construction zone no more than seven days before the initiation of construction that would occur between February 1 and August 15. The qualified biologist will hold a current Memorandum of Understanding with the County of Riverside to conduct nesting bird surveys. If breeding birds with active nests are found, a biological monitor shall establish a species-specific buffer around the nests for ground-based construction activities, 250 feet or 1,200 feet for raptor nests. Extent of protection will be based on proposed management activities, human activities existing at the onset of nesting initiation, species, topography, vegetative cover, and other factors. When appropriate, a no-disturbance buffer around active nest sites will be required from nest-site selection to fledging. If for any reason a bird nest must be removed during the nesting season, written documentation providing concurrence from the USFWS and CDFW authorizing the nest relocation shall be obtained. All nest removals shall occur after the nest is demonstrated to be inactive by a qualified biologist and have been shown to not result in take as defined by the Migratory Bird Treaty Act (MBTA). A Bird and Bat Conservation Strategy (BBCS) will be developed for this Project and include additional protections for avian species. The BBCS would be based on specific recommendations from the USFWS and would provide:

- a statement of the Applicant's understanding of the importance of bird and bat safety and management's commitment to remain in compliance with relevant laws;
- documentation of conservation measures BMSP would implement through design and operations to avoid and reduce bird and bat fatalities at both solar generation facilities as well as the associated gen-tie line, including consideration of bird height and wingspan requirements and use of flight diverters, perch and nest discouraging material, etc.;
- consistent, practical and up-to-date direction to BMSP staff on how to avoid, reduce, and monitor bird and bat fatalities;
- establishment of accepted processes to monitor and mitigate bird and bat fatalities;
- establishment of accepted fatality thresholds that, if surpassed, would trigger adaptive changes to management and mitigation management;
- an adaptive management framework to be applied, if thresholds are surpassed; and
- A three year post-construction monitoring study.

The BBCS would be considered a "living document" that articulates the Applicant's commitment to develop and implement a program to increase avian and bat safety and reduce risk. As progress is made through the program or challenges are encountered, the BBCS may be reviewed, modified, and updated. The initial goals of this BBCS are to:

- provide a framework to facilitate compliance with federal law protecting avian species and a means to document compliance for regulators and the interested public;
- allow the Agent to manage risk to protected bird and bat species in an organized and cost-effective manner;
- establish a mechanism for communication between BMSP managers and natural resource regulators (primarily USFWS);
- foster a sense of stewardship with BMSP owners, managers, and field engineers; and
- articulate and cultivate a culture of wildlife awareness (specifically birds and bats) and the importance of their protection.

Mitigation Measure Biology-7 would be implemented to reduce potential indirect impacts to Yuma clapper rail. The measure requires a BBCS with adaptive provisions. The BBCS would be implemented to help reduce potential impacts during construction and operation and maintenance of the gen-tie line and solar array facility. The BMSP BBCS includes baseline surveys, a three-year mortality and injury monitoring program, adaptive management, and care and transport for injured birds and bats. As a living document the BMSP BBCS would implement an adaptive management process in which impact minimization and mitigation measures are continuously reevaluated in order to improve them. Please refer to pages 16 and 17 of the Errata in Response to Comments section of this Final EIR/EA document which would the address direct, indirect, and cumulative effects of the Project to the Yuma clapper rail.

Response 3-6

USFWS states that an analysis should be performed that assesses the different degrees of vulnerability across all avian taxa and a risk assessment should be undertaken that includes quantification for take of listed and rare species. USFWS also states that post-construction monitoring should be designed to account for fatality events of rare species.

Appendix C4 of the Final EIR/EA includes a Bird and Bat Conservation Strategy and a component of this document is a Post-Construction Mitigation and Adaptive Management on page 29. The post-construction process includes an operation monitoring and wildlife reporting system that will account for rare species. Analyses were undertaken to assess the differing potential for impacts to various species, and the mitigation is designed to address impacts that arise. No federally-listed or state listed birds were detected at the Project site or are expected to find habitat at the Project site. Three non-listed special-status avian species or their sign were detected on site, including the western burrowing owl, Le Conte’s thrasher, and loggerhead shrike. The other existing solar facilities lie further from existing development than the proposed Project, and generally were constructed on undeveloped land. Because of agricultural development and general state of disturbance of the site of this proposed Project and action alternatives, the solar facility site provides little habitat for bird or bat species prior to construction. The gen-tie line extends westward through undeveloped BLM lands supporting wildlife habitats, and supports a community of desert scrub bird species and seasonal transient migrants. Mitigation Measure Biology-7 would be implemented to reduce potential indirect impacts to rare species. The measure requires a BBCS with adaptive provisions. The BBCS would be implemented to help reduce potential impacts during construction and operation and maintenance of the gen-tie line and solar array facility. The BMSP BBCS includes baseline surveys, a three-year mortality and injury monitoring program, adaptive management, and care and transport for injured birds and bats. As a living document the BMSP BBCS will implement an adaptive management process in which impact minimization and mitigation measures are continuously reevaluated in order to improve them.

Response 3-7

The USFWS recommends three alternative approaches that could be used to authorize and offset the incidental take of the Yuma clapper rail.

The Project is not expected to result in incidental take of the Yuma clapper rail. Nevertheless, the Project will work with the USFWS to determine whether any of the three alternative approaches should be pursued for this Project.

Response 3-8

The USFWS states that although mitigation measures are proposed to reduce direct effects to the lizard by salvaging individuals to reduce lizard fatalities, the Final EIR/EA did not quantify the direct loss of lizard habitat or acknowledge the indirect effects to offsite lizard habitat adjacent to and downward (east of the southwestern-most generation site parcel).

The Biological Resource Section 4.2.4 of the Final EIR/EA has been updated to include information quantifying the direct loss of habitat and potential indirect effect to habitat adjacent to and downward (east) of the southwestern-most generation site parcel. Please refer to pages 17 through 19 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these revisions to the text.

Response 3-9

The commenter states that indirect effects to the Mojave fringe-toed lizard would be caused by the disruption of eolian sand transport process to blowsand habitat (downwind) of the southwestern-most parcel of the Project site. USFWS goes on to state that construction of the proposed Project would initially eliminate suitable habitat and lizards from the site, but as eolian sand transport delivers fresh sand supplies from the west that accumulate on site, suitable habitat and lizards that move onto the Project site would be periodically eliminated if required by O&M practices.

Please refer to pages 19 through 21 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these revisions to the text to address the indirect impacts associated with the construction of the Project.

Response 3-10

The USFWS suggests that due to potential impacts to the Mojave fringe-toed lizard, the Applicant eliminate the southwestern-most parcel of the generation station.

As depicted in Figure 3.2.4-4, the Mojave fringe-toed lizard was documented along the gen-tie line routes and alternative routes. Removal of the southwestern-most parcel would not reduce the potential impact because the gen-tie line route would remain along the same path regardless if the southwestern-most parcel is removed or not. It should be noted that removal and/or relocation of the gen-tie line would not be feasible for construction of the proposed Project. However, mitigation for the proposed Project is proposed for potential impacts to the Mojave fringe-toed lizard, Biology Mitigation Measure 8, Chapter 4, p. 4-140. Please also refer to the Errata in Response to Comments section of this Final EIR/EA document which reflects revisions to the text to address the impacts associated with the construction of the Project.

The USFWS goes on to recommend a 3:1 ratio be applied should O&M practices require the periodic removal of sand accumulations on the Project site. The suggested ratio is included in Mitigation Measure Biology-8, page 4-145, of the Final EIR/EA.

Biology-8 To mitigate for permanent habitat loss and direct impacts to Mojave fringe-toed lizards the Applicant shall provide compensatory mitigation at a 3:1 ratio, which may include compensation lands purchased in fee or in easement in whole or in part, for impacts to stabilized or partially stabilized desert dune habitat (i.e., dune, sand ramp, or fine-sandy wash habitat). The Mojave fringe-toed lizard occurs within Alternatives 1, 3 and 5 gen-tie corridors and has a high potential to occur within Alternative 4 gen-tie corridor. If compensation lands are acquired, the Applicant shall provide funding for the acquisition in fee title or in easement, initial habitat improvements and long-term maintenance and management of the compensation lands.

Response 3-11

The USFWS provides specific avian recommendations within the BBCS as a result of informal consultation with the local USFWS Palm Springs Fish and Wildlife Office. The USFWS Palm Springs Fish and Wildlife Office provided specific guidance in the development of the BBCS. The guidance included following the *USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities*, and the Avian Power Line Action Committee's *Mitigating Bird Collisions with Power Lines: The State of Art in*

1994, *Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State if the Art in 2006*.

The Project will continue to informally consult with the BLM, CDFW and USFWS to review and comment on the developed BBCS located within Appendix C4 of the Final EIR/EA.

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Letter 4: State of California Governor's Office of Planning and Research State Clearinghouse and Planning Unit

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STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Edmund G. Brown Jr.
Governor

Ken Alex
Director

Memorandum

Date: June 20, 2014

To: All Reviewing Agencies

From: Scott Morgan, Director

Re: SCH # **2011111056**

Blythe Mesa Solar Project

Pursuant to the attached letter, the Lead Agency has *extended* the review period for the above referenced project to **August 4, 2014** to accommodate the review process. All other project information remains the same. 4-1

cc: Larry Ross
County of Riverside Planning Dept.
4080 Lemon Street, 12th Floor
P.O. Box 1409
Riverside, CA 92502-1409

From:	Kim Quinn <kim.quinn@powereng.com>
Sent:	Thursday, June 19, 2014 1:57 PM
To:	OPR State Clearinghouse
Subject:	Extension of the Public Review Period for the Draft EIR/EA for the Blythe Mesa Solar Project SCH #2011111056
Attachments:	County Clerk version BMSP_Notice_of_Availability_June 2014_REV revised further with 6-17 - 8-5.pdf

Attention: State Clearinghouse

Regarding: Extension of the Public Review Period for the Draft EIR/EA for the Blythe Mesa Solar Project SCH #2011111056

On behalf of the County of Riverside, POWER is informing the State Clearinghouse that the County of Riverside issued a Notice of Availability (NOA) for the Blythe Mesa Solar Project Draft Environmental Impact Report/Environmental Assessment. Due to unanticipated delays in the publication in the local newspapers, the NOA will be published June 20th rather than June 17th. The County has issued a clarification notice extending the public review period from August 1, 2014 to August 4, 2014.

Please see the revised NOA.

Please contact me with any questions or if you need additional information.

Kim Quinn
Environmental Planner

(714) 507-2730 direct
(714) 507-2713 office
(714) 507-2799 fax
kim.quinn@powereng.com

POWER Engineers
Energy • Facilities • Communications • Environmental
731 East Ball Rd. Suite 100
Anaheim, CA 92805
www.powereng.com

RIVERSIDE COUNTY
PLANNING DEPARTMENT

Juan C. Perez
Interim Planning Director

Notice of Availability of the
Draft Environmental Impact Report (EIR 529) for the
Blythe Mesa Solar Project (CUP 3685)

JUN 19 2014

DATE: June 17, 2014

TO: Agencies, Organizations, and Interested Parties

PROJECT CASE NO. /TITLE: Blythe Mesa Solar Project (EIR No. 529)/Conditional Use Permit 3685*/Public Use Permit No. 913, Development Agreement No. 79, Change of Zone No. 7831, establishment of an agricultural preserve and Williamson Act Contract Agricultural Preserve Case No. 1045 (State Clearing House No. 2011111056) (EA No. 0021)

PROJECT LOCATION: The Blythe Mesa Solar Project (Project) is located in East Riverside County – Palo Verde Area Plan, approximately five miles west of central Blythe and 40 miles east of Desert Center; more specifically, the Project is located north and south of Interstate 10, west of Neighbors Boulevard and Arrowhead Boulevard and south and east of the Blythe Airport (see exhibit entitled *Project Area - Blythe Mesa Solar Project*). The site is located south and east of the community of Nicholls Warm Springs/Mesa Verde APNs 821-110-004, 821-120-025, 821-120-026, 821-120-027, etc. (see attached sheet entitled *Assessors Parcels for Blythe Mesa Solar Project*).

PROJECT DESCRIPTION: Renewable Resources Group (Applicant), proposes to construct the Project, a solar photovoltaic (PV) electrical generating facility of up to 485 megawatt (MW) and 8.4-mile generation-tie line that would together occupy a total of 3,660 acres. A majority of the Project is within the County of Riverside jurisdiction. An approximate 334-acre portion of the 3,660-acre Project site is located within the City of Blythe jurisdiction.

The Project would likely be developed in phases that extend over several years. Pending commencement of each phase of construction, the existing agricultural lands likely would remain in agricultural production. The initial use of the Project site to be permitted under the conditional use permit will be active agricultural production. Agricultural uses are allowed uses under the entire site, but part of the site is not in an agricultural zone. To encourage agricultural use of the site to continue pending construction of solar facilities, approximately 1,249 acres would be rezoned from W-2 and N-A to A-1 (light agricultural), which would make zoning consistent throughout the solar facility. Approximately 1,485 acres, all south of Interstate 10 and representing the land not planned to be developed immediately, would be placed into an agricultural preserve under the Williamson Act. As each portion of the site is developed for solar use, any Williamson Act Contract for that portion of the site and the agricultural preserve would be cancelled. The Draft EIR/EA evaluates a construction schedule that assumes construction of the entire site within a three-year period, to ensure a conservative analysis of the most intense and concentrated construction activities reasonably possible. The information contained in the Draft EIR/EA will be considered by the County when evaluating the Applicant's Conditional Use Permit (CUP No. 3685) and Public Use Permit (PUP No. 913), Development Agreement (DA No. 79), Change of Zone application (CZ No. 7831), establishment of an agricultural preserve and Williamson Act Contract (Agricultural Preserve Case No. 1045), and potential future cancellation of the Williamson Act Contract and Agricultural Preserve. Together, these permits and applications are collectively being considered by the County as the Project. The information in the Draft EIR/EA will also be considered by the Bureau of Land Management (BLM) in its deliberations regarding approval of the right-of-way (ROW) grant, and by other federal, state, and local agencies with regard to their respective permit approvals, if any.

The Draft EIR/EA has been prepared in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA); both require consideration of a reasonable range of alternatives to the proposed Project that have the potential to feasibly attain most of the basic objectives of the Project or meet the federal purpose and need. The Draft EIR/EA analyses five alternatives. Alternative 1 (proposed Project) would consist of a solar array field utilizing single-axis solar PV trackers and panels with a combined maximum height of eight feet. Supporting facilities on-site would include up to three electrical substations, up to two operation and maintenance buildings, inverters, transformers, and associated switchgear. Since most of the site has nearly level to gently sloping topography, no mass grading would be required and the natural drainage patterns of the site would not be significantly altered. The Project site would be secured 24 hours per day by on site private security personnel or remote services with motion-detection cameras. An equestrian-wire, wildlife-friendly and drainage-compatible security fence that meets National Electric Safety Code would be placed around the perimeter of the site. The proposed lighting for the site would be consistent with County building code. A new 8.4 mile long, 230 kilovolt (kV) double-circuit generation-tie transmission line would connect the proposed Project with the approved Colorado River Substation located west of the Project site subject to Public Use Permit (3.6 miles of the generation-tie line are located within the Project site, and 4.8 miles are located off-site within a 125-foot-wide BLM ROW between the Project site and the Colorado River Substation). Under Alternative 2 (No Action/Project), the construction of a solar generating facility and associated infrastructure would not occur. Under Alternative 3 (Northern Alternative), the portion of the 230 kV double-circuit generation-tie transmission line that extends outside of the solar facility site to the Colorado River Substation would be located on the north side of the Alternative 1 generation-tie alignment and within the 125-foot ROW. Under Alternative 4, (Southern Alternative), the 230 kV double-circuit generation-tie transmission line would be located on the south side of the Alternative 1 generation-tie alignment and exit the southwestern portion of the solar array field then extend approximately four miles west to the Colorado River Substation. To facilitate this alignment, an additional 10,000 feet of 230 kV generation-tie line would need to be built within the solar array field extending south from the proposed Substation 3 and angling west to the site boundary. The generation-tie line would continue westerly off-site across 3.4 miles of BLM-managed lands and 0.6 mile of private lands before reaching the Colorado River Substation. The Draft EIR/EA also analyzes Alternative 5 (Reduced Project Alternative), which eliminates development of solar facilities north of Interstate 10. The attached exhibit entitled *Project Area - Blythe Mesa Solar Project* illustrates the proposed Project and the Northern and Southern Alternative 230 kV generation-tie line alignments.

IMPACTS OF THE PROJECT: The analyses in the Draft EIR/EA found that implementation of the proposed Project may result in significant environmental impacts to: Agriculture, Biological Resources, Cultural Resources, Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Noise, Paleontological Resources, Traffic and Transportation. As part of the proposed Project, implementation of best management practices would lessen potential impacts by avoiding, minimizing, or reducing/eliminating impacts. In addition, implementation of mitigation measures provided in the Draft EIR/EA would ensure that all potential impacts are less than significant when compared to significance criteria used in the evaluation. No unavoidable significant environmental impacts were identified for the proposed Project.

LEAD AGENCY:
Riverside County Planning Department
4080 Lemon Street, 12th Floor
P.O. Box 1409
Riverside, CA 92502-1409

PROJECT SPONSOR:
Renewable Resources Group
113 S. La Brea Ave., 3rd Floor
Los Angeles, CA 90036

PUBLIC REVIEW PERIOD: The 45-day public review period for the Draft EIR/EA will commence on June 17, 2014 and conclude on August 4, 2014 at 5:00 p.m. Comments on the adequacy of the analysis and the appropriateness of the Project may be made in writing, indicating the section of concern. The Project name and number should be noted on all correspondence and the comments should indicate if you would like to be notified of public hearings. Copies of Project documents, environmental impact report and technical appendices are available upon request.

During the public review period, written and oral comments concerning the scope of the Draft EIR/EA may be directed to:

Riverside County Planning Department
Attn: Mr. Larry Ross, Principal Planner
4080 Lemon Street, 12th Floor
P.O. Box 1409
Riverside, CA 92502-1409

FAX No.: 951-955-1811

Email: lross@rctlma.org

A copy of the document will be available on the Riverside County website at http://planning.rctlma.org/ and on the BLM website at http://www.blm.gov/wo/st/en/prog/energy/renewable_energy/active_renewable_projects.html. The document will also be available for review at the following locations:

Palo Verde Valley District Library
125 West Chanslor Way
Blythe, CA 92225

Lake Tamarisk Branch Library
43880 Lake Tamarisk Drive
Desert Center, CA 92239

Palo Verde Irrigation District
180 W. 14th Avenue
Blythe, CA 92225-2714

PUBLIC INFORMATION MEETING: In addition to offering the opportunity to submit written comments, the County of Riverside will hold a scoping meeting to discuss the proposed Project, environmental process, and provide agency representation, organizations, and interested parties the opportunity to make oral comments regarding the scope of the Draft EIR/EA. The public meeting will be held at the time and location indicated below.

Blythe Mesa Solar Project Public Meeting

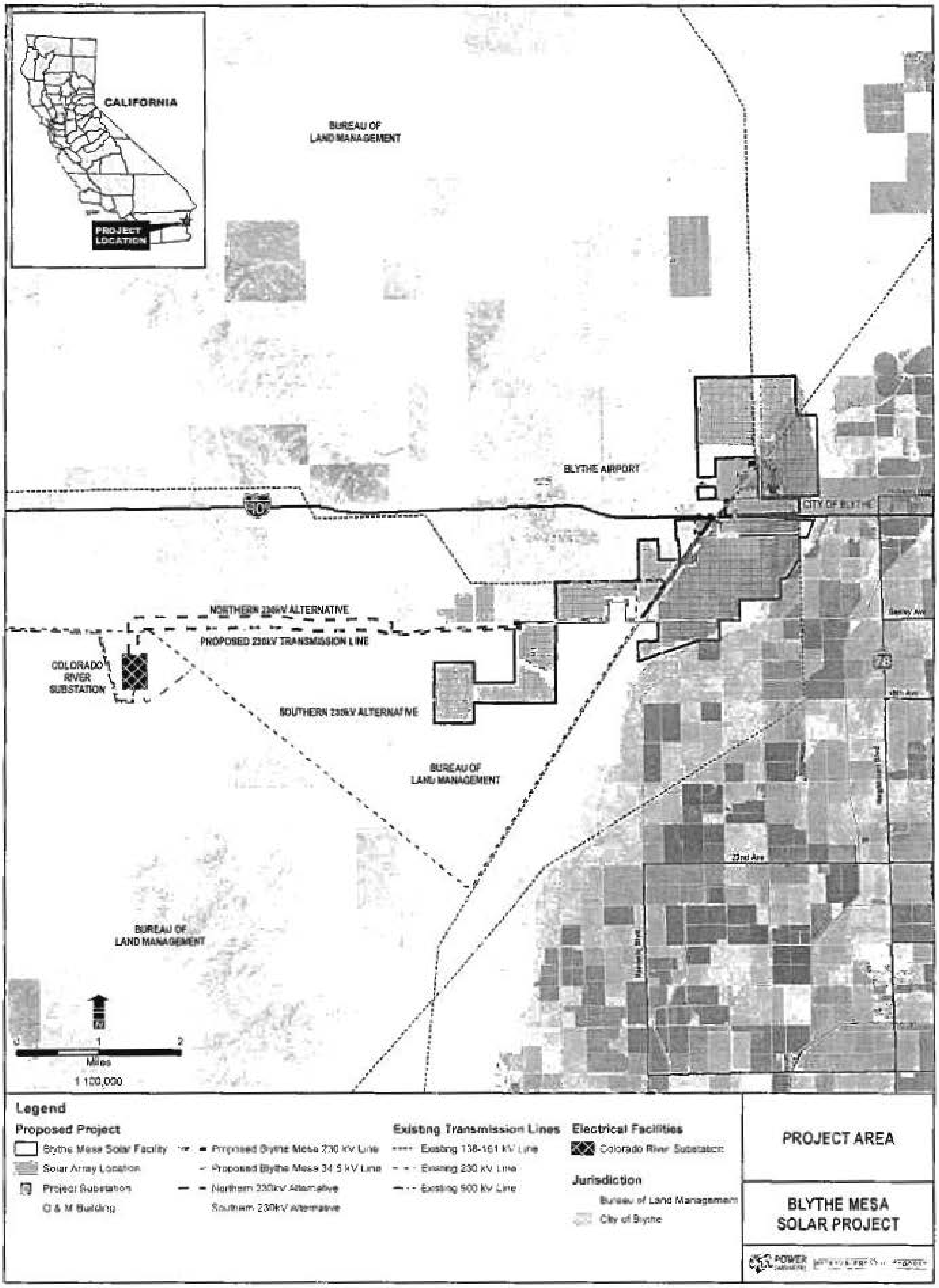
Date: July 10, 2014
Time: 5:00 p.m. to 8:00 p.m.
Location: City of Blythe Multi-Purpose Room
235 North Broadway
Blythe, CA 92225

If you have any questions please contact Larry Ross at (951) 955-9294 or email **lross@rctlma.org.**

Sincerely,
RIVERSIDE COUNTY PLANNING DEPARTMENT
Juan C. Perez, Interim Planning Director

Larry Ross, Principal Planner

*Previous Case No. CUP 3670; the Project has remained the same.



CALIFORNIA
PROJECT LOCATION
BUREAU OF LAND MANAGEMENT
BLYTHE AIRPORT
CITY OF BLYTHE
40
NORTHERN 230kV ALTERNATIVE
PROPOSED 230kV TRANSMISSION LINE
COLORADO RIVER SUBSTATION
SOUTHERN 230kV ALTERNATIVE
BUREAU OF LAND MANAGEMENT
BUREAU OF LAND MANAGEMENT
22nd Ave
0
1
2
Miles
1:100,000
Legend
Proposed Project
Blythe Mesa Solar Facility
Solar Array Location
Project Substation
O & M Building
Proposed Blythe Mesa 230 kV Line
Proposed Blythe Mesa 34.5 kV Line
Northern 230kV Alternative
Southern 230kV Alternative
Existing Transmission Lines
Existing 138-161 kV Line
Existing 230 kV Line
Existing 500 kV Line
Electrical Facilities
Colorado River Substation
Jurisdiction
Bureau of Land Management
City of Blythe
PROJECT AREA
BLYTHE MESA SOLAR PROJECT
POWER

Assessors Parcels for Blythe Mesa Solar Project

Assessor's Parcel Numbers for Solar Facility

Riverside County				City of Blythe
821110004	824102015	863040015	863100010	824101014
821120025	824102016	863040017	863100011	824101015
821120026	824130006	863040020	863100012	824101016
821120027	824130007	863040021	863100016	824101017
821120028	863030002	863050004	879090036	824102020
821120029	863030003	863050007	879090037	824102023
821120038	863030004	863050008	879090038	824102024
821120039	863030005	863050009	879090039	824102026
821120040	863030006	863060015	879090040	824102027
821120042	863030007	863060016	879090041	824110035
821120043	863030008	863060017	879090042	824110036
821120044	863030009	863060018	879090043	824110037
821120048	863030010	863070018	879090044	824110038
824080003	863030013	863070019	879090045	824122013
824080005	863030014	863070022	879090048	
824090009	863030015	863100005	879090049	
824090024	863030016	863100006	879090050	
824102013	863030017	863100008	879090051	
824102014	863040001	863100009	879110013	
			879110014	

Assessor's Parcel Numbers for Gen-tie Lines

Alternative 1 (Proposed)		Alternative 3 (Northern)	Alternative 4 (Southern)	
Riverside County	BLM	BLM	BLM	Riverside County
879080013	879080026	879080020	879080022	879080034
879080014	879080027	879080022	879080023	
879080032	879080028	879090033	879080024	
	879090035	879080025	879090033	
	879080024	879090034	879090034	
	879080022	879090031		
	879090033	879080021		
	879090034	879090035		

NOTICE OF COMPLETION & ENVIRONMENTAL TRANSMITTAL FORM

SCH# 2011111056

Project Title: Blythe Mesa Solar Project
Lead Agency: County of Riverside Planning Dept. — Contact Person: Larry Ross
Mailing Address: 4080 Lemon Street, 12th Floor, P.O. Box 1409 — Phone: (951) 955-9294
City: Riverside — Zip: 92502-1409 — County: Riverside

Project Location
County: Riverside — City/Community: City of Blythe, CA
Cross Streets: Mesa Drive and Hobson Way (in vicinity) — Zip Code: 92245
Assessor's Parcel No(s): See attached list — Section: 27 — Twp: 7S — Range: 2W — Base: San Bernardino
Latitude/Longitude: 33° 36' 80" North/ 114° 41' 40" West — Total Acres: 3,660
Within 2 miles: State Hwy#: Interstate 10 — Waterways: N/A
Airports: Blythe Airport — Railways: N/A — Schools: N/A

Document Type:
CEQA: ☐ NOP ☒ Draft EIR ☐ Early Cons ☐ Supplemental EIR ☐ Neg Dec ☐ Subsequent EIR ☐ Mit. Neg. Dec ☐ Other
NEPA: ☐ NOI ☒ EA ☐ Draft EIS ☐ FONSI
Other: ☒ Joint Document ☐ Final Document ☐ Other

Local Action Type:
☐ General Plan Update ☐ General Plan Amendment ☐ General Plan Element ☐ Community Plan
☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan
☒ Rezone ☐ Prezone ☒ Use Permit ☐ Land Division (Subdivision, etc.)
☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☒ Other: Development Agreement and Establishment of Agricultural Preserve, CUP 3685

Development Type:
☐ Residential: Units ___ Acres ___
☐ Office: Sq.Ft. ___ Acres ___ Employees ___
☐ Commercial: Sq.Ft. ___ Acres ___ Employees ___
☐ Industrial: Sq.Ft. ___ Acres ___ Employees ___
☐ Educational
☐ Recreational
☐ Water Facilities: Type ___ MGD ___
☐ Transportation: Type
☐ Mining: Mineral
☒ Power: Type Solar — Watts up to 485
☐ Waste Management: Type
☐ Hazardous Waste: Type
☐ Other:

Project Issues That May Have A Significant or Potentially Significant Impact
☒ Aesthetic/Visual ☒ Agricultural Land ☒ Air Quality ☒ Archaeology/Historical ☒ Biological Resources ☐ Coastal Zone ☐ Drainage/Absorption ☐ Economic/Jobs ☐ Fiscal
☐ Flood Plain/Flooding ☐ Forest Land/Fire Hazard ☒ Geologic/Seismic ☐ Minerals ☒ Noise ☒ Population/Housing Balance ☒ Public Services/Facilities ☒ Recreation/Parks
☐ Schools/Universities ☒ Septic Systems ☐ Sewer Capacity ☒ Soil Erosion/Compaction/Grading ☐ Solid Waste ☒ Toxic/Hazardous ☒ Traffic/Circulation ☒ Vegetation
☒ Water Quality ☒ Water Supply/Groundwater ☐ Wetland/Riparian ☐ Growth Inducing ☒ Land Use ☒ Cumulative Effects ☐ Other

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Present Land Use/Zoning/General Plan Designation: Active and Inactive Agriculture/Heavy Agricultural, Light Agriculture, Controlled Development/Agriculture and Rural Community

PROJECT DESCRIPTION: Renewable Resources Group (Applicant), proposes to construct the Project, a solar photovoltaic (PV) electrical generating facility of up to 485 megawatt (MW) and 8.4-mile generation-tie line that would together occupy a total of 3,660 acres. A majority of the Project is within the County of Riverside jurisdiction. An approximate 354-acre portion of the 3,660-acre Project site is located within the City of Blythe jurisdiction.

VC

State Clearinghouse Contact: (916) 445-0613

State Review Began: 6-16-2014

SCH COMPLIANCE: 8-4 ~~7-31~~-2014

Extended Review

Please note State Clearinghouse Number (SCH#) on all Comments

SCH#: 2011111056

Please forward late comments directly to the Lead Agency

AQMD/APCD 33

(Resources: 6/24)

Project Sent to the following State Agencies

X Resources
___ Boating & Waterways
___ Coastal Comm
___ Colorado Rvr Bd
X Conservation
X CDFW # 6
___ Delta Protection Comm
___ Cal Fire
X Historic Preservation
X Parks & Rec
___ Central Valley Flood Prot.
___ Bay Cons & Dev Comm
___ DWR
___ OES
___ Resources, Recycling and Recovery
Bus Transp Hous
X Aeronautics
X CHP
X Caltrans # 8
___ Trans Planning
___ Housing & Com Dev
___ Food & Agriculture
___ Public Health

State/Consumer Svcs
___ General Services
Cal EPA
X ARB: ALL Projects
___ ARB: Transportation Projects
___ ARB: Major Industrial Projects
___ SWRCB: Div. Financial Assist.
X SWRCB: Wtr Quality
___ SWRCB: Wtr Rights
X Reg. WQCB # 7
X Toxic Sub Ctrl-CTC
Yth/Adlt Corrections
___ Corrections
Independent Comm
X Energy Commission
X NAHC
X Public Utilities Comm
___ State Lands Comm
___ Tahoe Rgl Plan Agency

Conservancy

Response to Letter 4

Response 4-1

The commenter acknowledges the extended review period for the Blythe Mesa Solar Project SCH #2011111056 to August 4, 2014. No further response is required.

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Letter 5: State of California Governor's Office of Planning and Research State Clearinghouse and Planning Unit

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STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Edmund G. Brown Jr.
Governor

Ken Alex
Director

August 5, 2014

Larry Ross
Riverside County
4080 Lemon Street, 9th Floor
P.O. Box 1409
Riverside, CA 92502-1409

Subject: Blythe Mesa Solar Project
SCH#: 2011111056

Dear Larry Ross:

The State Clearinghouse submitted the above named Draft EIR to selected state agencies for review. The review period closed on August 4, 2014, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act. 5-1

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Document Details Report
State Clearinghouse Data Base

SCH# 2011111056
Project Title Blythe Mesa Solar Project
Lead Agency Riverside County

Type **EIR** Draft EIR

Description Note: Extended Review

Renewable Resources Group (Applicant), proposes to construct the Project, a solar photovoltaic (PV) electrical generating facility of up to 485 megawatt (MW) and 8.4-mile generating-tie line that would together occupy a total of 3,660 acres. A majority of the Project is within the County of Riverside jurisdiction. An approximate 334-acre portion of the 3,660-acre Project site is located within the City of Blythe jurisdiction.

Lead Agency Contact

Name Larry Ross
Agency Riverside County
Phone 951 955 9294 **Fax**
email jolivas@rctlma.org
Address 4080 Lemon Street, 9th Floor
P.O. Box 1409
City Riverside **State** CA **Zip** 92502-1409

Project Location

County Riverside
City Blythe
Region
Lat / Long 33° 36' 8.0" N / 114° 41' 40" W
Cross Streets Mesa Drive and Hobson Way (in vicinity)
Parcel No. 821-110-004, etc.,
Township 7S **Range** 2W **Section** 27 **Base** SBB&M

Proximity to:

Highways I-10
Airports Blythe Airport
Railways Union Pacific
Waterways Colorado River
Schools Palo Verde Valley
Land Use Active and inactive agriculture/Heavy Agricultural, Light Agriculture, Controlled Development Areas/Agriculture and Rural Community.

Project Issues Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Drainage/Absorption; Economics/Jobs; Fiscal Impacts; Geologic/Seismic; Noise; Population/Housing Balance; Public Services; Septic System; Soil Erosion/Compaction/Grading; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Landuse; Cumulative Effects; Other Issues

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Reviewing Agencies Resources Agency; Department of Conservation; Department of Fish and Wildlife, Region 6; Office of Historic Preservation; Department of Parks and Recreation; Caltrans, Division of Aeronautics; California Highway Patrol; Caltrans, District 8; Air Resources Board; State Water Resources Control Board, Division of Water Quality; Regional Water Quality Control Board, Region 7; California Energy Commission; Native American Heritage Commission; Public Utilities Commission

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Date Received 06/16/2014 **Start of Review** 06/16/2014 **End of Review** 08/04/2014

Response to Letter 5

Response 5-1

The commenter acknowledges that no state agencies submitted comments for the Blythe Mesa Solar Project SCH #2011111056 before the August 4, 2014 extension date. No further response is required.

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Letter 6: Mojave Desert Air Quality Management District

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Comment Letter 6

Mojave Desert Air Quality Management District
14306 Park Avenue, Victorville, CA 92392-2310
760.245.1661 • fax 760.245.2699
Visit our web site: http://www.mdaqmd.ca.gov
Eldon Heaston, Executive Director

June 19, 2014

Riverside County Planning Department
Attn: Mr. Larry Ross, Principal Planner
4080 Lemon Street, 12th Floor
P.O. Box 1409
Riverside, CA 92502-1409

Re: Blythe Mesa Solar Project (EIR No. 529)/Conditional Use Permit 3685/Public Use Permit No. 913, Development Agreement No. 79, Change of Zone No. 7831, establishment of an agricultural preserve and Williamson Act Contract Agricultural Preserve Case No. 1045 (State Clearing House No. 201111056)(EA No. 0021)

Dear Mr. Olivas,

The Mojave Desert Air Quality Management District (District) has reviewed the Draft Environmental Impact Report for the Blythe Mesa Solar Project. The proposed Project is a solar photovoltaic electrical generating facility of up to 485 megawatt and 8.4-mile generation-tie line that would together occupy a total of 3,660 acres. The majority of the Project is within the County of Riverside jurisdiction, with an approximately 334-acre portion located within the City of Blythe. The Project would likely be developed in phases over several years.

The District has reviewed the DEIR and concurs with the proposed BMPs and commitment to adhere to applicable District rules.

In addition to the proposed mitigation and the requirements of existing District Rules 401, 402, 403, 403.1 and 403.2 as applicable, the District recommends that the following dust mitigation measures be required on this project (enforceable by the District AND by the land use agency):

6-1

- The following signage shall be erected not later than the commencement of construction: A minimum 48 inch high by 96 inch wide sign containing the following shall be located within 50 feet of each project site entrance, meeting the specified minimum text height, black text on white background, on one inch A/C laminated plywood board, with the lower edge between six and seven feet above grade, with the contact name of a responsible official for the site and a local or toll-free number that is accessible 24 hours per day:
  "[Site Name] {four inch text}
  [Project Name/Project Number] {four inch text}
  IF YOU SEE DUST COMING FROM {four inch text}
  THIS PROJECT CALL: {four inch text}

[Contact Name], PHONE NUMBER XXX-XXXX {six inch text}
If you do not receive a response, Please Call {three inch text}
The MDAQMD at 1-800-635-4617 {three inch text}"

- For projects with exposed sand or fines deposits (and for projects that expose such soils through earthmoving), chemical stabilization or covering with a stabilizing layer of gravel will be required to eliminate visible dust/sand from sand/fines deposits. 6-1
- All perimeter fencing shall be wind fencing or the equivalent, to a minimum of four feet of height or the top of all perimeter fencing. The owner/operator shall maintain the wind fencing as needed to keep it intact and remove windblown dropout. This wind fencing requirement may be superseded by local ordinance, rule or project-specific biological mitigation prohibiting wind fencing.

The District supports the development of renewable energy sources; such development is expected to produce cumulative and regional environmental benefits.

Thank you for the opportunity to review this notice of preparation. If you have any questions regarding this letter, please contact me at (760) 245-1661 or Tracy Walters at ext. 6122.

Sincerely,

Alan J. De Salvio
Supervising Air Quality Engineer

AJD/tw

Response to Letter 6

Response 6-1

The commenter acknowledges that the District has reviewed the Draft EIR/EA document with BMPs committed to adhere to applicable District rules. The District also recommends that the following dust mitigation measures be required on this Project (enforceable by the District and by the land use agency):

The following dust control measures have been added to BMP-3 in Table 2-3, Best Management Practices, on pages 2-27 and 3-28 of the Final EIR/EA:

BMP-3.1 The following signage shall be erected not later than the commencement of construction: A minimum 48-inch high by 96-inch wide sign containing the following shall be located within 50 feet of each project site entrance, meeting the specified minimum text height, black text on white background, on one-inch A/C laminated plywood board, with the lower edge between six and seven feet above grade, with the contact name of a responsible official for the site and a local or toll-free number that is accessible 24 hours per day:

"[Site Name] {four inch text}
[Project Name/Project Number] {four inch text}
IF YOU SEE DUST COMING FROM {four inch text}
THIS PROJECT CALL: {four inch text}
[Contact Name], PHONE NUMBER XXX-XXXX {six inch text}
If you do not receive a response, Please Call {three inch text}
The MDAQMD at 1-800-635-4617 {three inch text}"

BMP-3.2 For projects with exposed sand or fines deposits (and for projects that expose such soils through earthmoving), chemical stabilization or covering with a stabilizing layer of gravel will be required to eliminate visible dust/sand from sand/fines deposits.

BMP-3.3 All perimeter fencing shall be wind fencing or the equivalent, to a minimum of four feet of height or the top of all perimeter fencing. The owner/operator shall maintain the wind fencing as needed to keep it intact and remove windblown dropout. This wind fencing requirement may be superseded by local ordinance, rule or project-specific biological mitigation prohibiting wind fencing.

These additional measures have been incorporated into the Final EIR/EA. Please refer to pages 21 and 22 of the Errata in Response to Comments section of this Final EIR/EA which reflects these changes to the text.

As detailed in the Final EIR/EA description of Project alternatives (Chapter 2), the solar facility would be enclosed with fencing that meets National Electric and Safety Code (NESC) requirements for protective arrangements in electric supply stations, such as a seven-foot-tall, equestrian-type wire fence along the perimeter (see Figure 2-11 in the Final EIR/EA).

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Letter 7: Metropolitan Water District of Southern California

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Response to Letter 7

Response 7-1

The commenter states that The Metropolitan Water District of Southern California (MWD) is concerned about potential direct and cumulative impacts on water supplies, including potential impacts on Colorado River supplies. MWD requests that the water use be monitored and reported annually to the County and BLM over the life of the Project to ensure utilization as reasonably required for beneficial use.

Please see response to comment 2-4 regarding the beneficial impact the proposed Project and action alternatives will have on water supply. As a Condition of Approval of the Conditional Use Permit for the Project (10 planning 43, titled "Water Report for MWD"), the Applicant will be required to monitor and annually report water usage during both Project construction and operation. The water usage monitoring shall be reported annually to the County and BLM over the life of the Project to ensure utilization as reasonably required for beneficial use.

Response 7-2

The commenter asks to ensure that the Colorado River water used for this Project is accounted properly. The comment notes that because this Project proposes to use Colorado River water on the Palo Verde Mesa for collectively 3,660 acres, the Project's use would reduce the remaining acreage available for further water use. The Applicant and PVID should ensure that the 3,660 acres is delineated and accounted as being included in the 16,000 acres of mesa land on which Colorado River water use is allowed.

Please see response to comment 2-4 regarding the beneficial impact the proposed Project and action alternatives will have on water supply. As demonstrated by PVID's review and acquiescence in the water supply assessment, the Project area is within the 16,000 acres of mesa land on which Colorado River water use is allowed.

Response 7-3

The commenter requests clarification with the proposed Project's use of groundwater. On page 2-19, the Final EIR/EA states that less than one ac-ft/yr of groundwater would be used for potable use in up to two operation and maintenance buildings. Conversely, Appendix G, page 10 of the Final EIR/EA states, "groundwater is not a component of the supplies for the Project."

Water supplies required for construction, operation, and maintenance of the Project would be provided by PVID water entitlements that currently support the agricultural operations on site; these operations are not currently supported by groundwater wells. The Water Supply Assessment conducted for the Project determined that adequate water supplies exist to serve the Project over the life of the Project (construction, operation and maintenance, and decommissioning). The great majority of water for the proposed Project (i.e., all of the non-potable water) would not be delivered by a public water system or using public water system connections. The proposed Project would use existing water infrastructure that currently delivers irrigation water from the PVID. Riverside County Community Service Area #122 (CSA #122) has substantiated its intention to provide this potable supply by issuing a will-serve letter for the Project's limited potable water needs. CSA #122 has provided a will-serve letter for the small amount (up to 150 gallons per day) of potable water for the two O&M buildings. The Project would result in a beneficial increase in available PVID water supply due to the reduction in water demand for the Project compared to existing agricultural use. As such, groundwater is not a component of the supplies for the Project. Please refer to page 22 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these clarifications and changes to the text.

Response 7-4

The commenter requests clarification with how PVID's water rights are defined to more accurately reflect the terms of PVID's rights pursuant to Article 6, Sections 1 and 3 of its Colorado River contract. Metropolitan requests that the text on page 3-175 of the Draft EIR/EA be revised to read:

> "Rather, their water rights are for irrigation and potable water needed to serve a gross area of 104,500 acres in the Palo Verde Valley with a first priority, and 16,000 acres on the Lower Palo Verde Mesa with a shared third priority."

The County acknowledges MWD's comment regarding clarification of how water rights are defined. Statements regarding this inconsistency have been corrected. Please refer to page 23 of the Errata in Response to Comments of this Final EIR/EA document which reflects these changes to the text.

Letter 8: Chemehuevi Indian Tribe

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Response to Letter 8

Response 8-1

The commenter states that the Chemehuevi Tribe is in receipt of the Final EIR/EA document and has no specific comment. It is noted that if evidence of cultural resources is discovered during construction/examination, all work should cease and to contact should immediately be made with the tribal representative.

Implementation of BMPs and Mitigation Measures Cultural-1 through Cultural-5 in Section 4.2.5 of the Final EIR/EA, under both NEPA and CEQA, would minimize the effects of Project-related impacts on cultural resources.

As detailed in Mitigation Measure Cultural-2 in Section 4.2.5 of the Final EIR/EA, if, during ground disturbance activities associated with construction, operation and maintenance, or decommissioning, archaeological sites are discovered that were not identified and evaluated in the archaeological survey reports or the Draft EIR/EA conducted prior to Project approval, and the following procedures shall be followed.

Cultural-2 The County advocates avoidance as the preferred choice, and the BLM requires that the development of a discovery plan (see Cultural–3) must occur prior to project construction. If, during ground disturbance activities associated with construction, operation and maintenance, or decommissioning, archaeological sites are discovered that were not identified and evaluated in the archaeological survey reports or the Final EIR/EA conducted prior to Project approval, and the following procedures shall be followed.

1) All ground disturbance activities within 100 feet of the discovered archaeological resource shall be halted until a meeting is convened between the developer, the Project archaeologist, the Native American tribal representative, the BLM, and (on non-federal land) the County archaeologist to discuss the significance of the find.
2) At the meeting, the significance of the discoveries shall be discussed in consultation with the Native American tribal representative and the Project archaeologist. The BLM alone shall determine the appropriate treatment for cultural resources on BLM-managed lands. The County Archaeologist and the BLM together shall determine the appropriate mitigation (documentation, evaluation, recovery, avoidance, etc.) for cultural resources on private lands. In determining the appropriate treatment on private land, the BLM shall follow requirements of 36 CFR 800.13 for post-review discoveries and the County Archaeologist shall implement CEQA Guidelines Section 15126.4(b) regarding mitigation related to impacts on historical resources and CEQA Guidelines Section 15064.5(c) and 21083.2(g) regarding archaeological resources.
3) Further ground disturbance shall not resume within the area of the discovery until a meeting is convened with the aforementioned parties and a decision is made with the concurrence of the BLM and (on private land) the County Archaeologist as to the appropriate preservation or mitigation measures. The Applicant shall comply with the determinations of the County Archaeologist and BLM.

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Letter 9: Soboba Band of Luiseno Indians

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Response to Letter 9

Response 9-1

The Soboba Band of Luiseno Indians commented on the Draft EIR/EA via written correspondence dated July 15, 2014. The letter was addressed to the consultant and not the County or BLM. The commenter requests that the Applicant initiate consultation and a face-to-face consultation meeting with the Soboba Band of Luiseno Indians.

The Applicant contacted Joseph Ontiveros, Director of Cultural Resources to follow up on the meeting request, but did not hear back from the commenter.

The BLM conducted a government-to-government consultation with the Soboba Band of Luiseno Indians on August 6, 2014, and will continue to involve that tribe as it moves forward.

It should also be noted, on March 12, 2012, the BLM formally invited 15 (listed in first bullet below) federally recognized tribes to consult on a government-to-government basis for the proposed Project, as provided in the Executive Memorandum of April 29, 1994, Executive Order 13175, and Sections 101 and 106 of the National Historic Preservation Act (NHPA):

- Agua Caliente Band of Cahuilla Indians, Augustine Band of Cahuilla Indians, Cabazon Band of Mission Indians, Cahuilla Band of Mission Indians, Chemehuevi Indian Tribe, Cocopah Indian Tribe, Colorado River Indian Tribes, Fort Mojave Indian Tribe, Fort Yuma Quechan Tribe, Morongo Band of Mission Indians, Ramona Band of Mission Indians, San Manuel Band of Mission Indians, Soboba Band of Luiseno Indians, Torres-Martinez Desert Cahuilla Indians, Twenty-Nine Palms Band of Mission Indians
- All of these federally recognized tribes were invited to be consulting parties.
- The BLM has received formal responses from four Indian tribes regarding their interest in the Project, comments on the EA, and/or requests to consult in a government-to-government manner. These four tribes are Agua Caliente Band of Cahuilla Indians, the Augustine Band of Cahuilla Indians, the Colorado River Indian Tribes, and the Soboba Band of Luiseno Indians.

Consistent with policy, the BLM notified and formally requested consultation with Indian tribes at the earliest stages of the project planning and review by letter on March 12, 2012, and has formally reiterated requests to consult in all subsequent correspondence. The BLM formally notified Indian tribes of its determinations of eligibility and finding of no adverse effect to historic properties for the Project by letter on August 8, 2013. The BLM Field Manager and staff have actively responded to all requests to meet with tribal leaders and staff at tribal offices throughout project review.

The primary issues of concern identified through consultation are focused on adverse effects to historic properties, including archaeological, religious and culturally significant properties. Through consultation, the BLM found that the BMSP will have no adverse effect to historic properties.

Response 9-2

The commenter requests that the Soboba Band of Luiseno Indians continue to act as a consulting tribal entity for this Project and that includes the transfer of information to the tribe regarding the progress of the Project as soon as new developments occur.

The County and BLM agree to keep the Soboba Band of Luiseno Indians informed regarding the progress of the Project as soon as new developments occur during all phases of ground disturbing activities; including construction and decommissioning of the Project. This requirement is a County Condition of

Approval (Planning 6 Use – Native American Monitor) of the Conditional Use Permit for the proposed Project. Mitigation Measure Cultural-4 has been revised to ensure Native American Tribes would be informed of Project developments; please refer to page 24 of the Errata in Response to Comments section of this Final EIR/EA.

Response 9-3

The commenter requests that Native American Monitor(s) from the Soboba Band of Luiseno Indians Cultural Resource Department be present during any ground disturbing proceedings, including surveys and archaeological testing.

As detailed in Mitigation Measure Cultural-4 in Section 4.2.5 of the Final EIR/EA, prior to any ground disturbances within the Project area, the Applicant shall, for a period of at least 60 days, make a good faith effort to enter into a contract with and retain monitors designated by Tribal representatives (this includes the Soboba Band of Luiseno Indians). These monitors shall be known as the Tribal Observer for this Project.

The following condition will be been placed on the Project by the County of Riverside. This requirement is a County Condition of Approval (Planning 6 Use – Native American Monitor) of the Conditional Use Permit for the proposed Project.

> Prior to the issuance of grading permits, the developer/permit applicant shall enter into a contract and retain a Native American monitor(s). The contract shall address the treatment and ultimate disposition of cultural resources which may include repatriation and/or curation in a Riverside County approved curation facility. It should be noted that Native American Monitoring is not required for CEQA mitigation on this project as monitoring by a qualified Archaeologist is required for such mitigation. However, it is recommended the developer/permit holder require a monitoring report be prepared by the Native American Monitor(s), to be submitted to the Project Archaeologist for incorporation in their monitoring report, as a term of their contract.
>
> The Native American Monitor shall be allowed on-site during all initial ground disturbing activities and excavation of each portion of the project site including clearing, grubbing, tree removals, grading, trenching, stockpiling of materials, rock crushing, structure demolition and etc. The Native American Monitor shall have the limited authority to temporarily divert, redirect or halt the ground disturbance activities to allow identification, evaluation, and potential recovery of cultural resources in coordination with the appropriate Cultural Resources Professional such as an Archaeologist, Historic Archaeologist, Architectural Historian and/or Historian.
>
> The developer/permit applicant shall submit a fully executed copy of the contract to the County Archaeologist to ensure compliance with this condition of approval. Upon verification, the County Archaeologist shall clear this condition.
>
> NOTE: 1) The Cultural Resources Professional is responsible for implementing mitigation and standard professional practices for cultural resources. The Professional shall coordinate with the County, developer/permit applicant and SI Monitors throughout the process. 2) Native American monitoring does not replace any required Cultural Resources monitoring, but rather serves as a supplement for coordination and advisory purposes for all groups' interests only. 3) The developer/permit applicant shall not be required to further pursue any agreement for special interest monitoring of this project if after 60 days from the initial attempt to secure an agreement the developer/permit applicant, through demonstrable good faith effort, has been unable to secure said agreement from the Native American Monitor(s). A good faith effort shall consist of no less

than three written attempts from the developer/permit applicant to the tribe to secure the required special interest monitoring agreement and appropriate e-mail and telephone contact attempts. Documentation of the effort made to secure the agreement shall be submitted to the County Archaeologist for review and consideration. 4) Should repatriation be preferred, it shall not occur until after the Phase IV monitoring report has been submitted to the Riverside County Archaeologist. Should curation be preferred, the developer/permit applicant is responsible for all costs.

This agreement/contract shall not modify any condition of approval or mitigation measure.

Response 9-4

The commenter requests that proper procedures are taken and requests of the tribe be honored as detailed in the attached pages of the comment letter from the Soboba Band of Luiseno Indians. Specifically, procedures for Cultural Items (Artifacts), Treatment and Disposition of Remains, Coordination with County Coroner's Office, and Non-Disclosure of Location Reburials are detailed. The detailed procedures shall be administered, as applicable to the Project.

Please refer to the Mitigation Measures Cultural-1, Cultural- 2 and Cultural-3, provided in Section 4.2.5 of the Final EIR/EA document.

Procedures for Treatment and Disposition of Remains:

Cultural-1 The BLM and the County of Riverside shall ensure that any human remains encountered during the course of construction are treated in a respectful manner and consistent with applicable law. No construction activities will be allowed within 100 feet of the discovery site of human remains until a Notice to Proceed is provided by the BLM or the County as appropriate.

In the case where human remains are inadvertently uncovered on federal land, the BLM will consult in accordance with 36 CFR 800.13. Reasonable and good faith efforts shall be made by the BLM to identify the appropriate Native American Indian tribes, group(s) and individuals, or other ethnic group(s) and individuals, related to the burial, and consult with them concerning the treatment of the remains. Native American human remains, associated grave goods, or objects of cultural patrimony discovered on federal lands will be treated in accordance with the requirements of NAGPRA. The BLM will direct its consultation regarding Native American human remains to specified federally recognized tribes with cultural affiliation to the project area. The BLM may invite consultation with non-federally recognized tribes, groups and individuals at its discretion. Regarding the disposition of human remains, Native American Concurring Parties will be consulted regarding the removal (if necessary) and reburial of the remains. Tribal elders, Most Likely Descendants and other persons identified by tribes will be consulted to determine what options are acceptable to Native Americans. It is understood that such options will be generally consistent with applicable state and federal laws, depending on jurisdiction.

If human remains are discovered on non-federal lands, the County of Riverside shall ensure that the human remains will be treated in accordance California Health and Safety Code Section 7050.5 and any other applicable state law. No construction activities will be allowed within 100 feet of the discovery until a Notice to Proceed is provided by County environmental department lead(s). The County will consult with the California Native American Heritage Commission to seek the advice of the Commission in such matters as determining which tribes, groups and individuals have standing as cultural participants or as Most Likely Descendants. Should any dispute arise the County will request that the NAHC act to mediate the dispute.

Procedures for Cultural Items (Artifacts):

Cultural-2 The County advocates avoidance as the preferred choice, and the BLM requires that the development of a discovery plan (see Cultural–3) must occur prior to project construction. If, during ground disturbance activities associated with construction, operation and maintenance, or decommissioning, archaeological sites are discovered that were not identified and evaluated in the archaeological survey reports or the Final EIR/EA conducted prior to Project approval, and the following procedures shall be followed.

1) All ground disturbance activities within 100 feet of the discovered archaeological resource shall be halted until a meeting is convened between the developer, the Project archaeologist, the Native American tribal representative, the BLM, and (on non-federal land) the County archaeologist to discuss the significance of the find.
2) At the meeting, the significance of the discoveries shall be discussed in consultation with the Native American tribal representative and the Project archaeologist. The BLM alone shall determine the appropriate treatment for cultural resources on BLM-managed lands. The County Archaeologist and the BLM together shall determine the appropriate mitigation (documentation, evaluation, recovery, avoidance, etc.) for cultural resources on private lands. In determining the appropriate treatment on private land, the BLM shall follow requirements of 36 CFR 800.13 for post-review discoveries and the County Archaeologist shall implement CEQA Guidelines Section 15126.4(b) regarding mitigation related to impacts on historical resources and CEQA Guidelines Section 15064.5(c) and 21083.2(g) regarding archaeological resources.
3) Further ground disturbance shall not resume within the area of the discovery until a meeting is convened with the aforementioned parties and a decision is made with the concurrence of the BLM and (on private land) the County Archaeologist as to the appropriate preservation or mitigation measures. The Applicant shall comply with the determinations of the County Archaeologist and BLM.

Cultural-3 Prior to obtaining the Project-related grading permit from the County of Riverside, the Applicant shall have the Secretary of the Interior Qualified/County-approved Project Archaeologist prepare and submit for approval to the BLM and the County of Riverside a CRMP. The CRMP shall map all cultural resources within the APE, as described in this Final EIR/EA. The CRMP must conform with BLM Measure #5, #6, #7 and #8 as found in the determination and findings document provided to SHPO dated August 7, 2013 (BLM 2013). The CRMP shall also detail how resources, if any, are determined eligible or resources that are unevaluated but avoided by Project design, would be marked and protected as Environmentally Sensitive Areas during construction. The CRMP shall also map additional areas that are considered to be of high sensitivity for discovery of buried significant cultural resources, including burials, cremations, or sacred features. The CRMP shall detail provisions for monitoring construction in these high-sensitivity areas. It shall also detail procedures for halting construction, making appropriate notifications to agencies, officials, and Native American tribes, and assessing NRHP and CRHR eligibility in the event that unknown archaeological resources are discovered during construction. For all post-review discoveries, the CRMP shall detail the methods, consultation procedures, and timelines for implementing Mitigation Measures Cultural-1 and Cultural-2. The CRMP shall be presented to all construction personnel, with Native

American Participants in attendance, in the form of a worker education program by the Project Archaeologist prior to commencement of groundbreaking. During subsequent Safety Meetings on the job site, the Project Archaeologist and/or his qualified representative shall inform all new construction personnel of the cultural resources issues associated with the Project.

Coordination with County Coroner's Office:

See above, Cultural-1.

Non-Disclosure of Location Reburials:

See above, Cultural-1.

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Letter 10: La Cuna de Aztlan Sacred Sites Protection Circle

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Response to Letter 10

Response 10-1

The commenter references the destruction of sacred cultural resources on the Genesis solar site. The comment further states that the solar projects cannot destroy just one sacred resource without destroying the sacredness of the entire area.

Tribal representatives will be allowed to monitor construction efforts as outlined in Responses 8-1 and 9-3 regarding tribal monitoring of Project construction and activities. As explained in the cumulative impact analysis for cultural resources in the Final EIR/EA, the past, present, and reasonably foreseeable projects considered to be the cumulative scenario for the Project are listed in Table 4.1-1 of the document. The geographic extent of these projects in relation to the BMSP is shown in Figure 4.1-1 of the Final EIR/EA, which includes a number of the large-scale renewable energy projects and related transmission lines and also includes some small-scale land development projects. Each of these projects would result in ground disturbance, primarily during Project construction that could damage or destroy archaeological sites; however, ground-disturbing activities during operation and maintenance and decommissioning could also potentially affect cultural resources.

Cultural resources are non-renewable; any loss or physical damage to these resources is considered permanent. They would be subject to direct impacts primarily during Project construction; however, impacts could occur during any ground-disturbing activities during operation and maintenance and decommissioning. For purposes of the cumulative analysis, the temporal impact scope is the life of the Project.

The cultural resource survey document(s) written in support of the Project state that significant cultural resources should be avoided. NRHP and CRHR eligibility of cultural resources identified with the Project APE was evaluated, in part, by considering their potential to address various research questions under NRHP Criterion D/CRHR Criterion 4 (POWER 2013a). These questions, presented in the archaeological and built environment inventory reports for the Project (refer to Appendix D1 and D2 of the Final EIR/EA) included:

- Do diagnostic artifacts from sites in the Project area occur in sufficient numbers and in suitable contexts to allow reliable cross-dating with archaeological sites elsewhere in the Palo Verde Valley/Colorado Desert area?
- Do artifacts and other evidence from archaeological sites indicate Paleoindian, Archaic or Late Prehistoric period occupation or use of the Project area?
- Can the characteristics and contexts of ceramics in the Project area allow further refinement of chronological change within the Late Prehistoric Patayan Complex?
- Did chronological variation in the types of resources exploited reflect environmental change, technological change, or fluctuations in the size and distribution of the human population?
- Do archaeological sites in the Project area represent base camps, temporary camps, or specific task-related loci?
- What environmental variables (e.g., water, natural habitats) influenced the use of the site or the distribution of the human population?
- Are the distribution of prehistoric sites and the contents of the sites associated with known prehistoric trails?
- Is there evidence of early European (i.e., Spanish) activity at archaeological sites in the Project area?

- Do any archaeological sites in the Project area contain artifacts or other evidence suggesting eighteenth- or nineteenth-century occupation by Native Americans?
- How did Native American and Euroamerican populations interact, and how did this interaction change as Euroamerican population increase?
- How did the subsistence practices of Native Americans in the Project area change after Euroamericans land use practices had altered the distribution and abundance of natural resources?
- How did the introduction of Euroamerican agriculture and domesticated animals affect the artifact assemblages found at Native American sites?
- How did the Euroamerican mining and transportation activities affect traditional tribal practices?
- How were land improvements first made under the Homestead Act and Desert Land Act affected by later development of extensive irrigation systems in the Blythe area?
- Did historic settlement and use of the Project area change as transportation into the Blythe area improve?
- Did the reduced incidence of flooding brought on by the construction of Boulder Dam in the 1930s affect land use in the Project area?
- Are there differences in the location and contents of archaeological resources associated with the DTC/C-AMA and those associated strictly with Blythe Army Air Base (BAAB) after it was no longer tied to the DTC/C-AMA?

Using these research questions as a guide, it was determined that none of the cultural resources identified within the APE for Alternative 1 had potential to yield information important in prehistory or history (NRHP Criterion D/CRHR Criterion 4) and, therefore, they were not considered significant. The County of Riverside, the BLM and State Historic Preservation Office (SHPO) have agreed with this opinion.

In some cases (e.g., P-33-018837, BAAB; P-33-019999, a historic refuse scatter), past farming and construction activities or demolition had seriously compromised the integrity of the resource. Other cultural resources in the APE (e.g., historic transmission lines, P-33-012532 and P-33-014083; a prehistoric pot drop, P-33-020001; surface concentrations of cans, glass and other twentieth century debris; and isolated artifacts) contain very little information beyond that obtained by simply recording the site. Other sites (e.g., sparse historic trash scatters, P-33-019996, P-33-020000) had a very low density of artifacts with limited potential to produce information important in prehistory or history.

The construction, operation and maintenance, and decommissioning of the proposed Project would not affect any historic properties under Section 106 of the NHPA nor would the proposed Project impact resources under NEPA. Under CEQA, the proposed Project would not impact any known historical resources, unique archaeological resources or human remains. Unanticipated impacts/effects could occur to previously undiscovered cultural resources, but these potential impacts would be mitigated for by implementing construction monitoring and other procedures.

Cumulatively, of the projects listed in Table 4.1-1 of the Final EIR/EA, it is likely that some of these projects would adversely affect cultural resources that might yield information important to addressing research questions similar to those listed above. Some of the projects are far from BAAB (P-33-018377) and would have no potential to affect that particular resource. On the other hand, some of the projects would have greater potential than Alternative 1 to adversely affect other World War II-era resources, such as those associated with the DTC/C-AMA. Most of the project areas in Table 4.1-1 of the Final EIR/EA probably contain isolated finds, low density can scatters, and prehistoric pot drops that are often found to be not eligible to either the NRHP or CRHR. On the other hand, depending on the specific locations, unlike Alternative 1, some projects could adversely affect eligible prehistoric habitation sites, quarries, or trails, and some projects could directly or indirectly adversely affect prehistoric and historic landscapes and resources of special importance to Native American groups. Though the implementation of cumulative projects could collectively impact cultural resources in the geographic area, the proposed Project is not expected to contribute to this cumulative impact because no known eligible resources would be impacted by the Proposed Project (Alternative 1).

Response 10-2

The commenter states that the Blythe Solar and McCoy projects are some of the worst heinous modern day crimes committed against humanity in the world and it is occurring where the human spirits descend from the cosmos to earth.

Please see Response 10-1.

Response 10-3

The comment states the California Energy Commission's (CEC) cultural resources investigation had found an abundance of cultural resources as stipulated in their report and the CEC has not respected nor honored its own research or the BLM's despite all our touring with them of the sacred sites and describing what they mean in the human creation story.

The CEC investigated the Genesis Solar Project, and not the proposed Project. The CEC has no approval authority over the proposed Project and is not involved in evaluating the impacts of the proposed Project. With reference to the findings published by the CEC for the Genesis Solar Project to which the commenter refers the CEC staff found that the loss of important cultural resources as a result of Genesis project construction was considerable and that loss could only be partially, but not totally, mitigated. The quote by Bagwell and Bastian was part of a lengthy cumulative discussion and was associated with a region-wide worst-case construction scenario. The CEC’s analysis of the Genesis Project was challenged in court, a court upheld the CEC’s determinations and the project was constructed (NREL 2014). The court’s decision considered all evidence, including that related to cultural resource impacts, and found that the CEC had approved the project using all legally appropriate means. In addition, none of the cultural resources located within the Genesis Solar project footprint extend directly into the proposed Project area. Therefore, the proposed Project will not adversely impact the significant cultural resources found within the footprint of the Genesis Project far to the west (CECb 2010).

Response 10-4

The commenter states that the Project will destroy remnants of what is the North/South Quechan trail that begins at Avi Kwame-Spirit Mountain north of Laughlin Nevada and ends in Yuma in the south. The Mesa site will also destroy the four circles that represent the four suns as shown in the Aztec Sunstone calendar and other geoglyphs which are south of l-l0 and west of Mesa Verde.

The location of Quechan trails is depicted on Figure 2 (page 45 of Cleland’s report) (Cleland 2004). Cleland created the figure on page 45 using many of the original ethnographic sources (Baksch 1995, 1997; Johnson 1985, 2001; Raven and Raven 1986) that have been repeatedly referenced over the years by archaeologists, ethnographers and tribal authorities. Figure 2 places two trails running southbound in the Blythe region on the west side of the Colorado River, and these are assumed to be part of a network of cosmologically significant trails for the Quechan and other Peoples. The trails on Figure 2 run between Pilot Knob and Avi Kwame, and is discussed by the commenter, however this map is not designed to portray exactly the locations of these trails due to scale. The studies Cleland cites may show such trails at an appropriate scale, but these were not encountered during the cultural resource records search for the proposed Project, and were not cited by POWER. Also they are not available on-line. One of the trails plotted by Cleland runs due south through the center of Blythe approximately 1-2 kilometers west of the Colorado River. The other trail appears to arc over the I-10 Freeway approximately 10 kilometers west of the center of Blythe or just east of the Project area. This trail appears to be located inside the agricultural zone. As far as how agriculture impacts prehistory trails, one merely has to review (Bryne 2011) to anticipate the effects plowing and irrigated field development will have on a prehistoric trail system. Any trails crossing the solar array facility would have been destroyed long ago, and no trails are mapped crossing the proposed gen-tie line.

Response 10-5

The commenter states that over 250 permanent jobs of the citrus farm workers that live in the Palo Verde Valley area have been displaced. The comment further states the solar power projects have destroyed all but a few existing acres of citrus orchards on the Mesa and that the farm workers were all permanent residents of the Palo Verde Valley; Blythe has lost population according to the census and the Palo Verde Unified School District; and currently the Palo Verde Valley is suffering the highest unemployment rate per capita in California with the exception of the Imperial Valley.

Approximately 1,185 acres of the Project area is planted in citrus. The property was acquired in April 2011, and the Seller was retained as a farm tenant to continue their existing citrus operations. In June 2013, the landowner received notice that the tenant was filing bankruptcy and could no longer continue citrus operations. The citrus farming has since ceased. The landowner is unaware of the total number of workers that were displaced from the citrus operations since the tenant managed the citrus farm and all of the labor associated with the operations.

The proposed Project would have beneficial socioeconomic impacts during construction and operation in terms of job creation, expenditures, and tax revenues. In fact, the positive incremental impacts of the Project, including job creation, expenditures, and tax revenues, would combine with the similar positive socioeconomic impacts from other present and reasonably foreseeable future projects in the Project vicinity (Table 4.1-1 of the Final EIR/EA) to create even greater positive cumulative impacts to the local economy.

Construction of the present and reasonably foreseeable future projects may overlap with construction of the proposed Project. Construction of the Devers-Palo Verde No. 2 transmission line, including the new SCE Colorado River Substation, is expected to be complete and in service by the third quarter of 2013, prior to anticipated commencement of Project construction in the fourth quarter of 2013. The CEC Decision for BSPP analyzed average and peak construction labor needs by construction craft for the BSPP, Palen Solar Power Project, Genesis Solar Energy Project, and Desert Sunlight Solar Farm and compared them to the available labor force for these projects. This analysis determined that these projects would have total peak monthly labor needs of 4,189 workers and total peak monthly local housing needs of 562 housing units. The proposed Project would have peak monthly labor needs of 500 workers.

Response 10-6

The commenter states that due to the heat intensity generated by the project, it will change the atmospheric conditions and a lot of the agriculture in the Palo Verde Valley will be affected.

Section 2.1.2, *Insolation*, on page 2-1 of the Final EIR/EA states,

> The amount of the sun’s heat absorbed by a solar panel is similar to the amount of the sun’s heat absorbed by the earth. Solar panels, however, store less heat than the earth. A solar panel is thin—the glass is approximately 3.0 millimeters (0.12 inch) in thickness—lightweight, and surrounded by airflow (because it is mounted above the ground).

> Therefore, heat dissipates quickly from a solar panel. The normal operating condition temperature for solar panels would be 20 degrees Celsius (°C) or 68 degrees Fahrenheit (°F) above ambient temperature, and so a typical summer day at 40°C (104° F) results in panel temperatures of approximately 60°C (140°F). When accounting for irradiance, wind, and module type, it is expected that the peak module temperatures would be between 35°C and 40°C (95°F and 104°F). Although the panels would be hot to the touch, the temperature below the panels would be nearly the same as ambient temperatures in the ordinary shade.

There is no evidence to suggest that the proposed PV solar panels would reflect significant amounts of heat resulting in a change in atmospheric conditions. The concerns regarding increased temperature are speculative.

Response 10-7

The commenter states that large solar panel projects in China are being protested because they have not only contaminated their drinking water but also the climate change has ruined their agriculture industry.

See Response 10-6 relative to heat from solar panels. In response to this comment relative to water, please see Response 2-4 regarding the beneficial impact of the proposed Project on water supply. Section 4.2.9, *Hydrology and Water Quality*, of the Final EIR/EA discusses potential impacts to water resources and mitigation required to reduce impacts to less than significant. With implementation of the Project BMPs and Mitigation Measures Hydrology-1 through Hydrology-4, potential hydrology and water quality impacts would be reduced to a less than significant level. Furthermore, the CEQA process is specific to California and the NEPA process is specific to the United States; there is no evidence to suggest that China has comparable rules and regulations which to evaluate project impacts and provide appropriate mitigation if necessary.

Response 10-8

The commenter states that the Blythe Mesa Solar Power Project will need a lot of water and will have to drill wells from aquifers that lead to the Colorado River.

Please see response to comment 2-4 regarding the beneficial impact of the proposed Project on water supply. The Project would have limited water needs during construction (i.e., for dust suppression and other construction needs) and operation (for maintenance needs). While water would be utilized during Project construction activities, the construction of new or expansion of existing, public water facilities would not be required. During operation and maintenance, potable drinking water would be supplied by County CSA #122 and non-potable water to clean the solar panels would be supplied by the PVID; while water would be utilized during operation, construction of new or expansion of existing public water facilities would not be required. As stated in Section 4.2.9, *Hydrology and Water Quality*, on page 4-246 of the Final EIR/EA, "It is assumed that Project construction would not involve the use of groundwater pumped from existing wells on-site."

Response 10-9

The commenter states that the solar power projects create a dramatic atmospheric change. This is not just a threat to the planes but also to all flying birds, etc. The commenter also states that the Blythe Airport is opposed to solar power project built around the airport.

In response to this comment relative to heat from solar panels, there is no evidence to suggest that the proposed PV solar panels would reflect significant amounts of heat resulting in a change in atmospheric conditions. The concerns regarding increased temperature are addressed in Response 10-6.

In April 2012, the Riverside County ALUC found the Project (Conditional Use Permit No. 3670) to be consistent with the RCALUCP. The ALUC Development Review letter is included as Appendix N of the Final EIR/EA. In addition, the FAA provided a "No Hazard to Air Navigation" determination for the 230 kV gen-tie line structures.

A glare study was completed to determine if glare would be visible from the landing approach of the four utilized runways at the Blythe Municipal Airport and the proposed lengthened section of Runway 8. Potential glare issues were studies along six landing approach scenarios. The Riverside ALUC provided *45 Vol. 3 Blythe Municipal.pdf* which was utilized in developing the 3D geometry of the landing approaches.

Simulations were developed for each landing approach at the Blythe Airport to study glare from the single-axis solar trackers that are proposed for the Project. Visual analysts studied the 3D simulation under different lighting conditions and at different times of the year.

The 3D geometric analysis (refer to the Glare Study in Appendix K) determined glare would be limited to westerly views for aircraft approaching Runway 26 and northerly views for aircraft approaching Runway 35. For Runway 26, glare may be present mid-morning and just before sunset, year-round with varying lengths of duration. Duration of glare ranged from 0.5 hour to 4.5 hours, depending on angle of descent and angle of approach to the runway. Glare for air traffic approaching Runway 35 would be limited to one hour or less at sunrise, and one hour or less at sunset during summer months only. Pilots approaching Runway 35 may experience glare during summer months in a northeasterly direction for one hour or less at sunrise (between the hours of 5:00 a.m. and 6:00 a.m.), and again in a northwesterly direction for one hour or less at sunset (between the hours of 7:00 p.m. and 8:00 p.m.). This glare is not concentrated and would be similar to or lesser in intensity to that experienced by pilots making airport approaches or takeoffs over bodies of water. Therefore, the analysis in Section 4.2.1, *Aesthetics, Visual Resources, and Reflection*, determined that impacts related to light and glare would be less than significant.

Response 10-10

The commenter states that the heat created from the solar power towers of the Ivanpah plant creates up to 800 degree temperatures and now the company has trained dogs to retrieve birds that perish while flying above the solar power plant.

The Ivanpah Solar Plant uses a heat-based technology, which is different than the PV technology of the proposed Project. Ivanpah is a 400 megawatt net solar complex comprising approximately 4,000 acres using mirrors to focus the power of the sun on solar receivers atop power towers. Ivanpah development includes three solar concentrating thermal power plants, which are comprised of fields of heliostats (elevated mirrors guided by a tracking system) focusing solar energy on boilers located on centralized power towers. Each heliostat tracks the sun throughout the day and reflects the solar energy to the receiver boiler. In each plant, one Rankine-cycle reheat steam turbine receives live steam from the solar boilers and reheat steam from the solar reheater.

In contrast to the Ivanpah Project, the Blythe Mesa Solar Project does not include the use of "power towers". As stated in Section 2.2.1, *Project Facilities*, on page 2-5, the Project would utilize single-axis PV trackers with approximately 1,425,600 high-efficiency, PV solar panels. As discussed above in

Response 10-6, although the panels would be hot to the touch, the temperature below the panels would be nearly the same as ambient temperatures in the ordinary shade.

Response 10-11

The commenter states that the Monarchs, along with any other butterflies flying through the area will be completely destroyed as will the birds such as the eagles, herons, etc.

Refer Section 4.2.4, *Biological Resources*, of the Final EIR/EA.

Conservation strategies for avian species have been established for the proposed Project. Appendix C4 of the Final EIR/EA includes a Bird and Bat Conservation Strategy (BBCS). The BBCS has been developed with consideration and guidance from the data and suggestions presented in the USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities and the Avian Power Line Interaction Committee's Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines, and Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. The USFWS provided additional details on the interim guidelines for bird mortality monitoring. As part of the adaptive management process outlined in the BBCS, Appendix C4 of the Final EIR/EA, BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk. As progress is made through the program or challenges are encountered, the BBCS may be reviewed, modified, and updated.

In addition, Section 4.2.4, *Biological Resources*, pages 4-103 through 4-105 of the Final EIR/EA, provides an analysis of direct and indirect impacts to migratory birds. The Final EIR/EA acknowledges that the proposed Project would potentially result in impacts to bird populations on the solar facility site. However, Mitigation Measures Biology-1 (Monitor Construction Site for Biological Compliance) and Biology-7 (Protect breeding birds) and, as a part of Biology-7, a BBCS would be implemented to help reduce potential impacts during construction and operation and maintenance of the gen-tie line and solar array facility (refer to Responses 3-1 and 3-2).

The monarch butterfly is the subject of a petition that was filed in August 2014 with the U.S. Fish and Wildlife Service to place the butterfly under the protection of the Endangered Species Act. However the U S Fish & Wildlife Service reports that "The monarch butterfly is not currently listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or protected specifically under U.S. domestic laws" (USFWS 2014). There is no evidence that the Project would cause substantial loss of Monarchs or other butterflies in any event. Insects have been known experience polarized light pollution (PLP) that may attract them to the solar facility. The phenomenon of PLP is global and has increased rapidly over the past several decades, following the rapid spread of urban development, road systems, and industrial agriculture. PLP includes direct glare, chronically increased illumination, and temporary, unexpected fluctuations of light emitted from structures (e.g., buildings, towers, bridges) and vehicles (Horvath et. al 2009). However, although the butterflies may be attracted to the site they will not be destroyed as a result of flying in or near the facility. Also, the protections to flying species that are afforded by the BBCS will help protect butterflies and other flying insects. With proper siting, design and management through coordination with USFWS and other resource agencies (e.g., CDFW), risk to flying species can be further reduced. Impact minimization measures were derived through coordination with USFWS and a review of the USFWS *Region 8 Interim Guidelines for the Development of a Project-Specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities* (USFWS 2010). For a full list of minimization measure refer to Appendix C4 of the Final EIR/EA includes a Bird and Bat Conservation Strategy (BBCS). The following measures were specifically pulled from the numerous minimization measures because they are applicable to flying insect protection:

- Solar arrays for the Project are located on disturbed land used primarily for agriculture. This limits direct loss of bird and bat habitat.
- All Project generation and transmission elements are located on a level alluvial mesa, far from topographical relief. This characteristic limits transmission line conflicts with raptor flight paths, which often follow the upwind side of ridges and escarpments.
- The erection of guyed structures is prohibited to reduce avian and bat collision risk.
- No FAA lighting will be used at the Project site.
- Where possible, existing roads were used for access roads. New access road construction will be minimized. This limits habitat loss, fragmentation, and displacement.
- Vegetation clearance and ground surface disturbance will be minimized and within defined and approved work limits.
- During construction, vegetation clearance will be conducted outside the breeding season to the maximum extent feasible. Pre-construction avian surveys will be conducted in appropriate habitats prior to any human disturbance or ground disturbing activities.
- In the event that ground disturbing activities are to occur in suitable avian nesting habitat during the breeding season (February 1 to September 15), pre-construction clearance surveys for nesting birds will be conducted by qualified biologists. Identified nests of migratory birds (other than raptors) will be flagged for avoidance with a 300-foot buffer. Work activities will be prohibited within this buffer until the Project biologist determines that the nest has failed or the young have fledged. Activity associated with this nest identification and monitoring will be recorded on appropriate reporting forms (Appendix C of the Final EIR/EA).
- Any nighttime construction will be generally avoided and specifically prohibited within the migratory bird breeding season.
- No Project element will create bat day or night roost sites or provide open water sources that may be attractive to bats or birds.
- Lighting at the operation and maintenance (O&M) facility and the substation are kept to a minimum to avoid confusing birds or attracting bats. Specifically, the lights at the O&M facility are downward directed floodlights. Lights at the substation are switched on manually and only used during rare occasions when someone is at the substation at night.
- Vehicle collision risk to wildlife will be minimized by driving at appropriate speeds within the Project. BMSP will implement a 25 mph speed limit at the Project for site personnel.
- Garbage at the site will be properly managed to avoid creating an attractive nuisance for bird species.
- Personnel will remove or bury carcasses found on site that might attract eagles and other avian scavengers.
- Removal of inactive non-raptor nests from solar generating facilities will occur outside the breeding season
- The Project will operate under and approved fire management plan to reduce further habitat loss caused by Project-started wildfire.

- Following the useful life of the Project (likely about 25 years), BMSP will either repower with some future technology or return to the site to agricultural use.

Response 10-12

The commenter states that there are many complaints by the Mesa Verde Community residents that are suffering from bronchitis, asthma, and other respiratory illnesses that lead to Valley Fever. These illnesses are related to the dust storms caused by the leveling of the pristine desert. The fungus is carried by the dust of the fields that are fallowed.

Please refer to Response 2-6.

Response 10-13

The commenter states that the region is home to numerous sites associated with Native American creation stories and that the sites in this area are linked to those in Mexico. The comment also states that the Rio Mesa Solar Project that was proposed to be built at the base of the sacred Mule Mountains was denied because the Palo Verde Irrigation District and other farmers plus the Cibola Wildlife Refuge and the Indigenous Tribes of the Colorado River protested it.

Extensive analysis and investigation revealed no known prehistoric cultural resources of significance, or associated with sacred sites bearing regional meaning, in the Project Area (refer to Section 4.2.5, *Cultural Resources*, in the Final EIR/EA and Appendices D1 and D2 of the Final EIR/EA). The fact that certain groups opposed other projects is not relevant to the question whether the Project area of the proposed project contains sacred sites or significant prehistoric or cultural resources. The location of the now-cancelled Rio Mesa Project is about ten miles south of the proposed Project. None of the known cultural resources in the Blythe Mesa Solar Project extend into the Rio Mesa project footprint, and no resources associated with the former Rio Mesa project have been shown to extend into the APE of the proposed Project.

Response 10-14

The commenter states that the U.S. Government does not need to continue its Manifest Destiny Policy of the 1850s. The Native American cultural cosmic tradition is still alive despite its 500 years of domination by the Spanish and English. Despite all the government's efforts to destroy the Native American's cosmic cultural traditions, the knowledge has survived the policy of “Kill the Indian, Save the Man.”

The Final EIR/EA is supported by a cultural resource analysis that fulfills CEQA Guidelines and was written to fulfill certain requirements associated with the National Historic Preservation Act (NHPA) and NEPA. Section 106-level consultations between the BLM and local Native American tribes are required under NHPA law and are being conducted. Refer to Response 9-1 relative to Native American consultation.

The cultural resource study has shown that the solar facility site would be located on lands tilled by previous agricultural activities, that monitoring guidelines would be put into place prior to construction, and that the voices of Native Americans have been and will continue to be heard. There are no anticipated impacts to significant cultural resources as a result of the proposed Project.

Response 10-15

The commenter states that the Obama administration is preparing to designate areas in New Mexico and California off-limits to development under its executive authority, a move that signals a bolder public-lands policy in the President’s second term. The tribe wholeheartedly supports this effort by President

Obama but would strongly encourage him to support the cultural resources that are related to the Native American human creation story and support all the laws that have been approved to protect the sacred sites by the United States government and the United Nations plus the resolutions by the Colorado River Indians Tribes and the National Congress of American Indians.

Research of news stories compiled after January 28, 2014 found no reference to any particular sites the President plans to set aside for public benefit utilizing the Antiquities Act of 1906. The commenter may be indirectly referring to a leaked Interior Department document reported by the New York Times published in 2010 (New York Times 2010). The list of locations named by the leaked document, reproduced in *The Wild Life News* (The Wildlife News 2014), does not include any portion of the Sonoran Desert and the nearest proposed region is at Gila Bend, Arizona. The proposed Project is located more than 100 miles from the nearest location.

Response 10-16

The commenter states the tribe is opposing the construction of the Blythe Mesa Solar Power Project because of its gross violation of certain listed Indigenous, State, Federal and United Nations laws that support our demands and why this Project should not be constructed within sacred areas.

The analysis in Section 4.2.5, *Cultural Resources*, of the Final EIR/EA has been prepared to satisfy all applicable laws, including CEQA, NEPA, and Section 106 of the NHPA, relative to identifying cultural resources and assessing potential impacts to, or effects on, such resources by the proposed Project. Analyses in the Final EIR/EA found that there are no significant cultural resources in the Project footprint. For this reason, none of the regulations listed in this comment have been, or will be, violated. The commenter states that the Athapaskan Tribe has submitted a request to the United Nations to declare the mountain ranges listed in this comment (McCoy, Big Maria, Granite) as a World Heritage Site. These are not currently designated as a World Heritage Site and they are not located at or near the Project footprint.

Response 10-17

The commenter states that the tribe strongly urges that the BLM consider the above information and disapprove this notorious solar power project. It will behoove President Obama to continue his motivation and concern in protecting those sacred sites by enforcing the laws and establish a National Monument in the McCoy/Big Maria Mountains and Valleys.

While the County has reviewed and considered this information in this comment, it does not comment on the sufficiency or accuracy of the Final EIR/EA or raise any significant environmental issues of the environmental analysis in the Final EIR/EA; therefore, no further response is required. Cal. Pub. Res. Code § 21091(d)(2)(B); 14 C.C.R. §§ 15088(c), 15132(d), 15204(a).

Letter 11: Conservation Organizations

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Response to Letter 11

Response 11-1

The commenter states that the Defenders of Wildlife, Sierra Club, Natural Resources Defense Council, Audubon California, National Parks Conservation Association, The Wilderness Society, and California Native Plant Society (Conservation Organizations) find the Final EIR/EA presents an accurate assessment of the effects of the Project on the environment and our only recommendation is to strengthen the monitoring and adaptive management during Project construction and operation with regard to migratory birds (addressed in Response 11-5).

The County appreciates the review and comment of the Conservation Organizations.

Response 11-2

The commenter states the Conservation Organizations have been aware of this proposed Project for several years due, in part, to their involvement in commenting on other PV solar projects on public lands to the north and east of the McCoy Mountains. The comment further states the Project conforms to their 2009 recommendations for siting renewable energy projects in the California Desert. The Conservation Organizations are pleased that the Project is planned for those Blythe Mesa Alternative lands due to their previously disturbed condition and absence of significant biological and cultural resources.

As stated on pages ES-15 and ES-16 of the Final EIR/EA, the proposed Project (Alternative 1) is the preferred and environmentally superior alternative. Chapter 2, *Alternatives Including the Proposed Project*, addresses the development of the range of alternatives considered, provides a detailed description of the proposed Project and alternatives selected for detailed study, and describes the alternatives considered and eliminated from further analysis.

Response 11-3

The commenter states the Conservation Organizations believe the proposed Project (Alternative 1) is the most desirable of all the alternatives in that it generates the greatest amount of electrical power while utilizing approximately 3,600 acres of previously disturbed agricultural land for generating electrical power, and a small amount of public land under BLM jurisdiction for a gen-tie line to deliver power to the existing Colorado River Substation west of the project. The Conservation Organizations also consider the alternatives to the Project do not offer any substantial environmental benefits largely because the previously disturbed condition of the majority of the lands within the Project site makes this a superior site for location of the Project.

As stated on pages ES-15 and ES-16 of the Final EIR/EA, the proposed Project (Alternative 1) is the preferred and environmentally superior alternative. Chapter 2, *Alternatives Including the Proposed Project,* addresses the development of the range of alternatives considered, provides a detailed description of the proposed Project and alternatives selected for detailed study, and describes the alternatives considered and eliminated from further analysis.

Response 11-4

The commenter states that the Conservation Groups appreciate the thorough consideration the Project developers and BLM have given to avoidance minimization and compensatory mitigation for impacts to Burrowing owl and to microphyll woodlands, and the transparency of providing a BBCS with the Draft EIR/EA (addressed in Section 4.2.4, *Biological Resources,* of the Final EIR/EA).

Response 11-5

The commenter states Conservation Organizations recommend that a revised monitoring and adaptive management component be developed specifically for the effects of the Project on migratory birds as part of the Bird and Bat Conservation Strategy (BBCS). The Conservation Organizations recommend systematic monitoring of bird injury and mortality at the Project be conducted as part of an avian protection plan as opposed to incidental monitoring and reporting as proposed for the Project in the Draft EIR/EA. The Conservation Organizations state that incidental monitoring should be performed by qualified biologists trained in systematic monitoring techniques and bird species identification as opposed to on-site workers.

It should be noted that the BBCS would be considered a "living document" that articulates the Applicant's commitment to develop and implement a program to increase avian and bat safety and reduce risk. As progress is made through the program or challenges are encountered, the BBCS may be reviewed, modified, and updated. The initial goals of this BBCS are to:

- provide a framework to facilitate compliance with federal law protecting avian species and a means to document compliance for regulators and the interested public;
- allow the Agent to manage risk to protected bird and bat species in an organized and cost-effective manner;
- establish a mechanism for communication between BMSP managers and natural resource regulators (primarily USFWS);
- foster a sense of stewardship with BMSP owners, managers, and field engineers; and
- articulate and cultivate a culture of wildlife awareness (specifically birds and bats) and the importance of their protection.

The BBCS was written with consideration to and guidance from the data and suggestions presented in the USFWS *Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities* (USFWS 2010), and the Avian Power Line Action Committee's (APLIC) *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994* (APLIC 1994), *Avian Protection Plan Guidelines* (APLIC 2005), and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006). In addition, existing information on bird and bat use in the Project area was utilized to effectively address avian and bat safety specific to the construction and operation and maintenance work of BMSP to reduce impacts to migratory birds, bald and golden eagles, listed bat and avian species.

The BBCS was prepared in coordination and consultation with the County of Riverside and the BLM. The BBCS states that monitoring would occur for three years by on-site workers. The County and BLM have concurred with the BBCS monitoring plan and the conclusion that there will be adequate protection of migratory birds. Therefore no further change is required at this time; however, as noted above, the document is a living document that will, if circumstances warrant in the eyes of the regulatory agencies be modified to respond to circumstances as they develop and as a part of the adaptive management processed outlined in the BBCS.

Letter 12: Adams Broadwell Joseph & Cardozo on behalf of Citizens for Responsible Solar

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August 4, 2014

Via Overnight and Electronic Mail

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Re: Comments on the Draft Environmental Impact Report/Environmental Assessment for the Blythe Mesa Solar Project (SCH No. 2011111056)

Dear Mr. Ross and Mr. McMenimen:

On behalf of Citizens for Responsible Solar, we submit these comments on the Draft Environmental Impact Report/Environmental Assessment ("DEIR/EA") for Renewable Resource Group's ("Applicant") 485-megawatt ("MW") Blythe Mesa Solar Project ("Project"), prepared pursuant to the California Environmental Quality Act ("CEQA").[1] The solar photovoltaic ("pv") array will occupy approximately 3,587 acres, with a 230 kilovolt ("kV") transmission line ("gen-tie line") on another approximately 73 acres in the Palo Verde Mesa region of Riverside County. The proposed Project is located approximately five miles west of the City of Blythe, north and south of Interstate 10 ("I-10"), west of Neighbors Boulevard and Arrowhead Boulevard, and south and east of Blythe Airport.[2]

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[1] Pub. Resources Code § 21000 et seq.
[2] Riverside County Planning Department, Blythe Mesa Solar Project, Drat Environmental Impact Report/Environmental Assessment, p. p1 - 2 (June 2014) [*hereinafter* DEIR/EA].

I. INTRODUCTION

The Project is proposed for construction on approximately 3,660 acres, including 3,253 acres under the County's jurisdiction, 334 acres under the City of Blythe's jurisdiction, and 73 acres under Bureau of Land Management's ("BLM") jurisdiction. Project components include:

- Solar array field;
- System of interior collection power lines between inverters and substations;
- Up to three on-site substations;
- Up to two operations and maintenance buildings (3,500 square feet each);
- Associated communication facilities and site infrastructure;
- Two primary off site access roads and several interior access roads;
- Approximately 3.6 miles of transmission lines located within the solar facility, which would connect all on-site substations; and
- Approximately 4.8 miles of transmission line outside of the solar facility within a 125-foot-wide ROW on 73 acres.[3]

The Project is located in the Bureau of Land Management's Riverside East Solar Energy Zone ("SEZ"), which encompasses areas covered by the Northern and Eastern Colorado Desert Coordinated Management Plan ("NECO Plan"), and the California Desert Conservation Area ("CDCA").[4] Three solar power plants in the SEZ have already been approved for development on 8,590 acres in the SEZ, and seven applications are still pending.[5] As each Project is developed the needs of each individual project will unavoidably tax limited water and land resources to a potentially significant cumulative extent. Furthermore, the lack of sufficient mitigation measures associated with each individual project will inevitably have cumulative impacts as they encroach upon special status species habitat. The final toll taken by this historic energy boom on California's desert environment, public health and natural resource base may not be known for several years or longer, but the mounting evidence of detrimental impacts shows that the effects may be severe. 12-1

Information is now available regarding the impacts that solar pv projects have on sensitive desert mammals and bat and avian species, the strains that project development is having on the state's limited water and agriculture 12-2

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[3] DEIR/EA, p. 2-2.
[4] *Id.*
[5] http://blmsolar.anl.gov/sez/ca/riverside-east/; *see also* http://blmsolar.anl.gov/sez/ca/riverside-east/monitoring/.

resources, and the impacts associated with mitigation measures once believed to reduce impacts. The Mojave Desert in and around Blythe has been approved for approximately 8,590 acres of solar development with little regard for the cumulative impacts these projects will have on the fragile desert ecosystem. 12-2 Now, more than ever, it is essential that the County and BLM adequately identify and analyze the Project's foreseeable direct, indirect and cumulative impacts. It is also imperative that any and all feasible mitigation measures be presented and discussed. Indeed, CEQA and NEPA require nothing less.

As explained below, the Project will generate a multitude of significant, unmitigated impacts on several resources, including biological resources and water 12-3 resources, among others, and from hazardous materials. The DEIR/EA either mischaracterizes, misanalyzes, underestimates or fails to identify many of these impacts. The DEIR/EA, for example, fails entirely to identify the Project's impacts to the fully adjudicated Colorado River. Furthermore, many of the mitigation measures described in the DEIR/EA will not mitigate impacts to the extent claimed. 12-4 In some instances, the mitigation measures may generate additional impacts that are not evaluated. For example, the DEIR/EA proposes the passive relocation of burrowing owls to mitigate significant impacts to the birds. However, the DEIR does not evaluate known, potentially significant impacts associated with owl translocation. The DEIR/EA must be revised to resolve its inadequacies and must 12-5 be recirculated for public review and comment.

CEQA requires recirculation of a DEIR/EA for public review and comment when significant new information is added to the DEIR following public review, but before certification.[6] The CEQA Guidelines clarify that new information is significant if "the DEIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the Project or a feasible way to mitigate or avoid such an effect."[7]

The purpose of recirculation is to give the public and other agencies an opportunity to evaluate the new data and the validity of conclusions drawn from it.[8] As explained more fully below, the DEIR/EA does not comply with the requirements of CEQA because the DEIR/EA (1) fails to set forth a stable and finite project 12-6 description, (2) fails to set forth the environmental baseline for hazardous materials, biological and hydrological resources, among other resources, (3) fails to

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[6] Pub. Resources Code § 21092.1.
[7] CEQA Guidelines § 15088.5.
[8] *Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors* (1981) 122 CalApp3d 813, 822.

identify, analyze and mitigate to the extent feasible, all the impacts that the Project will have on public health and the state's limited hydrological, biological and other resources, and (4) defers formulation of mitigation measures to post approval studies. The County and BLM may not approve the Project until an adequate DEIR/ draft environmental impact statement ("DEIR/DEIS") is prepared and circulated for public review and comment. 12-6

We have reviewed the DEIR/EA and its technical appendices with assistance from technical consultants, whose comments and qualifications are attached as follows: Scott Cashen (**Attachment A**), Matt Hagemann (**Attachment B**), and Anders Sutherland (**Attachment B**). The County must respond to these consultants' comments separately and individually. 12-7

II. STATEMENT OF INTEREST

Citizens for Responsible Solar is an unincorporated association of individuals and labor organizations that may be adversely affected by the potential public and worker health and safety hazards and environmental and public service impacts of the Project. The association includes Blythe resident George Ellis, Riverside County resident James Hennegan, and California Unions for Reliable Energy ("CURE") and its members and families and other individuals that live and/or work in the City of Blythe and Riverside County (collectively, "Riverside Residents").

The individual members of Riverside Residents and the members of the affiliated labor organizations live, work, recreate and raise their families in Riverside County, including the City of Blythe. They would be directly affected by the Project's environmental and health and safety impacts. Individual members may also work constructing the Project itself. They will be first in line to be exposed to any health and safety hazards that may be present on the Project site. They each have a personal interest in protecting the Project area from unnecessary, adverse environmental and public health impacts.

The organizational members of Riverside Residents also have an interest in enforcing environmental laws that encourage sustainable development and ensure a safe working environment for the members that they represent. Environmentally detrimental projects can jeopardize future jobs by making it more difficult and more expensive for businesses to locate and people to live there. This, in turn, jeopardizes future development by causing construction moratoriums and otherwise reduces future employment opportunities for construction workers. The labor organization members of Riverside Residents therefore have a direct interest in enforcing environmental laws to minimize the adverse impacts of projects that would otherwise degrade the environment. Finally, the organizational members of Riverside Residents are concerned about projects that risk serious environmental harm without providing countervailing economic benefits. The CEQA and NEPA processes allow for a balanced consideration of a project's socioeconomic and environmental impacts, and it is in this spirit that we offer these comments.

III. THE DEIR/EA FAILS TO ADEQUATELY DESCRIBE THE PROJECT

The DEIR/EA does not meet CEQA's and NEPA's requirements because it fails to include an accurate, complete and stable Project description, rendering the entire analysis inadequate. California courts have repeatedly held that "an accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient [CEQA document]."[9] CEQA requires that a project be described with enough particularity that its impacts can be assessed.[10] Accordingly, a lead agency may not hide behind its failure to obtain a complete and accurate Project description.[11]

It is impossible for the public to make informed comments on a project of unknown or ever-changing description. "A curtailed or distorted project description may stultify the objectives of the reporting process. Only through an accurate view of the project may affected outsiders and public decision-makers balance the proposal's benefit against its environmental costs…."[12] As articulated by the court in *County of Inyo v. City of Los Angeles*, "a curtailed, enigmatic or unstable project description draws a red herring across the path of public input."[13] Without a complete project description, the environmental analysis under CEQA is impermissibly limited, thus minimizing the project's impacts and undermining meaningful public review.[14]

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Under NEPA, a complete project description is necessary for the public and decision makers to understand the effects of the proposed action and its

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[9] *County of Inyo v. City of Los Angeles* (3d Dist. 1977) 71 Cal.App.3d 185, 193.
[10] *Id.* at 192.
[11] *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 311 (hereinafter, "Sundstrom").
[12] *Id.* at 192-193.
[13] *Id.* at 197-198.
[14] *See, e.g., Laurel Heights Improvement Assn. v. Regents of the Univ. of Cal.* (1988) 47 Cal.3d 376.

alternatives.[15] It follows that information in an EA that is incomplete will skew the environmental consequences analysis and prevent informed public input. Courts have held that "[w]here the information in the initial EIS was so incomplete or misleading that the decisionmaker and the public could not make an informed comparison of the alternatives, revision of an EIS may be necessary to provide a reasonable, good faith, and objective presentation of the subjects required by NEPA."[16] 12-8

An accurate and complete project description is necessary to perform an adequate evaluation of the potential environmental effects of a proposed project. In contrast, an inaccurate or incomplete project description renders the analysis of environmental impacts inherently unreliable. Without a complete project description, the environmental analysis under CEQA and NEPA will be impermissibly narrow, thus minimizing the project's impacts and undercutting public review.[17]

A. The DEIR/EA Fails to Adequately Disclose the Extent of Grading at the Project Site

The DEIR/EA fails to provide a sufficiently detailed account of what areas will require grading and trenching and the extent of the grading and trenching. This project description information is critical to ensuring that the Project's impacts can be assessed. According to the DEIR/EA, "[s]ince most of the site has nearly level to gently sloping topography, no mass grading would be required. Some of the parcels where facilities and arrays would be located would require light grubbing for leveling and trenching."[18] This vague description is incorrect and insufficient to enable an adequate evaluation of impacts for three reasons. 12-9

First, Project construction and operation will require installation of electrical equipment, which necessitates grading and trenching. Indeed, the DEIR/EA states, "[i]nstallations of electrical collection system would require excavations to a depth of about three feet for underground electrical circuits."[19] Furthermore, during 12-10

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[15] See 40 C.F.R. § 1502.15; see also *Laguna Greenbelt v. U.S. Dept. of Transportation* (1994) 42 F.3d 517, 528-29 [reviewing plaintiff's claim that inconsistent definition resulted in misleading analysis of project's positive and negative effects].
[16] *Natural Resources Defense Council v. U.S. Forest Service* (2005) 421 F.3d 797, 811 [citing Animal Defense Council v. Hodel (1988) 840 F.2d 1432, 1439].
[17] *See, e.g.*, *Laurel Heights Improvement Assn. v. Regents of the Univ. of Cal.* (1988) 47 Cal.3d 376.
[18] DEIR/EA, p. 2 – 12.
[19] *Id.*, p. 2-6.

Project construction, "the array assembly would include up to 25 small gas-powered generators, support piles for which will be driven approximately eight to twelve feet into the ground."[20] However, no information is given as to where any of these installations will be located. This is especially disconcerting given the potential presence of hazardous materials, ephemeral streams, special status plants, burrowing owls, and Mojave fringe-toed lizards at the Project site.

Second, the Project description includes the construction of up to two 3,500 square foot operations and maintenance ("O&M") buildings at the Project site.[21] The O&M buildings would require excavations to a depth of approximately three feet.[22] However, again, the DEIR/EA fails to set forth the location of these buildings, rendering any analysis impermissibly narrow. The impact from construction of O&M buildings on biological and hydrological resources cannot be determined without more information as to where the buildings will be located in relation to jurisdictional features and biological resources identified on the Project site. The DEIR/EA states only that, "[c]onstruction of the proposed Project would not permanently alter the course of any of the drainages."[23] However, without any information as to the location of the O&M buildings in relation to the ephemeral streams onsite, the validity of this statement cannot be fully evaluated. 12-10

Lastly, the Project will require construction of a significant number of access roads. The DEIR/EA states, "[w]ithin the solar field, 12-foot-wide access roads would also be constructed approximately every 200 to 400 feet."[24] Although the Project description states that minimal grading for roads would be required, the Project will be constructed over approximately 3,660 acres. This amounts to a significant amount of ground disturbing activity for roads alone. Furthermore, the DEIR/EA fails to describe the number of roads, the length of each road, and the extent of grading associated with access road creation. The DEIR/EA only explains that the access road for the O&M building will be approximately 100 feet in length.[25] This is insufficient. The DEIR/EA's failure to describe the proposed grading and existing topographical setting renders the DEIR/EA's conclusory statement of little worth in analyzing the potential impacts the Project may have on the environment.

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[20] *Id.*, p. 2 – 17.
[21] *Id.*, p. 2-2.
[22] *Id.*, p. 2 – 12.
[23] *Id.*, p. 4-232.
[24] DEIR/EA, p. 2 – 17.
[25] *Id.*, p. 2 – 232.

B. The DEIR/EA Fails to Identify a Water Supply that Can be Used for Construction and Operation of the Project

The DEIR/EA fails to identify a water source that may be used for the Project's non-potable water needs, and assumes the existence of an entitlement not in existence. According to the DEIR/EA, Project construction will require approximately 1,345 acre-feet ("AF") of water (451 AF per year) for dust control,[26] and operational non-potable water requirements would be approximately up to 345 AF/year."[27] However, the Project has not secured a water source. 12-11

The DEIR/EA continues, "[t]he Project ***would*** coordinate with Gila Farm Land, LLC (landowner) and the Palo Verde Irrigation District ["PVID"] to secure water service and supply during operation."[28] After stating that water service must still be secured, the DEIR/EA proceeds to assume the existence of an entitlement not in effect: "Water for the Project would be taken from existing PVID water entitlements that support the agricultural operations currently on the proposed solar facility site."[29] However, no supporting evidence is provided in the DEIR/EA. 12-12

Although the DEIR/EA claims that the surface delivery system from the PVID would be available to serve the proposed solar facility, no information is provided to substantiate their claim to PVID water.[30] PVID water is to be used for irrigation purposes and potable uses.[31] Construction and operation of a solar facility does not constitute either of these permissible uses of Colorado River water, which is fully adjudicated under a system of treaties, agreements, and contracts with the Department of Interior, and other Colorado River Basin states.[32] The County is required to produce and circulate a DEIR/EA that adequately sets forth and describes a water source that may legally satisfy the Project's non-potable water needs. 12-13

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[26] *Id.*, p. 2 – 12.
[27] *Id.*, p. 2- 19.
[28] *Id.*
[29] *Id.*, p. 4 – 234 *emphasis added*.
[30] DEIR/EA, p. 3 – 21.
[31] EIR/EA, p. 3 – 179; *see also* http://pvid.org/history.html. **Attachment C.**
[32] *See* 43 U.S.C. §§ 617 *et al.*; *see also Arizona v. California*, 373 U.S. 546 (1963).

IV. THE DEIR/EA FAILS TO ADEQUATELY ESTABLISH THE EXISTING ENVIRONMENTAL SETTING AGAINST WHICH ENVIRONMENTAL IMPACTS SHOULD BE MEASURED

The DEIR/EA describes the existing environmental setting inaccurately and incompletely, thereby skewing the entire impact analysis. The existing environmental setting is the starting point from which the lead agency must measure whether a proposed project may cause a significant environmental impact.[33] Both CEQA and NEPA require the lead agencies to include a description of the physical environmental conditions in the vicinity of a project, as they exist at the time environmental review commences.[34] CEQA defines the environmental setting as the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, from both a local and regional perspective.[35]

Describing the environmental setting accurately and completely for each environmental condition in the vicinity of the Project is critical to an accurate, meaningful evaluation of environmental impacts. The importance of having a stable, finite, fixed environmental setting for purposes of an environmental analysis was recognized decades ago.[36] Today, the courts are clear that, "[b]efore the impacts of a Project can be assessed and mitigation measures considered, an [environmental review document] must describe the existing environment. It is only against this baseline that any significant environmental effects can be determined."[37] In fact, it is:

> a central concept of CEQA, widely accepted by the courts, that the significance of a Project's impacts cannot be measured unless the DEIR first establishes the actual physical conditions on the property. In other words, baseline determination is the first rather than the last step in the environmental review process.[38]

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[33] *See, e.g.*, *Communities for a Better Env't v. S. Coast Air Quality Mgmt. Dist.* (March 15, 2010) 48 Cal.4th 310, 316; *Fat v. County of Sacramento* (2002) 97 Cal.App.4th 1270, 1278 ("*Fat*"), citing Remy, et al., Guide to the Calif. Environmental Quality Act (1999) p. 165.
[34] CEQA Guidelines, § 15125(a); *see also Communities for A Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 321; *see also,* 40 C.F.R. § 1502.15.
[35] CEQA Guidelines §15125(a) (emphasis added); *Riverwatch v. County of San Diego* (1999) 76 Cal.App.4th 1428, 1453 ("*Riverwatch*").
[36] *County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185.
[37] *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 952.
[38] *Save our Peninsula Comm. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 125.

The DEIR/EA must also describe the existing environmental setting in sufficient detail to enable a proper analysis of Project impacts.[39] Section 15125 of the CEQA Guidelines provides that "[k]nowledge of the regional setting is critical to the assessment of environmental impacts."[40] This level of detail is necessary to "permit the significant effects of the Project to be considered in the full environmental context."[41]

The description of the environmental setting in the DEIR/EA is inadequate because it omits highly relevant information regarding biological resources, hazardous materials and water resources. The County and the BLM must gather the relevant data and provide an adequate description of the existing environmental setting in a revised and recirculated DEIR/DEIS. 12-14

A. The County Failed to Establish the Existing Environmental Setting for Hazards

The DEIR/EA failed to accurately establish the existing environmental setting because it failed to rely on a Phase I Environmental Site Assessment ("ESA") to establish the setting for hazards at the Project site. According to former Environmental Protection Agency ("EPA") scientist, Matt Hagemann, a Phase I ESA is the customary due diligence investigation used to establish the baseline setting for potential hazards at a project site.[42] However, instead of abiding by this industry standard, the DEIR/EA includes a misleading account of hazards in a Data Map Area Study, which includes "a summary of environmentally affected sites," derived from agency databases. This information fails to adequately set forth the existing environmental setting, which is required for an adequate analysis of impacts under CEQA and NEPA, for two reasons. 12-15

First, the DEIR/EA itself explains that the Data May Area Study cannot be relied on to establish existing environmental conditions and to evaluate environmental and public health risks from hazards. [43] According to the DEIR/EA:

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[39] *Galante Vineyards v. Monterey Peninsula Water Mgmt. Dist.* (1997) 60 Cal.App.4th 1109, 1121-22.
[40] CEQA Guidelines § 15125(d).
[41] *Id.*
[42] SWAPE comments, p. 2.
[43] *Id.*

> Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property.[44]

12-15

Mr. Hagemann agrees and explains that "[i]n no way does the EDR Data Map Study Area constitute a Phase I ESA which is routinely conducted to support the analysis of project impacts in the Hazards and Hazardous Waste analysis in Environmental Impact Report prepared under CEQA."[45] Despite this, the DEIR/EA improperly and solely relies on the Data Map Area Study to set forth existing conditions and as evidence that the impacts associated with hazardous materials are less than significant.[46]

Second, the Data Map Area Study fails to adequately set forth the existing environmental setting because it is inconsistent with the standard industry protocol for determining existing hazards on a particular site. According to Mr. Hagemann, "[t]he failure to conduct a Phase I ESA for the Project disregards an environmental due-diligence process that is routine for CEQA and NEPA documentation."[47] Solar projects already under development in the area, such as McCoy, Rio Mesa and the Blythe Solar Power Project have all used an ESA to "identify hazardous waste issues that may pose a risk to the public, workers, or the environment and which may require further investigation, including environmental sampling and cleanup."[48] Therefore, reliance on a Data Map Area Study is inconsistent with the industry standard.

12-16

The DEIR/EA failed to accurately establish the existing environmental setting because it relies on a Data Map that the DEIR/EA admits cannot be relied upon for an analysis of risks and does not rely on an industry-standard Phase I ESA to establish the setting for hazards at the Project site. A Phase I ESA is required to establish the baseline for hazards at the Project site. This information must be included in a revised DEIR/DEIS that is circulated to the public for review.

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[44] DEIR/EA Appendix F, Data Map.
[45] *Id.*
[46] *See e.g.* DEIR/EA, p. 4 – 206.
[47] SWAPE comments, p. 3.
[48] *Id.*, p. 2.

i. *The DEIR/EA Fails to Identify the Project Site as a Formerly Used Defense Site and Disclose the Extent of Military Operations that Have Occurred on Site*

The County and BLM failed, but are required to, identify the Project site as a Formerly Used Defense Site ("FUDS") and describe any associated hazardous materials that may be present at the Project site. During World War II ("WWII"), the Blythe Airport was used by the military, as the Blythe Army Airfield ("BAAB").[49] In addition, the surrounding areas, including portions of the Project site, were used for gunnery practice to prepare troops for the North African campaign. Although the DEIR/EA acknowledges that military training exercises were conducted in the desert near the California – Arizona border, and that "[a] portion of the BAAB extends into the Project [Area of Potential Effects] APE,"[50] the DEIR/EA fails to describe with any particularity the extent and nature of the training exercises, and any machinery, ammunition, supplies or other hazards that may be left, and encountered or disturbed, at the Project site. 12-17

According to hazards expert, Matt Hagemann, there are two particular areas of concern with regards to establishing the existing environmental setting for hazardous materials found at FUDS. First, a former practice bombing area lies just adjacent to the Project site. This is of particular concern because seven instances of unexploded ordnance ("UXO") were discovered at the adjacent Blythe Solar Power Project, left there from the same military training exercises that may have impacted the Project site. Further, UXO is associated with various sites of military training. For instance, "[a] Phase I conducted for the Rice Solar Project identified UXO used in conjunction with the Rice Army Airfield to be a REC."[51] According to Mr. Hagemann, "[p]otential contaminants associated with that part of the BAA[B] that is within the Project APE…should also be evaluated in a Phase I ESA to be included in the DEIR/EA."[52] The DEIR/EA fails to disclose the extent of former military use of the Project site and the surrounding area. As a result, the DEIR/EA downplays the likely presence of UXO on the site. 12-18

Second, an "'Air to Ground Gunnery Range' generally underlies an area that is proposed for a 73-acre portion of the 4.8 mile gen-tie line corridor that extends 12-19

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[49] *Id.*, p. 6.
[50] DEIR/EA, pp. 3 – 87; 3 - 44.
[51] SWAPE comments, pp. 7-8.
[52] *Id.*, p. 7.

west of the solar arrays."[53] According to Mr. Hagemann, "[b]ullets, which may contain lead, and other munitions used in the air to ground gunnery range, including incendiary devices, may also pose a hazard to construction crews who may disturb soil in that area when installing the gen-tie line."[54] However, the DEIR/EA fails to identify the Gunnery Range, or any potential UXO that may be present at the Project site. Accordingly, the County and the BLM must develop a Phase I ESA so that the environmental baseline for hazards may be adequately set forth and the impact analysis revised in an updated and recirculated DEIR/DEIS. 12-19

ii. *<u>The DEIR/EA Fails to Identify Pesticide Use Associated with Agricultural Activity at the Project Site</u>*

The County and the BLM failed to, but must, disclose what pesticides were used for the cultivation of crops at the Project site. The Project site is currently occupied by active agricultural cultivation. "Active agricultural uses include a citrus grove and wheat and alfalfa fields."[55] Accordingly, the DEIR/EA states, "there is a potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater."[56] However, the DEIR/EA completely fails to describe with any particularity the types of pesticides which may be present at the Project site, preventing any meaningful analysis of the impacts those chemicals may have on the environment and public health. 12-20

Farming in the Blythe area began in the 1970s, when the use of organochlorine pesticides, such as dichlorodiphenyldichloroethylene ("DDE"), dichlorodiphenyltrichloroethane ("DDT"), and chlordane, were widely used.[57] Since that time, the U.S. EPA has determined that these pesticides are human carcinogens, which also pose impacts to the human nervous system.[58] The California Department of Toxic Substances Control ("DTSC") has noted the prevalence and relative persistence of these harmful pesticides throughout the state: 12-21

[53] *Id.*, p. 6.
[54] *Id.*, 7.
[55] DEIR/EA, p. 1-3.
[56] *Id.*, p. 4 – 206.
[57] SWAPE comments, p. 4.
[58] *Id.*

> DDT is ubiquitous to California soil due to heavy agricultural usage prior to cancellation in 1972. Therefore, agricultural land which is currently being developed or considered for new uses … frequently contains DDT.[59]

Despite the prevalence of DDT in the state, the DEIR/EA fails to conduct the necessary studies of the Project site to fully disclose the hazardous materials that may be present. Matt Hagemann points out in his comments, "there has been no sampling to indicate if soils are 'chemically impacted' and therefore, there is no way to know when and where those soils may be contacted by construction crews and risks that would result from dermal contact or inhalation."[60] However, the DEIR/EA relies upon the Data Map Area Study to determine that no impacts will occur. The DEIR/EA states,

> Should there be chemically impacted soils (i.e., fuels, pesticides, herbicides) be [*sic*] present in the Project area, the risk of exposure to human health is not believed to be a significant concern (refer to Environmental Data Resources, Inc. [EDR] report in Appendix F of this Draft EIR/EA). The construction of the proposed Project would require minimal grading for the foundations of the substations and O&M buildings; therefore, it is anticipated that workers' exposure to impacted soils would be at low-level concentrations.[61] 12-21

Given the prevalence of these cancer-causing substances, the DEIR/EA's failure to describe with any particularity the types of pesticides which may be present at the Project site prevents any meaningful analysis of the impacts those chemicals may have on the environment and public health. According to Mr. Hagemann, it is crucial that a Phase I ESA be conducted to determine the environmental setting for hazardous materials, and soil testing and further investigation of the site be performed, if necessary.[62] The County and the BLM are required to obtain this information and disclose it in an updated and recircualted DEIR/DEIS.

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[59] SWAPE comments, p. 4, *see also* Office of the Science Advisor, DDT in Soil: Guidance for the Assessment of Health Risks to Humans. http://www.dtsc.ca.gov/AssessingRisk/upload/chap8.pdf, p. 11.
[60] *Id.*, p. 5.
[61] DEIR/EA, p. 4 – 206.
[62] SWAPE comments, pp. 5-6.

B. The DEIR/EA Fails to Discuss the Environmental Setting Against Which Project Impacts to Water Supply Should be Measured

The Project describes two sources of water that may be used for Project construction and operation, yet fails to set forth the environmental setting for either of the sources. The DEIR/EA states,

> The proposed Project would use existing water infrastructure that currently delivers irrigation water from the PVID. Riverside County Community Service Area #122 (CSA #122) has substantiated its intention to provide this potable supply by issuing a will-serve letter (October 26, 2012 c/o Steve H. Jones – Manager) for the Project's limited potable water needs. CSA #122 has provided a will-serve letter for the small amount (up to 150 gallons per day) of potable water for the two O&M buildings.[63] 12-22

However, the DEIR/EA stops there. No further information, data, or reasoning as to how much water is available for the Project, what the current uses of these water sources are, or the recharge rates of the water bodies is provided. Thus, the County and BLM have provided none of the essential information necessary to establish the environmental setting for water supply. Without more it is impossible to determine what impact the Project will have on hydrological resources. The County and the BLM are required to rectify this inadequacy in an updated and sufficient DEIR/EIS.

C. The DEIR/EA Fails to Adequately Discuss the Environmental Setting Against Which Project Impacts to Water Quality Should be Measured

The County and the BLM are required to set forth a full and adequate description of water quality in the area so that impacts to those water bodies may be adequately assessed and mitigated. According to the DEIR/EA, the ephemeral streams at the Project site eventually drain to the Colorado River.[64] However, no 12-23
information as to Colorado River water quality is provided in the DEIR/EA. The only water quality information provided in the DEIR/EA is information regarding a nearby outfall drain. "Within the Project region, one water body is listed as impaired on the Section 303(d) list. The Palo Verde Outfall Drain and Lagoon are

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[63] DEIR/EA, p. 3 – 179.
[64] *Id.*, pp. 3 – 126 – 129.

listed as impaired by dichlorodiphenyltrichloroethane (DDT) and pathogens, both from unknown sources."[65] Elsewhere, in the DEIR/EA appendices, it states, "[s]heet flow eventually reaches the edge of the Mesa and flows into the canal and drain system of the Palo Verde Valley south of 10th Street. This system eventually returns water to the Colorado River via the Outfall Drain…"[66] 12-23

There is no information as to whether the Project's ephemeral streams feed directly to the Colorado River,[67] or, in the alternative, flow into the degraded water body lying at the end of the Palo Verde Outfall drain with the sheet flow from the Palo Verde Mesa. More information is required so that impacts to water quality may be determined. This is especially important because the Palo Verde Outfall Drain and Lagoon are impaired for DDT. The DEIR/EA readily admits, "[g]round disturbance related to construction of the Project could potentially degrade water quality through the inadvertent release of residual pesticides from former agricultural lands."[68] Without more it is impossible to assess the direct, indirect and cumulative impacts to water quality that will result from Project construction. The County is required to fully and adequately describe the environmental setting for water quality so that decision makers and the public are fully informed of any associated impacts. 12-24

D. The DEIR/EA Fails to Set Forth the Existing Biological Setting Against Which Impacts Should Be Measured

i. *The DEIR/EA Fails to Adequately Describe the Environmental Setting for Endangered Flora on the Project Site*

The DEIR/EA fails to fully and completely set forth the environmental setting for special species plants located on the Project site. The DEIR/EA points out that Harwood's woollystar occurs within the Project gen-tie line, and Harwood's milk-vetch occurs within the Project site and gen-tie line. According to Scott Cashen, a field biologist with over 20 years of experience, the DEIR/EA's description of the setting for special species plants is inadequate. According to Mr. Cashen, the DEIR/EA, "fails to establish the ecological context of the populations in the Project area relative to other extant populations in the region."[69] This 12-25

[65] *Id.*, p. 3 – 130.
[66] DEIR/EA, Appendix C5, Review of Federal Waters, p. 7.
[67] *See* DEIR/EA, p. 3 – 129.
[68] DEIR/EA, p. 4-232.
[69] Cashen comments, p. 2.

oversight, Mr. Cashen states, "precludes the public and decision makers from being able to evaluate the relative severity of Project impacts of these two species."[70] 12-25

According to Mr. Cashen's research, "Harwood's woollystar has a Rare Plant Rank of 1B.2, which indicates it is rare throughout its range and fairly endangered in California."[71] Furthermore, Harwood's woolystar "has a global rank of G2 and a state rank of S2, which indicates it is 'at high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors' at both the statewide and global scale."[72] This information is essential in making an informed decision as to Project impacts. 12-26

The same is true of Harwood's milkvetch. The plant has "a Rare Plant Rank of 2.2, which indicates it is rare or endangered in California, but more common elsewhere."[73] Given the relative scarcity of the special status plants occurring on the Project and gen-tie line site, an accurate environmental baseline is essential for informed decision-making. The County and the BLM must recirculate a DEIR/EIS that adequately portrays the context of ratings for flora rarity so the public and decisionmakers are informed as to the existing baseline and the agencies may conduct an adequate analysis of actual impacts. 12-27

ii. *__The DEIR/EA Fails to Accurately Set Forth the Environmental Setting for Couch's Spadefoot__*

The DEIR/EA fails to identify the potential presence of Couch's spadefoot, a listed BLM Sensitive Species and California Species of Special Concern, in the Project area, and underestimates its potential for occurrence. According to Table 3.2.4-3 of the DEIR/EA, there is a low probability of Couch's spadefoot occurrence. However, Mr. Cashen points out, "[t]he Couch's spadefoot is an extremely rare species in California," and "[t]he Project site is within the geographic range of the species."[74] Indeed, the California Natural Diversity Database has documented only six occurrences of Couch's spadefoot. The species was detected in flooded alfalfa fields and desert scrub near agricultural fields.[75] According to the 12-28

[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] *Id.*
[74] *Id.*
[75] *Id.*

DEIR/EA, the Project site contains just this type of habitat. Accordingly, Mr. Cashen opines that, "the DEIR/EA has inappropriately concluded that the Couch's spadefoot has a 'low' potential of occurring in the Project area."[76] The County and the BLM must remedy this oversight and set forth the appropriate baseline for Couch's spadefoot, so species impacts may be fully disclosed, analyzed and mitigated. 12-28

iii. *<u>The DEIR/EA Fails to Adequately and Consistently Describe the Jurisdictional Features on the Project Site</u>*

The DEIR/EA presents inconsistent information with regards to the two ephemeral streams located on the Project site. According to the DEIR/EA,

> A hydrology study was performed in 2012 to review potential jurisdictional waters (provided in Appendix C5, *Review of Federal Waters,* of this Draft EIR/EA). POWER found that there are two discontinuous ephemeral channels within the Project area.[77]

12-29

The DEIR/EA continues, "[b]ased on the data collected the two discontinuous ephemeral channels are considered potential federal waters."[78]

Presumably, the DEIR/EA determined that there are federal waters under the jurisdiction of the Army Corps of Engineers ("USACE") on the Project site because the ephemeral streams at the Project site drain to the Colorado River.[79] However, the DEIR/EA's *Review of Federal Waters* comes up with a contradictory conclusion: "POWER concludes that the two discontinuous ephemeral channels on the Project site do not meet the criteria for regulable waters of the U.S. provided in the USACE Jurisdictional Determination Form Instruction Guidebook."[80] The reason that POWER drew their conclusion was because the consultants allege that the Project waters did not flow into the Colorado River. The County must address this direct contradiction between the appendices and information in the DEIR/EA and recirculate a DEIR/DEIS with an accurate and consistent environmental baseline determination. 12-30

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[76] Cashen comments, p. 3.
[77] DEIR/EA, p. 3-58.
[78] *Id.*
[79] *Id.*, pp. 3 – 126 – 129.
[80] *Review of Federal Waters,* DEIR/EA Appendix C5, p. 15 [hereinafter *Appendix C5*].

iv. *The DEIR/EA Fails to Adequately and Consistently Describe Burrowing Owl Habitat at the Project Site*

The DEIR/EA includes a completely misleading account of the presence of burrowing owls present on the Project site. The wildlife inventory results map depicted by Figure 3.2.4-3 fails to depict the full extent of burrowing owl sign and habitat on the Project site.[81] The map indicates that no burrowing owls were detected during reconnaissance surveys. However, according to the Burrowing Owl Survey in Appendix C3, six owls were detected during the first survey, and eight in a subsequent survey. Furthermore, burrowing owl sign was identified in five separate locations at the Project site, along with nine suitable burrows that may be used by single, or paired owls. 12-31

In addition, the DEIR/EA fails to disclose that some of these owls may be nesting. The field biologists conducting the surveys noted they "were unable to determine if the owls were two separate pairs or one pair with two juveniles" in one location, and whether a pair of owls residing in another area of the Project site was nesting.[82] This information is imperative, as nesting burrow owls require additional and enhanced mitigation. 12-32

Despite the abundance of owl presence and sign at the Project site, Figure 3.2.4-3 only depicts two locations for burrowing owl burrows. This is completely misleading, and fails to fully and consistently describe burrowing owl habitat at the Project site. The DEIR/EA must set forth the full extent of burrowing owls, burrowing owl habitat, and known active burrowing owl burrows at the Project site so impacts may be fully known, analyzed and mitigated. This information must be included in a revised DEIR/DEIS that is circulated for public review. 12-33

v. *The DEIR/EA Fails to Adequately Describe Desert Kit Fox Habitat at the Project Site*

The DEIR/EA fails to set forth an accurate and consistent description of the environmental setting for desert kit foxes at the Project site. According to the DEIR/EA, "[a] kit fox den was detected on the southern [gen-tie line] alternative."[83] However, the DEIR/EA then proceeds as though there are no kit foxes present in the Project APE. The DEIR/EA fails to set forth any further information regarding 12-34

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[81] *See* DEIR/EA, Figure 3.2.4-3.
[82] *Burrowing Owl Survey*, DEIR/EA Appendix C3, p. 10 [*hereinafter* Appendix C3].
[83] DEIR/EA, p. 3 – 70.

the presence of kit fox at the Project site, aside from the information presented in Figure 3.2.4-3, which presents inconsistencies in the data. According to Figure 3.2.4-3, there are various burrows, which presumably belong to either desert kit foxes or coyotes along the northern gen-tie route, which is the proposed alternative for interconnection. Further, the Habitat Assessment Report for the gen-tie line indicates that desert kit fox sign and scat were also found in this area.[84] 12-34

The DEIR/EA must fully set forth the environmental setting for desert kit foxes, given their high potential to occur on the Project site.[85] The Western Burrowing Owl Survey included as Appendix C3 states, "[b]urrows observed in the southern half of the site belonged to either kit fox (Vulpes macrotis) or kangaroo rat (Dipodomys sp.). No burrowing owl sign was observed near the kit fox burrows. Several of the kit fox burrows were recent and active kit fox sign was documented."[86] The Biological Technical Report, Appendix C1, is consistent with this data: "[p]otential desert kit fox scat and tracks were found scattered throughout the proposed solar array disturbance area."[87] Given the high potential for kit fox presence at the Project site, the County and the BLM must produce and recirculate a DEIR/DEIS that contains accurate information on desert kit fox so that impacts to biological resources may be fully and completely assessed. 12-35

V. THE COUNTY LACKS SUBSTANTIAL EVIDENCE TO SUPPORT ITS CONCLUSIONS IN THE DEIR/EA REGARDING THE PROJECT'S SIGNIFICANT IMPACTS, THE DEIR/EA FAILS TO INCORPORATE ALL FEASIBLE MITIGATION MEASURES NECESSARY TO REDUCE SUCH IMPACTS TO A LEVEL OF INSIGNIFICANCE

CEQA has two basic purposes, neither of which the DEIR/EA satisfies. First, CEQA is designed to inform decision makers and the public about the potentially significant environmental impacts of a Project before harm is done to the environment.[88] The DEIR is the "heart" of this requirement.[89] The DEIR has been described as "an environmental 'alarm bell' whose purpose it is to alert the public

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[84] *Blythe Mesa Solar Project: 230 kV Transmission Line Alternatives Habitat Assessment Report,* Appendix E: Observed Wildlife Table.
[85] *Biological Resources Technical Report*, DEIR/EA Appendix C1, p. 60 [*hereinafter* Appendix C1].
[86] Appendix C3, p. 10.
[87] AppendixC1, p. 55.
[88] CEQA Guidelines § 15002(a)(1); *Berkeley Keep Jets Over the Bay v. Bd. of Port Comm'rs.* (2001) 91 Cal.App.4th 1344, 1354 ("*Berkeley Jets*"); *County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810.
[89] *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 84.

and its responsible officials to environmental changes before they have reached ecological points of no return."[90]

To fulfill this function, the discussion of impacts in a DEIR must be detailed, complete, and "reflect a good faith effort at full disclosure."[91] An adequate DEIR must contain facts and analysis, not just an agency's conclusions.[92] CEQA requires a DEIR to disclose all potential direct and indirect, potentially significant environmental impacts of a project.[93]

Second, if a DEIR identifies potentially significant impacts, it must then propose and evaluate mitigation measures to minimize these impacts.[94] CEQA imposes an affirmative obligation on agencies to avoid or reduce environmental harm by adopting feasible project alternatives or mitigation measures.[95] Without an adequate analysis and description of feasible mitigation measures, it would be impossible for agencies relying upon the DEIR to meet this obligation.

Under CEQA, an EIR must not only discuss measures to avoid or minimize adverse impacts, but must ensure that mitigation conditions are fully enforceable through permit conditions, agreements, or other legally binding instruments.[96] A CEQA lead agency is precluded from making the required CEQA findings unless the record shows that all uncertainties regarding the mitigation of impacts have been resolved; an agency may not rely on mitigation measures of uncertain efficacy or feasibility.[97] This approach helps "insure the integrity of the process of decision by precluding stubborn problems or serious criticism from being swept under the rug."[98]

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[90] *County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810.
[91] CEQA Guidelines § 15151; *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 721-722.
[92] See *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 568.
[93] Pub. Resources Code § 21100(b)(1); CEQA Guidelines § 15126.2(a).
[94] Pub. Resources Code §§ 21002.1(a), 21100(b)(3); CEQA Guidelines § 15002(a)(2) and (3); *Berkeley Jets,* 91 Cal.App.4th at 1354; *Laurel Heights Improvement Ass'n v. Regents of the University of Cal.* (1998) 47 Cal.3d 376, 400.
[95] Pub. Resources Code §§ 21002-21002.1.
[96] CEQA Guidelines, § 15126.4, subd. (a)(2).
[97] *Kings County Farm Bur. v. County of Hanford* (1990) 221 Cal.App.3d 692, 727-28 (a groundwater purchase agreement was inadequate mitigation because there was no record evidence that replacement water was available).
[98] *Concerned Citizens of Costa Mesa, Inc. v. 32nd Dist. Agricultural Assn.* (1986) 42 Cal.3d 929, 935.

NEPA requires a full and fair discussion of every significant impact, as well as disclosure to the decision-makers and the public of reasonable alternatives which would avoid or minimize adverse impacts.[99] The impacts analysis must include a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented.[100] The discussion of impacts must include both "direct and indirect effects (secondary impacts) of a proposed project."[101] The agency need not speculate about all conceivable impacts, but it must evaluate the reasonably foreseeable significant effects of the proposed action.[102] In this context, reasonable foreseeability means that "the impact is sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision."[103] NEPA also requires a discussion regarding possible conflicts between the proposed action and the objectives of Federal, regional, State, and local land use plans, policies and controls for the area concerned.[104]

In this case, the DEIR/EA fails to satisfy the basic purposes of CEQA and NEPA. The DEIR/EA's conclusions regarding impacts to biological and hydrological resources, public health impacts and cumulative impacts are not supported by substantial evidence. In preparing the DEIR/EA, the County and BLM: (1) failed to provide sufficient information to inform the public and decision-makers about potential environmental impacts; (2) failed to accurately identify and adequately analyze all potentially significant environmental impacts; (3) failed to incorporate adequate measures to mitigate environmental impacts to a less than significant level; and (4) failed to analyze impacts associated with mitigation measures. The County and the BLM must correct these shortcomings and recirculate a revised DEIR/DEIS for public review and comment. 12-36

[99] 40 C.F.R. § 1502.
[100] *Id.* at § 1502.16.
[101] *Id.* at § 1502.16(b); *see also Sierra Club v. Marsh*, 976 F.2d 763, 767 (1st Cir. 1992).
[102] *Sierra Club v. Marsh*, 976 F.2d at 767.
[103] *Ibid; see also Dubois v. Dept. of Agriculture*, 102 F.3d 1273, 1286 (1st Cir. 1996).
[104] *Id.*

A. The DEIR/EA Lacks Substantial Evidence to Support its Conclusion that the Project Will Have Less Than Significant Impacts on Water Quality due to the Implementation of Mitigation Measures

The DEIR/EA lacks substantial evidence to support its conclusion that the Project will not further degrade water quality in the Project region. According to the DEIR/EA, "[g]round disturbance related to construction of the Project could potentially degrade water quality through the inadvertent release of residual pesticides from former agricultural lands."[105] Mr. Hagemann explains that, "[t]he release of residual pesticides from construction could further degrade water quality in the region of the Project."[106] Currently, the Palo Verde Outfall Drain and Lagoon are listed as impaired water bodies, pursuant to section 303(d) of the Clean Water Act ("CWA").[107] Reflecting the historical agricultural uses prevalent in the Colorado River Region, the "US EPA has stated a Total Maximum Daily Load ("TMDL") is needed to reduce loading of DDT to the Palo Verde Outfall Drain."[108] Although the disturbance of contaminated soil may result in the release of pesticides, the DEIR/EA does not address any mitigation related to the DDT contamination that may be present at the Project site due to prolonged agricultural use. 12-37

The DEIR/EA proposes mitigation measures that are completely unrelated to the water quality degradation from inadvertent releases of pesticides.[109] The DEIR/EA points to Best Management Practice ("BMP") – 9 for the conclusion that water quality at the Project site will not be degraded during construction, stating "it is not anticipated that construction activities for the proposed Project would release hazardous materials, substances, or waste."[110] However, BMP-9 relates to the maintenance of vehicles. The stated purpose of BMP-9 is to ensure that no oil or petroleum products leak from vehicles at the Project site. Though this mitigation measure may prevent the contamination of stormwater runoff during construction, it is unclear how vehicle maintenance would address the release of residual pesticides during ground disturbing activities. The DEIR/EA lacks substantial evidence to support its determination that releases of pesticides related to ground disturbing activity will be mitigated to a less than significant level. A revised DEIR/EIS is required to fully identify the impacts the Project may have on the Palo 12-38

[105] DIER/EA, p. 4-232.
[106] SWAPE comments, p. 15.
[107] *Id.*
[108] *Id.*
[109] *Id.*, p. 16.
[110] DIER/EA, p. 4-233.

Verde Outfall Drain and Lagoon, and propose mitigation measures sufficient to reduce those impacts to a level of insignificance. 12-38

B. The DEIR/EA Fails to Adequately Disclose and Mitigate Public Health Impacts Associated with Project Construction

The DEIR/EA fails to fully disclose the extent of potential impacts associated with Valley Fever, and fails to implement measures sufficient to mitigate associated impacts to public health. According to the DEIR/EA, "[w]hile the potential for a direct impact could occur during construction in association with exposure of workers to Valley Fever spores, a dust abatement plan as required by the [Mojave Desert Air Quality Management District] MDAQMD would minimize the spread of fungal spores, thereby reducing potential for contracting Valley Fever during construction."[111] The DEIR/EA's analysis and conclusion are misleading and insufficient for reasons. 12-39

First, the DEIR/EA assumes, without substantial evidence, that only construction workers will be exposed to Valley Fever spores during construction. However, "[t]he potentially exposed population is much larger than construction workers on or adjacent to the Project site because dust generated during Project construction will carry the very small spores – 0.002 – 0.005 millimeters in diameter – into other areas, potentially exposing large non-Project related populations."[112] Given that Riverside County is an area in which Valley Fever is endemic, no known cure for this debilitating disease exists, and the disease is presumed to be significantly more active during drought periods, such as the one California is currently facing, [113] sufficient mitigation measures are essential to ensure the safety of the public. 12-40

Second, the DEIR/EA proposes insufficient mitigation measures to address the impacts associated with Valley Fever. Mr. Hagemann points out that the Dust Management Plan envisioned by MDAQMD Rule 403 is insufficient to address impacts related to Valley Fever because of the difference in particle size between the Valley Fever Spores and dust that would be released during Project construction.[114] Due to this difference, even if the air at the Project site appears to be clear of dust, Valley Fever spores, which are so small that they are undetectable 12-41

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[111] *Id.*, p. 4 – 215.
[112] SWAPE comments, p. 10.
[113] *Id.*, pp. 8 - 12.
[114] *Id.*, p. 10.

by the human eye, may likely be present.[115] Accordingly, specific mitigation measures that are designed to prevent the contraction of Valley Fever are required. 12-41

Third, "[i]n the past few years, several incidences of severe dust storms and reported cases of Valley Fever occurred during construction of photovoltaic energy projects."[116] A dust storm during the construction of Antelope Valley Solar Ranch One in Kern County, "led to complaints of respiratory distress by local residents and a concern of Valley Fever."[117] Furthermore, during the construction of Topaz Solar Farm and California Valley Solar Ranch, 28 construction workers contracted Valley Fever.[118] The County and the BLM must disclose these Project-specific aspects of development, and implement sufficient mitigation measures to protect construction workers and nearby residents. 12-42

Fourth, the DEIR/EA fails to disclose and evaluate the disproportionate impact the Project may have on prison inmates. The Project is located approximately 10 miles from Chuckwalla State Penitentiary.[119] Mr. Hagemann states, "Valley Fever has been blamed for 62 deaths among California prison inmates statewide. Annually, 200 prisoners are hospitalized 5,000 days for treatment of Valley Fever conditions at an estimated care cost of about $23.4 million."[120] Last year, 103 corrections facility personnel suffered Valley Fever related illnesses, and three corrections workers were killed by the epidemic.[121] The County and the BLM are required to fully identify the significant public health impacts associated with Valley Fever, and to propose mitigation measures specific to preventing Riverside County residents, local prison populations and construction workers at the Project site from contracting Valley Fever. 12-43

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[115] *Id.*, p. 12.
[116] SWAPE, p. 11.
[117] *Id.*
[118] *Id.*
[119] *See* SWAPE comments, p. 11. *See also* Google Earth Image of Prison. **Attachment D**.
[120] *Id.*
[121] Don Thompson, *Study: Valley Fever has Killed 3 Prison Workers, 103 Sickened*, THE FRESNO BEE, (February 6, 2014). **Attachment E.**

C. The DEIR/EA Fails to Disclose and Mitigate Impacts to Ephemeral Streams that are Located on the Project Site and Transmission Line Route, and Impacts Associated with Project Construction

According to the DEIR/EA, "[c]onstruction of the proposed Project would not permanently alter the course of any of the drainages."[122] However, the DEIR/EA continues, "one gen-tie pole would be within the potential ordinary high water mark of the drainage."[123] Consequently, the placement of gen-tie pole will alter the flow of water at the Project site. The DEIR/EA not only fails to disclose the fact that this impact may be significant, but the DEIR/EA also fails to provide any information, evidence or data to support its conclusory determination that construction directly in an ephemeral stream will have no impacts on drainage at the Project site. The DEIR/EA's reasoning is faulty and inadequate. 12-44

Furthermore, the DEIR/EA discusses impacts associated with Project construction that may pose impacts to drainage at the site of the solar array. However, the DEIR/EA fails to address, analyze, mitigate, or provide any evidence at all for its conclusion that the Project will not have a significant impact on drainage. The DEIR/EA explains,

> Grading could potentially alter naturally occurring drainage patterns and result in soil erosion, sedimentation, long-term siltation, and increased stormwater runoff, which increases the potential for flooding off-site or downstream of the construction areas. However, the Project area is relatively flat and would not require mass grading for construction purposes. The majority of the existing topography at the Project area would be maintained and, therefore, no added storm drainage control would be required outside of the substations and switching station.[124] 12-45

Although the DEIR/EA states that the Project site is relatively flat, Project construction will require a significant amount of trenching and grading, as discussed previously in these comments. Roads will be located every 200 feet, and several of the Project components require excavation of approximately 3 feet in various areas that have not been disclosed. Until more is known and substantial evidence is produced to support the DEIR/EA's conclusions, the County and the

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[122] DEIR/EA, p. 4 – 232.
[123] *Id.*, p. 4-233.
[124] DEIR/EA, p. 4 – 233.

BLM may not certify and approve the DEIR/EA. The County and the BLM must specify how the Project will avoid the washes and make these design features enforceable through the Project's conditions of approval. 12-45

D. The DEIR/EA Fails to Sufficiently Disclose, Analyze and Mitigate Impacts on Water Supply

The Project assumes the existence of an entitlement in existence for the use of PVID water. According to the DEIR/EA, "Project construction will require approximately 1,345 acre-feet ("AF") of water (451 AF per year) for dust control,[125] and operational non-potable water requirements would be approximately up to 345 AF/year."[126] However, the Project has not secured a water source. 12-46

The DEIR/EA continues, "[t]he Project ***would*** coordinate with Gila Farm Land, LLC (landowner) and the Palo Verde Irrigation District ["PVID"] to secure water service and supply during operation."[127] After stating that water service must still be secured, the DEIR/EA proceeds to assume the existence of an entitlement not in effect: "Water for the Project would be taken from existing PVID water entitlements that support the agricultural operations currently on the proposed solar facility site."[128] However, the DEIR/EA fails to provide evidence sufficient to support the claim that the Applicant has secured an entitlement to PVID water. 12-47

In the alternative, if the Applicant has received an entitlement to use PVID water, the water will be provided in violation of both state and federal law because PVID water is not approved for industrial uses.[129] The use of Colorado River water has been fully adjudicated under a system of treaties, agreements, and contracts with the Department of Interior, and other Colorado River Basin states.[130] Under this system of treaties, agreements, and contracts, PVID water is to be used for irrigation purposes and potable uses.[131] The Water Supply Assessment for the Project states, 12-48

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[125] *Id.*, p. 2 – 12.
[126] *Id.*, p. 2- 19.
[127] *Id.*
[128] *Id.*, p. 4 – 234 *emphasis added*.
[129] *See* 43 U.S.C. §§ 617 *et al. See also*, BOULDER CANYON PROJECT, Agreement: Requesting Apportionment of California's Share of the Waters of the Colorado River Among the Applicants in the State (August 18, 1931). **Attachment F.**
[130] *See* 43 U.S.C. §§ 617 *et al.*; *see also Arizona v. California*, 373 U.S. 546 (1963).
[131] EIR/EA, . P. 3 – 179; *see also* http://pvid.org/history.html.

> The PVID water supply is derived from its Colorado River contract. The PVID holds the Priority 1 rights to California's share of Colorado River water, and a shared portion of the Priority 3 rights, and their rights are not quantified by volume. Rather, the PVID's water use is defined by the irrigation water needed to serve a total of 104,500 acres in the Palo Verde Valley, and an additional 16,000 acres on the Palo Verde Mesa.[132]

12-48

Because the use of PVID water is limited to irrigation and potable uses, the water may not be used to support industrial development. The Project must obtain a water source sufficient to serve the Project, and identify, analyze and mitigate the impacts of the Project on that water body. The County is required to produce and circulate a DEIR/DEIS that adequately sets forth and analyzes Project impacts on a water source that may legally satisfy the Project's non-potable water needs.

E. The County and the BLM Lack Substantial Evidence to Support their Claim that Air Impacts Associated with Project Construction Will be Mitigated Below a Level of Significance

The DEIR/EA lacks substantial evidence to support its claim that Project construction will not have a significant impact on air quality. According to air quality expert, Anders Sutherland, the Project, "poses two potentially significant impacts to air quality: (1) generation of PM 10 emissions during construction are above the threshold (2) emissions of diesel particulate matter ["DPM"] during construction would pose health risks to nearby residents."[133] Because the DEIR/EA incorrectly determines that the Project will not pose a significant impact to air quality, a new DEIR/DEIS is required to address, analyze and significant air quality impacts. 12-49

i. *<u>The DEIR/EA Bases its Determination that the Project Will Not Result in Significant Impacts Related to PM-10 Emissions on Faulty Data</u>*

The DEIR/EA incorrectly estimates the daily fugitive dust emissions generated by Project construction to be below the threshold-of-significance for particulate matter ("PM").[134] According to MDQAMD thresholds, any emissions of 12-50

[132] Water Supply Assessment, DEIR/EA: Appendix G, p. 9.
[133] Swape comments, p. 16.
[134] DEIR/EA, p. 4- 71.

PM above 82 pounds per day (lb/day) are significant.[135] The conclusions reached in the Air Quality Technical Report ("AQTR") are faulty and not backed by substantial evidence. 12-50

The AQTR makes its determination of insignificance by misconstruing the results of a paper produced by Midwest Research Institute ("MRI"), nearly 15 years ago. In doing so, the AQTR anticipates that Project fugitive dust control measures, solely represented by watering the Project site three times daily, will have a 75% efficiency rating in fugitive dust reduction. Based on this conclusion, the AQTR sets PM construction emissions at 41.82 lb/day.[136] This conclusion is inaccurate and misleading. 12-51

The information in the MRI paper was based on a case study from Clark County, NV ("study"). The study estimated emissions from construction activities, track-out, and wind erosion. The study concluded that overall, control efficiency for PM emissions was at 50%, whereas, mitigation measures specifically applied to the "track-out" were higher, at 75%.[137] The DEIR/EA incorrectly applied the higher value to all construction emissions, rather than just "track-out".

The DEIR/EA evaluates emissions from numerous sources, and therefore, the 75% efficiency rating is inapplicable to the totality of emissions sources. The AQTR evaluates emissions associated with wrecking, excavation, grading, clearing of land, and solid waste disposal operations, as well as scraping, backfilling and compacting.[138] However, none of these activities are accounted for in the "track-out" efficiency emissions estimate of 75% that the AQTR applied to the whole of Project construction emissions. When correcting for this oversight by applying the 50% control efficiency rating actually used by the MRI study, air expert, Anders Sutherland calculated PM emissions at 83.64 lb/day. [139] The corrected value exceeds the MDAQMD threshold-of-significance of 82 lb/day. Accordingly, an updated DEIR/DEIS that corrects this miscalculation, identifies a significant impact and identifies further mitigation measures for PM abatement is required. 12-52

[135] SWAPE comments, p. 17.
[136] *Id.*, pp. 16 – 18.
[137]*Id.,* pp. 17-18.
[138] DEIR, p. 4 -20.
[139] SWAPE comments, pp. 17-18.

ii. *The DEIR/EA Failed to Evaluate DPM Emissions Impacts on Sensitive Receptors in Reaching its Determination of Significance*

The DEIR/EA's conclusion that the Project will not result in increased cancer rates to sensitive receptors is not supported by substantial evidence. The DEIR/EA fails to address impacts to childhood receptors, and therefore, reaches an inaccurate conclusion in the AQTR.

The AQTR in Appendix B to the DEIR/EA supposedly provides a "worst case analysis of the potential for TAC impacts to sensitive receptors."[140] However, as Mr. Sutherland points out, the "statement is unfounded because the screening health risk assessment ['HRA'] in the AQTR did not consider DPM exposures to children who inhabit nearby residences."[141] Because childhood receptors are more susceptible than adults, a heightened multiplier is used in estimating carcinogenic exposures to air pollutants.[142] Mr. Sutherland determined that a new calculation was required based on this oversight. 12-53

Accordingly, Mr. Sutherland reconstructed the HRA in accordance with what the worst case scenario would actually be, using the most recent version of screening methodologies recommended by the Federal EPA.[143] By applying AERSCREEN, which has been used since 2006 due to enhanced simulation models,[144] Mr. Sutherland determined that over the course of the three year construction period, the Project would result in an excess childhood cancer risk of 17.1 in one million. This vastly exceeds the applicable MDAQMD threshold-of-significance of 10 in one million. The County must produce and recirculate an updated DEIR/DEIS that identifies, analyzes and mitigates significant air quality and public health impacts to sensitive receptors.

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140 *Air Quality Technical Report*, DEIR/EA Appendix B, p. 46.
141 SWAPE comments, p. 18.
142 *Id.*
143 *Id.*
144 *Id.*

F. The County and the BLM Lack Substantial Evidence to Support their Conclusion that Impacts to Biological Resources Have Been Mitigated Below a Level of Significance

i. *The County Lacks Substantial Evidence to Support its Conclusion that Impacts to Burrowing Owls will Be Mitigated Below a Level of Significance and Fails to Evaluate Impacts Associated with Proposed Mitigation*

The DEIR/EA proposes mitigation in the form of buffers at burrowing owl burrows and translocation of burrowing owls to adjacent sites to compensate for impacts to burrowing owl habitat. However, as Scott Cashen, a field biologist with over 20 years of experience, points out, the DEIR/EA's mitigation measures and analysis falls short for four reasons. 12-54

First, the DEIR/EA incorrectly states that the 146 acres identified as compensatory habitat would fully mitigate Project impacts to burrowing owl habitat. Mr. Cashen finds the DEIR/EA's conclusion is unjustified, because the Project site will impact approximately 1,970 acres of burrowing owl habitat. He states, "[t]he minimum habitat replacement recommendations issued by the California Burrowing Owl Consortium over 20 years ago are no longer accepted by the CDFW because they have proven **ineffective** in the conservation of burrowing owls."[145] Accordingly, California Department of Fish and Wildlife ("CDFW") now recommends "replacement with an equivalent or greater habitat area."[146] Mr. Cahsen concurs with the CDFW's determination, "especially given the importance that the burrowing owl population in the Palo Verde Valley has to the statewide conservation of the species."[147] 12-55

Second, the compensatory habitat identified is wholly insufficient. Mr. Cashen's investigation of the identified parcels proposed for compensatory habitat demonstrates their glaring inadequacy for burrowing owl occupation. The sites identified appear to be barren land, road shoulder, or currently occupied by human residences.[148] "[T]hese sites do not have any value for the conservation of 12-56

[145] Cashen comments, pp. 11 – 12.
[146] CDFW 2012 Staff Report on Burrowing Owl Mitigation.
[147] Cashen comments, p. 13.
[148] *See* Cahsen comments, Figures 7 – 12.

burrowing owls," because they "appear to lack the attributes that would make 12-56
them suitable for burrowing owl occupancy."[149]

Third, the DEIR/EA proposes reduced buffer distances, which contain "several flaws and do[] not ensure effective burrowing owl mitigation."[150] The DEIR/EA does not provide substantial evidence that reduced buffers will be effective at reducing impacts to burrowing owls. Mr. Cashen believes that "there is already evidence that the buffers should not be reduced."[151] He explains that whether a buffer is eligible for reduction is based on the level of disturbance and
the sensitivity of the owls at the Project site.[152] The Burrowing Owl Study 12-57
reported the relative sensitivity of the burrowing owls at the Project site. For example, the field biologist conducting surveys reported, "[t]he burrowing owls occupying Area 2 were easily distressed and would flush and call to one another whenever biologists entered the vicinity."[153] Furthermore, the noise associated with construction activity presents a high level of disturbance. Mr. Cashen concludes, "[t]he combination of these two factors makes it inappropriate for the County and BLM to experiment with reduced buffer distances."[154]

Finally, the DEIR/EA fails to identify and analyze any impacts associated with mitigation measures. The DEIR/EA indicates that the Project may involve the passive relocation of burrowing owls to compensatory mitigation habitat, or the eviction of burrowing owls. "Consistent with California Department of Fish
and Wildlife guidelines, passive relation is a potentially significant impact under 12-58
CEQA that must be analyzed."[155] The County and BLM are required to, but have not, identified or analyzed impacts, such as increased stress, reduced reproduction rates and increased depredation, associated with passive relocation. The County is required to disclose and analyze these impacts, and implement sufficient mitigation in an updated and recirculated DEIR/DEIS.

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[149] Cashen comments, p. 13.
[150] *Id.*, p. 11.
[151] *Id.*
[152] *Id.*
[153] Western burrowing Owl Survey, p. 10.
[154] Cashen comments, p. 11.
[155] *Id.*, p. 4.

ii. *The Mitigation Measures for Impacts to Avian and Bat Species are Vague, Voluntary, and Unenforceable*

The *Avian and Bat Protection Plan* ("ABPP") presents mitigation measures that are vague and unenforceable, in violation of CEQA. CEQA requires that all feasible mitigation measures be implemented, and "that measures to mitigate or avoid significant effects on the environment are fully enforceable through permit conditions, agreements, or other measures."[156] According to Mr. Cashen, "[t]he ABPP identifies various facility thresholds that *may* trigger adaptive management and additional mitigation."[157] Therefore, the ABPP, "has little, if any value in mitigating Project impacts to birds and bats" due to its untenable triggers and unenforceability.[158] The unmitigated levels of mortality that trigger the adaptive management strategy "equate[] to 1,940 native birds, 145.5 raptors, or 1,455 bats per year."[159] Mr. Cashen calls these levels "unacceptable," and has determined that the ABPP presents an approach that is "not scientifically acceptable."[160] 12-59

Mr. Cashen recommends that the Project applicant incorporate the United States Fish and Wildlife Service ("USFWS"), or the National Fish and Wildlife Forensic Laboratory monitoring methods to examine take at a solar facility. Monitoring of avian death at solar facilities is currently required by the California Energy Commission ("CEC"). Yet, as Mr. Cashen demonstrates in his comments, the applicant has failed to adopt sufficient monitoring. The ABPP requires only three years of post-construction fatality monitoring, but fails to identify any specific measures for determining Project-associated avian fatality.[161] Because the DEIR/EA fails to identify tenable triggers for the adaptive management strategy and includes vague and unenforceable mitigation measures, the County must produce an updated DEIR/EA, which incorporates the CEC required monitoring, and specific measures for mitigating impacts to avian species.

[156] CEQA Guidelines, § 21081.6, subd. b.
[157] Cashen comments, p. 17.
[158] *Id.*
[159] *Id.*
[160] *Id.,* pp. 17-18.
[161] *See id.*

iii. ***The DEIR/EA Lacks Sufficient Evidence To Support its Conclusion that Impacts to Mojave Fringe-Toed Lizard Have Been Mitigated and Failed to Identify, Analyze and Implement Mitigation Measures for Cumulative Impacts to Mojave Fringe Toed Lizards***

The DEIR/EA lacks substantial evidence to support its conclusion that the implementation of mitigation measures would reduce impacts to the Mojave fringe-toed lizard to a less than significant level.[162] Mr. Cashen concludes the Project has a considerable contribution to cumulative impacts on Mojave fringe-toed lizards. The "Project's gen-tie line and access road would fragment a relatively large population (or metapopulation) of Mojave fringe-toed lizards in the corner of the species range."[163] Therefore, the Project has the potential to increase the risk of "local extirpation."[164] Mr. Cahsen's conclusion is based on the fact that Mojave fringe-toed lizards have a metapopluation structure, which depends on: (1) the persistence of local populations, (2) the success immigration to and emigration from the popoulation, and (3) movements in and out of the metapopulation.[165] 12-60

The DEIR/EA fails to address, analyze and mitigate cumulative impacts to which the Project has a considerable contribution. Mr. Cashen points out in his comments that the proposed mitigation measures, "would be limited to attempts to reduce impacts to the Mojave fringe-toed lizard and its habitat; they do not offset the impacts identified in the DEIR/DEA's analyses (e.g., reduced population size, long-term predation vulnerability, and decreased dispersal opportunities)."[166] Accordingly, Mr. Cashen believes that the Project's incremental contribution to cumulative impacts would have a considerable and unmitigated impact on the persistence of Mojave fringe-toed lizards in the Chuckwalla Valley. The County is required to produce and recirculate the DEIR/DEIS that addresses, analyzes and mitigates cumulative impacts to the Mojave fringe-toed lizard persistence in the Chuckwalla Valley. 12-61

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[162] *See* DEIR/EA, p. 4-129.
[163] Cashen, p. 5
[164] *Id.*
[165] *Id.*, p. 6.
[166] *Id.*, p. 7.

iv. ***The County and the BLM Fails to Set Aside Habitat Compensation for Impacts to Desert Tortoise Habitat in Violation of the NECO Plan and Fails to Identify Impacts Associated with Raven Predation***

The DEIR/EA fails to identify and mitigate Project impacts to the Desert Tortoise for two reasons. First, the DEIR/EA fails to discuss and quantify habitat loss related to the Project. This information is essential to determine whether and what mitigation is required. The Project is located within the NECO Plan Area. "The NECO Plan requires project proponents to provide compensatory mitigation (through land acquisition or a mitigation fee) for impacts to desert tortoise habitat."[167] One acre of compensatory mitigation habitat is required for every one acre disturbed. Although the Project identifies desert tortoise burrows located in the Project APE,[168] the DEIR/EA fails to quantify what area of habitat will be disturbed. Because "[t]he DEIR/EA does not require the Applicant to provide compensatory mitigation for Project impacts to desert tortoise habitat…it does not adhere to the requirements of the NECO [p]lan."[169] 12-62

Second, the DEIR/EA does not require a Raven Management Plan, in violation of the USFWS *Renewable Energy Development in the California Desert: Common Raven Predation on the Desert Tortoise* ("Raven Predation Plan").[170] BLM addresses increased predation of tortoises by the common raven in the CDCA.[171] Indeed, "[t]he BLM's biological assessments and the [USFWS] biological opinions for the CDCA plan amendments reiterate the need to address this species and its potential impacts on desert tortoise populations."[172] Accordingly, in 2010, the Raven Predation Plan was developed to address the increase in common raven population and distribution resolution development of renewable energy resources.[173] The Plan includes conservation measures and "mitigation that may reduce or eliminate the opportunity for proliferation of ravens."[174] According to the USFWS and Mr. Cashen, the common raven is a predator of the desert tortoise. 12-63

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167 *Id.*, p. 15.
168 DEIR/EA, Figure 3.2.4-3
169 Cashen, p. 15.
170 *Id*, pp. 15-16.
171 U.S. Fish and Wildlife, *Renewable Energy Development in the California Desert: Common Raven Predation on the Desert Tortoise*, p. 1 (November 2010). **Attachment G.**
172 *Id.*
173 *Id.*
174 *Id.*

The DEIR/EA notes the following with regards to impacts to Mojave fringe-toed lizards,

> Long-term predation vulnerability may occur due to vegetation loss, which decreases dispersal and refuge opportunities from predators. In addition, increased perching opportunities resulting from construction of the proposed gen-tie line also increases this species' predation vulnerability.

12-64

However, the DEIR/EA fails to carry this analysis over to impacts on desert tortoise even though the common raven is a known desert tortoise predator. This oversight results in the DEIR/EA's "fail[ure] to require sufficient mitigation to address the Project's contribution to the local and regional raven population."[175] Therefore, "impacts to the desert tortoise remain potentially significant."[176] To address this issue, the County must require the Applicant to comply with both the NECO Plan and Raven Predation Plan so that issues related to desert tortoise habitat reduction and predation are reduced to a less than significant level, as required by CEQA and NEPA.

v. *<u>The County and the BLM Failed to Disclose, Analyze and Mitigate Significant Impacts to Spade Foot Toad</u>*

The DEIR/EA failed to identify any issues related to Couch's spadefoot. Couch's spadefoot is an extremely rare species, listed as a BLM Sensitive Species and a California Species of Special Concern. As discussed earlier in these comments, Couch's spadefoot has been known to occur in flooded alfalfa fields, and adjacent to irrigated agricultural sites, similar to the Project site. However, the DEIR/EA failed to address any impacts to the species.

12-65

According to Mr. Cashen, noise from Project construction has the potential to mimic rainfall, causing the Couch's spadefoot to seek refuge in highly unfavorable conditions that are hot, dry and fatal to adults.[177] Furthermore, "breeding sites used by the Couch's spadefoot are potentially vulnerable to Project disturbance that alters the percolation characteristics of the substrate in a manner that makes pools too short-lived for larvae to attain metamorphosis."[178] Throughout the Project site, there are irrigation ponds, the fate of which is not

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[175] *Id.*
[176] *Id.*
[177] Cashen comments, p. 4.
[178] *Id.*

described in the DEIR/EA. If Couch's spadefoot are present near these water sources, or in one of the four ponds adjacent to the Project site, the Couch's spadefoot will be subject to potentially significant impacts that are neither identified, nor mitigated in the DEIR/EA. Accordingly, Mr. Cashen has determined that the Project may have unmitigated significant impacts to Couch's spadefoot, given its extreme rarity. 12-65

G. The County and the BLM Lack Substantial Evidence to Support their Conclusion that Project Visual Impacts Will be Less than Significant

The DEIR/EA lacks substantial evidence to support its conclusion that no substantial adverse effects to scenic resources will result from Project development for two reasons. First, the DEIR/EA admits, "I-10 has been identified by the County of Riverside as eligible for designation as a scenic corridor."[179] Indeed, the Riverside County General Plan requires that scenic vistas be preserved, and that distribution lines be relocated from eligible areas.[180] Based on this information, the County formulated Policy C-19.1, the stated purpose of which is to "[p]reserve scenic routes that have exceptional or unique visual features in accordance with Caltrans' Scenic Highways Plan."

12-66

The Palo Verde Valley Area Plan ("PVVAP"), which also covers the Project site, contains similar, consistent policies. For instance, PVVAP 10.2 was formulated to, "[e]ncourage the designation of Interstate 10 and US Highway 95 as eligible and subsequently Official Scenic Highways in accordance with the California State Scenic Highway Program." Accordingly, the DEIR/EA evaluated I-10 as a scenic highway.[181] However, "[m]otorists along I-10 would be the closest ground-based viewers" of the Project.[182] As a result, "[t]he public would primarily view the Project area from I-10."[183] Yet, the DEIR/EA concludes that no impacts to visual resources would occur. The DEIR/EA provides no rationale for its conclusion.

Second, the Project would violate the Riverside County General Plan Policy C-25.2. Policy C-25.2 requires that developments "locate new and relocated utilities underground when possible. All remaining utilities shall be located or screened in a 12-67

[179] DEIR/EA, p. 4 – 34.
[180] *Id.*, p. 3 – 16.
[181] *Id.*
[182] *Id.*
[183] *Id.*

manner that minimizes their visibility by the public."[184] The Project proposes the construction of an 8.4 mile – 230 kV gen-tie line. Furthermore, various 34.5 kV collection lines will be erected throughout the Project site, which will be above ground, and visible. The Project and its lines will be directly adjacent to and on both sides of I-10. The DEIR/EA provides no evidence for why this Project will not present a visual impact on this potential scenic corridor. The County and the BLM are required to produce and circulate a DEIR/DEIS that identifies significant impacts to scenic resources in Riverside County, and mitigates those impacts. 12-67

VI. THE COUNTY IMPERMISSIBLY DEFERS FORMULATING MITIGATION MEASURES FOR IMPACTS RELATED TO STORMWATER IN VIOLATION OF CEQA; THE BLM FAILS TO INCLUDE A REASONABLY COMPLETE DISCUSSION OF SUCH MITIGATION IN VIOLATION OF NEPA

The DEIR/EA defers preparation of a plan designed to minimize impacts to drainage and impacts from stormwater run-off until after Project approval. The DEIR/EA also fails to include a reasonably complete discussion of these mitigation measures. Without definite enforceable mitigation measures, the public and decision makers cannot assess whether impacts on drainage and hydrology will remain significant during the public review process. Deferral of the formulation of mitigation measures to post-approval studies is generally impermissible under CEQA.[185] An agency may only defer the formulation of mitigation measures when it "recognizes the significance of the potential environmental effect, commits itself to mitigating the impact, and articulates specific performance criteria for the future mitigation."[186] "A study conducted after approval of a project will inevitably have a diminished influence on decision making. Even if the study is subjected to administrative approval, it is analogous to the sort of post hoc rationalization of agency action that has been repeatedly condemned in decisions constructing CEQA."[187] 12-68

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[184] DEIR/EA, p. 3 – 16.
[185] *Sundstrom v. County of Mendocino* (1988) 202 Cal.App.3d 296, 307 (hereafter *Sundstorm*); *see also* CEQA Guidelines, § 15126.4, subd. (a)(1)(B).
[186] G*entry v. Murietta* (1995) 36 Cal.App.4th 1359, 1411 citing *Sacramento Old County Assn. v. County Council* (1991) 229 Cal.App.3d 1011, 1028-1029.
[187] *Sundstrom,* 202 Cal.App.3d at 307.

NEPA requires "a reasonably complete discussion of possible mitigation measures."[188] Mitigation includes "avoiding the impact altogether by not taking a certain action or parts of an action."[189] It also includes "minimizing impacts by limiting the degree or magnitude of the action and its implementation."[190] The mandate to thoroughly evaluate all feasible mitigation measures is critical to NEPA's purposes.[191] Hence, a "perfunctory description" or a "mere listing" of possible mitigation measures is not adequate to satisfy NEPA's requirements.[192] 12-69

The DEIR/EA states that the construction and development of the Project may lead to disruption in drainage rates and drainage patterns.[193] There are two ephemeral streams that are located on the Project site, which may be impacted by pollutants contained in stormwater run-off, by impacts to drainage, or by disturbance of pesticides that contaminate the Project site. These ephemeral streams drain to the Colorado River, which also may be impacted in these same ways. Accordingly, the County and the BLM are requiring the implementation of multiple BMPs to address potential Project impacts.[194] However, the DEIR/EA's discussion is not reasonably complete, as required by NEPA. Also, none of these measures contain performance standards or make approval further contingent on meeting the performance standards, as required by CEQA.[195] The County and the BLM include the formulation of a Stormwater Pollution Prevention Plan ("SWPPP") that defers study of the Project site drainages.[196] The SWPPP BMP requires that the Applicant, "identify site surface water runoff patterns and include measures that prevent excessive and unnatural soil deposition and erosion throughout and downslope of the Project site and Project-related construction areas."[197] This is a blatant deferral of mitigation to post-approval studies in violation of CEQA. This deferral also fails to ensure that the mitigation measures are reasonably described and disclosed in the environmental review document in violation of NEPA. Because the information in the SWPP will only become available after Project approval, the 12-70

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[188] *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989).
[189] 40 C.F.R. § 1508.20(a).
[190] *Id.* § 1508.20(b).
[191] *Id.*, § 1500.1(c).
[192] *Neighbors of Cuddy Mountain*, 137 F.3d at 1380; *Idaho Sporting Cong. v. Thomas*, 137 F.3d 1146, 1151 (9th Cir. 1998).
[193] DEIR/EA, p. 4 – 233.
[194] *Id.*, pp. 2 – 28 – 31.
[195] *Endangered Habitats League v. County of Orange* (4th Dist. 2005), 131 Cal.App.4th 777, 793-94.
[196] DEIR/EA, p. 2 – 28.
[197] *Id.*

requirement to prepare a SWPPP fits the very definition of a post hoc 12-70
rationalization of an agency action and violates CEQA and NEPA.

VII. CONCLUSION

The Project presents significant environmental impacts that the County and
the BLM failed to address in the DEIR/EA, which must be disclosed, analyzed and
mitigated in a revised DEIR/DEIS prior to Project approval. The DEIR/EA's Project
description is improperly truncated. The DEIR/EA fails to adequately establish the
existing setting upon which to measure impacts to biological and hydrological
resources. The DEIR/EA also fails to include an adequate analysis of and 12-71
mitigation measures for the Project's potentially significant impacts. The
DEIR/EA's conclusions lack substantial evidence as required by CEQA and NEPA.
Finally, the Project is inconsistent with the NECO Plan. The County and the BLM
failed to include a reasonable discussion and improperly deferred the formulation of
mitigation measures to post-approval studies for drainage and hydrological
resources. Due to these significant deficiencies, a revised DEIR/DEIS that
addresses these inadequacies must be recirculated.

Sincerely,

Meghan A. Quinn

MAQ:clv

Attachments	
Attachment A	Comments and Attachments, Scott Cashen
Attachment B	Comments and Attachments, SWAPE Consulting
Attachment C	PVID website
Attachment D	Map of Solar Array in Relation to Chuckwalla Prison
Attachment E	News Articles About Increased Valley Fever Rates in Prisons
Attachment F	Boulder Canyon Project Agreement and Boulder Canyon Project Act
Attachment G	U.S. Fish and Wildlife, *Renewable Energy Development in the California Desert: Common Raven Predation on the Desert Tortoise* (November 2010).

ATTACHMENT A

July 29, 2014

Ms. Meghan A. Quinn
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Subject: Comments on the Draft Environmental Impact Report and Draft Environmental Assessment Prepared for the Blythe Mesa Solar Project

Dear Ms. Quinn:

This letter contains my comments on the Draft Environmental Impact Report and Draft Environmental Assessment ("DEIR/DEA") prepared for the Blythe Mesa Solar Project ("Project") by Riverside County ("County") and the Bureau of Land Management ("BLM"). Renewable Resources Group ("Applicant") proposes to construct, operate, maintain, and decommission an up to 485-megawatt photovoltaic solar generating facility and 8.4-mile generation interconnection (gen-tie) line. The Project would occupy a total of 3,660 acres in the Palo Verde Mesa region of Riverside County.

I am an environmental biologist with 21 years of professional experience in wildlife ecology, forestry, and natural resource management. To date, I have served as a biological resources expert for over 80 projects, the majority of which have been renewable energy facilities. My experience and scope of work in this regard has included assisting various clients with evaluations of biological resource issues, reviewing environmental compliance documents prepared pursuant to the California Environmental Quality Act ("CEQA") and the National Environmental Policy Act ("NEPA"), submitting written comments in response to CEQA and NEPA documents, and testifying as an expert witness before the California Energy Commission and California Public Utilities Commission. My educational background includes a B.S. in Resource Management from the University of California at Berkeley, and a M.S. in Wildlife and Fisheries Science from the Pennsylvania State University.

I have gained particular knowledge of the biological resource issues associated with the Project through the scientific research I have conducted in the Colorado Desert, and through my work on numerous other renewable energy projects in the Project region. The comments herein are based on my review of the environmental documents prepared for the Project, a review of scientific literature pertaining to biological resources known to occur in the Project area, consultations with other biological resource experts, and the knowledge and experience I have acquired during more than 21 years of working in the field of natural resources management.

BASELINE CONDITION ISSUES

Special-Status Plants

Harwood's woollystar (*Eriastrum harwoodii*) occurs within all three potential gen-tie corridors.[1] Harwood's milk-vetch (*Astragalus insularis* var. *harwoodii*) occurs on the Project site (Figure 1) and within the northern gen-tie line corridor.[2] Harwood's woollystar has a Rare Plant Rank of 1B.2, which indicates it is rare throughout its range and fairly endangered in California.[3] The species has a global rank of G2 and a state rank of S2, which indicates it is "at high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors" at both the statewide and global scale.[4] Harwood's milk-vetch has a Rare Plant Rank of 2.2, which indicates it is rare or endangered in California, but more common elsewhere.[5] The species has a state rank of "S2.2?," which represents slightly less certainty than a rank of S2.[6]

Although the DEIR/DEA provides the Rare Plant Ranks for Harwood's woollystar and Harwood's milk-vetch, it fails to establish the ecological context of the populations in the Project area relative to other extant populations in the region (e.g., size of the population in Project area versus other populations). This precludes the public and decision makers from being able to evaluate the relative severity of Project impacts to these two species.

Couch's Spadefoot

The Couch's spadefoot is listed as a BLM Sensitive Species and a California Species of Special Concern. The Couch's spadefoot is an extremely rare species in California and its range is limited to a very small region in the southeastern portion of the state.[7] The Project site is within the geographic range of the species.

The California Natural Diversity Database ("CNDDB") has only six documented records of the species in the state.[8] One of the records is associated with a flooded alfalfa field.[9] Three of the remaining records are associated with desert scrub near agricultural fields.[10] Portions of the Project site and gen-tie line corridor contain these conditions.[11] Based on

[1] DEIR/DEA, p. 3-48.

[2] *Ibid*, Figure 3.2.4-2. *See also* California Natural Diversity Database, Biogeograhic Data Branch, Department of Fish and Wildlife. 2014 Jul 1 (Version 5).

[3] California Department of Fish and Game, Natural Diversity Database. 2011 Jan. Special Vascular Plants, Bryophytes, and Lichens List. Available at: <http://www.dfg.ca.gov/habcon/plant/info.html>.

[4] *Ibid*.

[5] *Ibid.*

[6] *Ibid.*

[7] Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division.

[8] California Natural Diversity Database, Biogeograhic Data Branch, Department of Fish and Wildlife. 2014 Jul 1 (Version 5).

[9] *Ibid.*

[10] *Ibid.*

[11] DEIR/DEA, Figure 3.2.4-1.

this information, I believe the DEIR/DEA has inappropriately concluded that the Couch's spadefoot has a "low" potential of occurring in the Project area.[12]

The DEIR/DEA Provides Inconsistent Information on the Presence of Special-Status Species

The DEIR/DEA provides inconsistent information on the presence of several special-status species. For example:

1. DEIR/DEA Figure 3.2.4-3 does not depict all of the burrowing owls, burrowing owl burrows, and burrowing owl signs that were detected during the Applicant's burrowing owl surveys.[13]
2. The DEIR/DEA indicates no bighorn sheep or sign were detected in the Project study area.[14] This information conflicts with the Biological Resources Technical Report, which indicates a bighorn sheep skull was found within the proposed solar array project footprint.[15] In addition, the "Affected Environment" section of the DEIR/DEA lists Nelson's bighorn sheep as one of the species detected within the Project study area.[16]
3. The Biological Resources Technical Report indicates the ferruginous hawk has a low potential of occurring within the Project area.[17] This information conflicts with the DEIR/DEA, which indicates the species is present along the gen-tie line routes.[18] Unlike most other special-status bird species, the special-status designation applied to the ferruginous hawk pertains to birds on their wintering grounds.

PROJECT IMPACT ISSUES

Special-Status Plants

The DEIR/DEA indicates the Project would result in direct impacts to special-status plant species.[19] It also acknowledges the potential for the Project to have several different types of indirect impacts to special-status plant species.[20] The DEIR/DEA, however, concludes implementation of BMP-13 (Ground and surface disturbance), BMP-14 (Travel and traffic), BMP-15 (New access roads and parking lots), and BMP-19 (Plants and wildlife) "would ensure that direct loss of habitat as a result of construction would be

[12] *Ibid*, Table 3.2.4-3.
[13] *Ibid* and Appendix C3: Western Burrowing Owl Survey Report, Figure 2.
[14] *Ibid*, p. 4-102, Table 3.2.4-3 and Figure 3.2.4-3.
[15] *Ibid*, Vol III, Appendix C1: Biological Resources Technical Report, pp. 23 and 54.
[16] *Ibid*, p. 3-57.
[17] *Ibid*, Vol III, Appendix C1: Biological Resources Technical Report, p. 51.
[18] *Ibid*, Table 3.2.4-3 and Figure 3.2.4-3.
[19] *Ibid*, p. 4-94.
[20] *Ibid*, pp. 4-94 and -95.

less than significant."[21] Although the referenced BMPs would reduce impacts, they do not require avoidance of special-status plants, or compensatory mitigation for direct impacts to the plants. As a result, the DEIR/DEA does not have the scientific basis to conclude impacts to special-status plants would be less than significant.

As discussed previously, the DEIR/DEA failed to establish the ecological context of the special-status plant populations in the Project area relative to other extant populations in the region. As a result, I used the CNDDB and the Biogeographic Information & Observation System ("BIOS") to generate maps that depict: (a) the CNDDB records for Harwood's woollystar and Harwood's milk-vetch in the Project region; and (b) the corresponding renewable energy projects in the region.[22] The resulting maps suggest that the Project, in conjunction with other approved and reasonably foreseeable future projects, would impact the majority of the known populations of Harwood's woollystar and Harwood's milk-vetch in the Project region (Figures 2 and 3).

Couch's Spadefoot

The DEIR/DEA does not discuss potential impacts to the Couch's spadefoot, nor does it provide mitigation to ensure impacts are less than significant.

Subterranean refuge sites used by the Couch's spadefoot may be susceptible to disturbance from off-road vehicles that create noise similar to rainfall, inducing emergence under highly unfavorable (hot, dry) conditions that would be almost certainly fatal to adults (Brattstrom and Bondello 1979).[23] Noise from Project construction has the potential to mimic these conditions. In addition, breeding sites used by the Couch's spadefoot are potentially vulnerable to Project disturbance that alters the percolation characteristics of the substrate in a manner that makes pools too short-lived for larvae to attain metamorphosis.[24] Given the extremely rare status of the species in California, any adverse impacts to the Couch's spadefoot would be significant and remain unmitigated.

Burrowing Owl

The Project may involve the eviction of burrowing owls from their burrows.[25] The DEIR/DEA, however, fails to adequately evaluate potential impacts to burrowing owls from the temporary or permanent closure of burrows, or to identify mitigation measures sufficient to reduce such impacts below a level of significance. Consistent with California Department of Fish and Wildlife ("CDFW") guidelines, passive relocation is a potentially significant impact under CEQA that must be analyzed.[26] Specifically, the temporary or permanent closure of burrows may result in: (a) significant loss of burrows

[21] *Ibid*, p. 4-95.
[22] BIOS data layers ds490, ds491, and ds492. Available at: <http://www.dfg.ca.gov/biogeodata/bios/>.
[23] Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division.
[24] *Ibid.*
[25] DEIR/DEA, p. 4-138.
[26] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation, p. 10.

and habitat for reproduction and other life history requirements; (b) increased stress on burrowing owls and reduced reproductive rates; (c) increased depredation; (d) increased energetic costs; and (e) risks posed by having to find and compete for available burrows.[27] The County and BLM must disclose and thoroughly analyze the impacts associated with evicting burrowing owls from the Project site.

The need for full analysis of potential impacts from passive relocation (i.e., eviction) is further supported by research that indicates most translocation projects have resulted in fewer breeding pairs of burrowing owls at the mitigation site than at the original site, and that translocation projects generally have failed to produce self-sustaining populations.[28] Investigators attribute the limited success of translocation to: (a) strong site tenacity exhibited by burrowing owls, and (b) potential risks associated with forcing owls to move into unfamiliar and perhaps less preferable habitats.[29]

Mojave Fringe-Toed Lizard

Mojave fringe-toed lizards: (a) have patchy distribution; (b) are vulnerable to local extirpations from habitat disturbance and fragmentation; and (c) are dependent on fragile ecosystems requiring protection against both direct and indirect disturbance. Aside from the population on the Project site, the DEIR/DEA fails to describe the distribution and status of Mojave fringe-toed lizard populations in the region. This precludes the ability to evaluate the relative significance of Project impacts to the population that occurs along the gen-tie line corridors. The BLM has the ability to at least partially describe the distribution and status of Mojave fringe-toed lizards in the region based on the survey results from other projects under the BLM's jurisdiction.

Based on my own independent research I determined: (a) the Mojave fringe-toed lizards in the Project area are in the southeasternmost portion of the species' range; and (b) Mojave fringe-toed lizard populations are believed to be decreasing.[30]

The Project's gen-tie line and access road would fragment a relatively large population (or metapopulation) of Mojave fringe-toed lizards in the corner of the species' range. This would greatly increase the risks of range contraction and local extirpation, neither of which would be mitigated by the measures prescribed in the DEIR/DEA.

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[27] *Ibid.*

[28] Smith BW, JR Belthoff. 2001. Burrowing owls and development: short-distance nest burrow relocation to minimize construction impacts. J. Raptor Research 35:385-391.

[29] *Ibid.*

[30] Cablk ME, JS Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands administered by the Bureau of Land Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p. *See also* Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division, p. 94.

Cumulative Impacts

The DEIR/DEA acknowledges that the projects considered in County and BLM's cumulative impacts analysis may remove or degrade a very large amount of habitat for the Mojave fringe-toed lizard.[31] Data available from the CNDDB and BIOS supports that conclusion (Figure 4).[32] There are two reasons the cumulative impacts scenario has the potential to have especially severe implications on the persistence of Mojave fringe-toed lizards in the Chuckwalla Valley. First, the Mojave fringe-toed lizard exhibits a metapopulation structure.[33] The fate of plant and animal metapopulations depends on three things: the persistence of local populations, the success of emigration and immigration, and movements in and out of the metapopulation as a whole.[34] The Project, in conjunction with other approved and reasonably foreseeable future projects, would impact all three of these things.[35]

Second, Mojave fringe-toed lizard populations are known to be highly susceptible to the adverse effects of habitat fragmentation, edge effects, and anthropogenic disturbance.[36] These adverse effects include mortality from vehicle strikes; the introduction and spread of invasive plants; erosion and sedimentation of disturbed soils; fragmentation and degradation of remaining habitat (including from the application of dust suppression chemicals); harm from accidental spraying or drift of herbicides; and an increase in access for avian predators (such as loggerhead shrikes) due to new perching structures.[37]

The DEIR/DEA lacks any quantitative analysis of cumulative impacts to the Mojave fringe-toed lizard. Nevertheless, it jumps to the conclusion that:

> Effects from the BMSP would be reduced to less than significant levels with the implementation of Mitigation Measures Biology-1 (Monitor Construction Site for Biological Compliance) and Biology-8 (Protect Mojave fringed-toed lizard). As

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[31] DEIR/DEA, p. 4-129.

[32] BIOS data layers ds490, ds491, and ds492. Available at: <http://www.dfg.ca.gov/biogeodata/bios/>.

[33] Definition of the term "metapopulation" has been subject to debate since it was first coined in 1969, but for the purposes of conservation and management a working definition is a population that has a spatially discrete distribution, and for which at least one or more local populations has a non-trivial probability of extinction. *See* McCullough DR. 1996. Introduction. Pages 1-10 in DR McCullough, editor. Metapopulations and Wildlife Conservation. Island Press, Washington (DC).

[34] Wiens JA. 1996. Wildlife in Patchy Environments: Metapopulations, Mosiacs, and Management. Pages 53-84 in DR McCullough, editor. Metapopulations and Wildlife Conservation. Island Press, Washington (DC).

[35] DEIR/DEA, p. 4-129.

[36] Cablk ME, JS Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands administered by the Bureau of Land Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p. *See also* Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division, p. 94.

[37] Cablk ME, JS Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands administered by the Bureau of Land Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p. *See also* Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division, p. 94.

> part of the Project, habitat would also be protected with the implementation of BMP-3 (Fugitive Dust Abatement Plan), BMP-10 (Integrated Weed Management Plan), BMP-13 (Ground and surface disturbance), and BMP-19 (Plants and wildlife). With implementation of the above-mentioned BMPs as part of the proposed Project, in addition to protection through the implementation of Project mitigation measures, the cumulative effects to the Mojave fringed-toed lizard between the BMSP and past, present and foreseeable projects would be less than significant.[38]

All of the referenced conditions (except Biology-8) would be limited to attempts to reduce impacts to the Mojave fringe-toed lizard and its habitat; they do not offset the impacts identified in the DEIR/DEA's analyses (e.g., reduced population size, long-term predation vulnerability, and decreased dispersal opportunities).[39] Although Biology-8 entails habitat compensation, the conditions associated with that measure are too vague to ensure the mitigation would have any long-term benefit to the conservation of Mojave fringe-toed lizards in the Chuckwalla Valley. I discuss this issue in the subsequent section pertaining to mitigation.

Based on the information provided above, and other factors (e.g., deterministic and stochastic factors) that affect the persistence of small populations, I believe that the cumulative impacts scenario threatens the persistence of Mojave fringe-toed lizards in the Chuckwalla Valley. I also believe that the Project's incremental contribution to cumulative impacts would be cumulatively considerable, and potentially unmitigated.

Avian Collisions

One hundred million to 1 billion birds are killed annually by daytime window collisions at low-level structures in the U.S. alone.[40] The visual system of birds is simply not capable of perceiving glass as a physical obstacle.[41] Whereas the extent of the threat remains unknown, the presence of dead and injured birds (including numerous water birds) at solar facilities under construction in California demonstrates that solar arrays present a collision hazard to birds.[42] At PV facilities, birds appear to mistake the broad reflective surfaces of the solar arrays for water.[43] When this occurs, the birds become susceptible to mortality by: (a) colliding with the solar arrays; or (b) becoming stranded (often injured) on a substrate from which they cannot take flight, thereby becoming susceptible to predation and starvation.[44]

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[38] DEIR/DEA, p. 4-129.

[39] *Ibid.*

[40] Evans Ogden LJ. 2002. Summary Report on the Bird Friendly Building Program: Effect of Light Reduction on Collision of Migratory Birds. Special Report for the Fatal Light Awareness Program (FLAP). Available at: http://www.flap.org/.

[41] Klem D Jr. 2009. Preventing Bird-Window Collisions. The Wilson Journal of Ornithology 121(2):314–321.

[42] Kagan RA, TC Viner, PW Trail, EO Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. 28 pp.

[43] *Ibid.*

[44] *Ibid.*

The DEIR/DEA's analysis of the collision risk to birds contains several inaccurate statements, including:

- "[i]n most cases, the cause of death [at solar facilities in Riverside County] was either clearly unrelated to a collision with panels/mirrors (e.g., confirmed impact with a vehicle or tangled in construction water pond netting) or uncertain (e.g., found deceased with no clear evidence of a collision) (Riverside County 2013)."[45]

- "[t]he Desert Sunlight Project…recorded a total of 19 waterfowl mortalities. Only one was confirmed as caused by collision with a solar panel."[46]

- "No fatalities of any bird species, including waterfowl, were reported as a result of collision with the solar trough mirrors [at the Genesis Solar Energy Project]."[47]

- "Of the total avian and bat mortalities reported for each of the three projects listed above [Desert Sunlight, Genesis, Ivanpah] from 2012-2014 the Desert Sunlight Project reported the least amount of mortality by 27 percent difference."[48]

- "[d]espite no scientific evidence of fatality risk to birds associated with PV solar arrays…"[49]

Each of these statements conflicts with information provided in a recent report prepared by the National Fish and Wildlife Forensics Laboratory (2014).[50]

The DEIR/DEA proceeds by attempting to discount the potential for many birds to even be in the Project area. For example, it states: (a) "[a]n important distinguishing factor for the BMSP is there will be no evaporation ponds and therefore the Project eliminates this potential attractant of waterfowl to the Project;" and (b) "[s]everal solar projects within Riverside County are located within undisturbed habitat, which would be expected to host a greater number of avian species than BMSP."[51]

Although the Project will not have evaporation ponds, the northern portion of the Project site is located immediately adjacent to two sewage treatment ponds, and two other ponds of unknown use (Figure 5). Sewage treatment ponds are known to attract an abundance of birds due to the food they supply.[52] Based on my calculations, the sewage treatment

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45 DEIR/DEA, p. 4-100.
46 *Ibid.*
47 *Ibid.*
48 *Ibid.*
49 *Ibid*, p. 4-101.
50 Kagan RA, TC Viner, PW Trail, EO Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. 28 pp.
51 DEIR/DEA, p. 4-101.
52 Access: <http://www.sctimes.com/story/life/outdoors/2014/05/03/birders-never-turn-noses-sewage-treatment-sites/8618855/>.

ponds adjacent to the Project site are approximately twice as large as the evaporation ponds adjacent to the Desert Harvest facility (Figure 6).

The DEIR/DEA provides the unsubstantiated statement that solar projects in undisturbed habitat would be expected to host a greater number of avian species than Project site. Animal species richness is often greater near ecotones than within adjacent homogeneous habitats.[53] Therefore, one could also argue that the *Project site* would be expected to host a greater number of avian species. Ultimately, both arguments are speculative because they are not supported by empirical data. As the DEIR/DEA acknowledges, the Applicant's consultant did not conduct point count surveys to assess avian abundance in the Project area.[54] As a result, the number of birds that may be exposed to the Project remains unknown. Despite this uncertainty, a 485-MW PV solar facility dispersed across 3,660 acres <u>will undoubtedly kill birds</u>.

Irrigation Ponds

The Project site contains six irrigation ponds that provide accessible fresh water for wildlife.[55] The DEIR/DEA does not identify the wildlife species that use (or may use) the ponds. It also does not identify the fate of the ponds, and the corresponding impacts to wildlife once the ponds are filled and/or surrounded by Project fencing.

MITIGATION ISSUES

Special-Status Plants

The DEIR/DEA's proposed mitigation for Project impacts to special-status plants is limited to one measure: Biology-3. This mitigation measure requires the Applicant to conduct pre-construction surveys for State and federally listed Threatened and Endangered, Proposed, Petitioned, and Candidate plants in a 250-foot radius around all areas subject to ground-disturbing activity.[56] If any plants with these designations are detected during the pre-construction survey, the Applicant is required to implement measures to avoid and minimize impacts from "unauthorized trespass by workers and equipment, staging and storage of equipment and materials, refueling activities, and littering or dumping debris."[57] The proposed mitigation measure does not reduce Project impacts to a less-than-significant level.

First, the measure directs the Applicant to conduct pre-construction surveys for State and federally listed Threatened and Endangered, Proposed, Petitioned, and Candidate plants. However, according to the Biological Resources Technical Report, no plants with any of

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[53] Morrison ML, BG Marcot, and RW Mannan. 2006. Wildlife-Habitat Relationships: Concepts and Applications. 3rd ed. Washington (DC): Island Press. p. 283.
[54] DEIR/DEA, Vol III, Appendix C4: Avian and Bat Protection Plan, p. 27.
[55] *Ibid*, Appendix C3: Western Burrowing Owl Survey Report, Figure 2 and p. 9.
[56] *Ibid*, p. 4-137.
[57] *Ibid*.

those designations have the potential to occur in the Project area.[58] Pre-construction surveys should be floristic in nature (meaning that every plant taxon that occurs on site is identified to the taxonomic level necessary to determine rarity and listing status), and include documentation of plants with a Rare Plant Rank of 1 or 2.[59]

Second, the DEIR/DEA fails to establish any circumstances under which special-status plants *must* be avoided. Instead, its conditions are limited to having the Applicant avoid and minimize impacts to special-status plants outside of the designated construction footprint.[60] As has been done for the Desert Riparian Woodland Wash, it appears feasible to make slight modifications to the gen-tie line (and associated features) to reduce impacts to special-status plants.[61]

Third, the DEIR/DEA lacks any compensatory mitigation for impacts to special-status plants. For the Blythe Solar Power Project (which also has the potential to affect Harwood's woollystar and Harwood's milk-vetch), the California Energy Commission ("CEC") concluded compensatory mitigation was required to reduce impacts to special-status plant species to less than significant levels.[62] A similar conclusion is warranted for this project.

Burrowing Owl

The mitigation measures proposed in the DEIR/DEA do not ensure Project impacts to burrowing owls would be mitigated to a less-than-significant level.

<u>Buffers</u>

The DEIR/DEA accurately relays the importance of buffering burrowing owl burrows from construction activities. It also accurately reports the buffer distances recommended by the CDFW.[63] However, in establishing the buffer distances that will be applied to the Project, the DEIR/DEA states:

> The approved Biologist will coordinate with the Construction Contractor to determine the level of disturbance and buffer distance needed. As topography and site conditions allow, setback distances can be reduced. Where appropriate, the setback distances can be reduced by screening burrows (i.e., installing hay bales or another type of material to create a visual and auditory barrier between

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[58] *Ibid*, Vol III, Appendix C1 (Biological Resources Technical Report), p. 31.

[59] California Department of Fish and Game. 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. Available at: <http://www.dfg.ca.gov/wildlife/nongame/survey_monitor.html#Plants>.

[60] DEIR/DEA, p. 4-137.

[61] *Ibid*, p. 4-94.

[62] California Energy Commission. 2013 Dec 5. Blythe Solar Power Project: Energy Commission Staff Recommended Conditions of Certification. BIO-19: Special-Status Plant Impact Avoidance, Minimization and Compensation. Docket number 09-AFC-06C.

[63] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 14. *See also* DEIR/DEA, Vol II, pp. 4-137 and -138.

> construction and the burrow) as a means of minimizing disturbance to owls… In addition, the approved Biologist will monitor the set-back distances to ensure that the applied distance is an effective buffer. Effective buffers are those that minimize indirect impacts on the burrowing owl by providing a distance between the burrow and construction activities.[64]

The proposed process for reducing buffer distances suffers several flaws and does not ensure effective burrowing owl mitigation.

First, the DEIR/DEA provides no evidence that buffer distances shorter than the ones recommended by CDFW are effective. Until reduced buffers have been proven effective, the County and BLM should require buffers consistent with CDFW guidelines.

Second, the DEIR/DEA provides no assurances that the Applicant's "approved Biologist" would be as qualified as the experts that established the buffer guidelines, or that the biologist would have the expertise to reduce buffers without adversely affecting burrowing owls.[65]

Third, there is already evidence that buffers should not be reduced. The appropriate buffers for burrowing owl burrows is largely dependent on: (a) the level of disturbance; and (b) the sensitivity of the individual owls.[66] Construction activities associated with the Project will cause a high level of disturbance requiring the maximum buffer distances recommended by CDFW.[67] In addition, the Applicant's survey data indicate that the burrowing owls on the Project site are very sensitive to disturbance.[68] The combination of these two factors makes it inappropriate for the County and BLM to experiment with reduced buffer distances.

Fourth, the actions associated with screening burrows (i.e., installing hay bales or another type of material to create a visual and auditory barrier between construction and the burrow) may result in adverse effects to the owls. Research has shown that owls exposed to human surveyors (in a vehicle or on foot) are ≥5 times more likely to be displaced than owls in the control group.[69] All survey methods displaced owls ≤18 times farther than the control group, which led to the researchers inferring that human disturbance caused by surveys exceeds the tolerance of habituated owls. The Applicant's consultant reported that burrowing owls occupying "Area 2" were easily distressed and would flush and call

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[64] *Ibid.*

[65] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 9-10. *See also* Scobie C, A Marsh, R Fisher. 2013 Jul. Influence of Petroleum Development on Burrowing Owl Ecology. Available at: <www.ptac.org/attachments/1166/download>.

[66] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 7-9.

[67] *Ibid*, p. 9.

[68] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 10.

[69] Manning JA, RSA Kaler. 2011. Effects of Survey Methods on Burrowing Owl Behaviors. Journal of Wildlife Management 75(3):525-530.

to one another whenever biologists entered the vicinity.[70] Disturbance (including flushing) can decrease survivorship and affect nesting behavior.[71] As a result, screening burrows (i.e., to allow reduced buffers) cannot be considered an acceptable mitigation alternative.

Fifth, CDFW guidelines state that reduced buffer distances need to be accompanied by a "broad-scale, long-term, scientifically-rigorous monitoring program" that ensures burrowing owls are not detrimentally affected.[72] The DEIR/DEA fails to implement this approach, or define any success criteria for minimizing indirect impacts to burrowing owls exposed to reduced buffers.

<u>Habitat Compensation</u>

The DEIR/DEA indicates: "146 acres of habitat have been identified adjacent to the Project area" to compensate for impacts to burrowing owls in the northern portion of the Project area.[73] To mitigate impacts, compensatory habitat must be protected and managed in perpetuity for the conservation of burrowing owls.[74] The DEIR/DEA fails to identify how the proposed compensation lands will be protected in perpetuity, or the mechanism (e.g., endowment) that will ensure the lands are maintained and managed for burrowing owl conservation.

The DEIR/DEA cites the California Burrowing Owl Consortium (1993) guidelines to support its conclusion that 146 acres of compensatory habitat would "fully mitigate" Project impacts to 1,970 acres of burrowing owl habitat.[75] The DEIR/DEA's conclusion is unjustified. The minimum habitat replacement recommendations issued by the California Burrowing Owl Consortium over 20 years ago are no longer accepted by the CDFW because they have proven **ineffective** in the conservation of burrowing owls.[76] As the DEIR/DEA acknowledges throughout the remainder of the document, the current mitigation guidelines are provided in CDFW's 2012 *Staff Report on Burrowing Owl Mitigation*. Those guidelines state:

> the current scientific literature supports the conclusion that mitigation for permanent habitat loss *necessitates replacement with an equivalent or greater habitat area* for breeding, foraging, wintering, dispersal, presence of burrows, burrow surrogates, presence of fossorial mammal dens, well drained soils, and

[70] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 10.

[71] Manning JA, RSA Kaler. 2011. Effects of Survey Methods on Burrowing Owl Behaviors. Journal of Wildlife Management 75(3):525-530.

[72] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 9-10.

[73] DEIR/DEA, p. 4-138.

[74] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 11-13.

[75] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16.

[76] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. pp. 1-2.

abundant and available prey within close proximity to the burrow.[77]

I concur with the CDFW in this regard, especially given the importance that the burrowing owl population in the Palo Verde Valley has to the statewide conservation of the species.[78]

Additional Compensation Lands

The DEIR/DEA indicates an additional 131 acres of land (across five sites) are available for habitat compensation, if needed.[79] Whereas I support the Applicant's efforts to identify potential sites for habitat compensation, the DEIR/DEA fails to meet CDFW guidelines by demonstrating the proposed sites have any value for conservation of burrowing owls.[80] Indeed, the majority of the proposed sites appear to lack the attributes that would make them suitable for burrowing owl occupancy (Figures 7 through 12).

Trigger for Habitat Compensation

The DEIR/DEA establishes an inappropriate trigger for burrowing owl habitat compensation. It states: "per the 2012 CDFG mitigation guidelines, a pre-construction survey will be conducted to determine the number of burrowing owls and the amount of compensation land that shall be required to be protected."[81] This statement is misleading. The intent of pre-construction surveys is to avoid take of burrowing owls, not to establish compensatory habitat requirements.[82] According to CDFW guidelines: [o]ccupancy of burrowing owl habitat is confirmed at a site when at least one burrowing owl, or its sign at or near a burrow entrance, is observed within the last three years."[83] Moreover, because burrowing owls can be difficult to detect, data from a pre-construction survey supplements, but does not replace, the data from protocol surveys.[84] Because burrowing owls have been detected on the Project site within the past three years, compensatory mitigation is required regardless of the results of the pre-construction surveys.

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[77] *Ibid,* p. 8. [emphasis added].

[78] Wilkerson RL and RB Siegel. 2011. Distribution and Abundance of Western Burrowing Owls (*Athene Cunicularia Hypugaea*) in Southeastern California. The Southwestern Naturalist 56(3): 378-384.

[79] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16 and Figure 4: Potential Burrowing Owl Mitigation Land.

[80] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. pp. 11-13 and Appendices E and F.

[81] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16.

[82] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. Appendix D.

[83] *Ibid,* p. 6.

[84] Klute DS, LW Ayers, MT Green, WH Howe, SL Jones, JA Shaffer, SR Sheffield, TS Zimmerman. 2003. Status assessment and conservation plan for the western Burrowing Owl in the United States. Bio Tech Pub FWS/BTP-R6001-2003. Washington: US Fish and Wildlife.

Success Criteria

The DEIR/DEA lacks clear, measurable performance standards and contingency plans to ensure the proposed mitigation measures are successful. According to the DEIR/DEA:

> All evicted burrowing owls will be monitored daily from dawn until dusk to determine their post-eviction fate until one of the following events occurs: 1) the burrowing owl is observed to reside in the artificial burrow for at least 10 consecutive days; 2) the owl is consumed by a predator or otherwise dies, and its death is documented and reported to CDFG, USFWS, and the County of Riverside; or 3) the monitoring team is unable to locate the owl in the vicinity of the Project area for 10 consecutive days, in which case the monitoring team will report the owl as "disappeared" in the final post-eviction report sent to the three agencies.[85]

There are two significant problems with this approach:

First, the DEIR/DEA fails to identify how the biological monitor would be able to distinguish between the owls evicted from the Project site, and any owls that already reside in the proposed mitigation sites. This confounds the ability to determine the fate of owls evicted from the Project site. CDFW's 2012 Staff Report provides the following discussion of this issue:

> Monitoring is qualitatively different from site surveillance; monitoring normally has a specific purpose and its outputs and outcomes will usually allow a comparison with some baseline condition of the site before the mitigation (including avoidance and minimization) was undertaken. Ideally, monitoring should be based on the Before-After Control-Impact (BACI) principle (McDonald et al. 2000) that requires knowledge of the pre-mitigation state to provide a reference point for the state and change in state after the project and mitigation have been implemented.[86]

As the DEIR/DEA acknowledges, burrowing owl and habitat assessment surveys have not been conducted on all of the proposed compensation lands.[87]

Second, the proposed mitigation allows evicted owls to die (or disappear) without any supplemental mitigation to compensate for the take. If this occurs, the Project would cause a decline in the burrowing owl population, and significant impacts to the species would remain unmitigated.[88]

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[85] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 15.

[86] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. p. 14. [emphasis added].

[87] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 14.

[88] Although the DEIR/DEA mentions an adaptive management program, it does not provide any details about the program, including performance standards and the enforcement mechanism.

Artificial Burrow Maintenance

The DEIR/DEA states: "[m]aintenance of artificial burrows shall occur three to four times during the year immediately following relocation, as necessary."[89] One year of maintenance is insufficient for the long-term success of mitigation lands. As reported in CDFW's 2012 Staff Report: "[a]ny long-term reliance on artificial burrows as natural burrow replacements must include semi-annual to annual cleaning and maintenance and/or replacement (Barclay et al. 2011, Smith and Conway 2005, Alexander et al. 2005) as an ongoing management practice."[90]

Desert Tortoise

Habitat Compensation

The Project would result in the permanent loss of habitat for the desert tortoise.[91] However, the DEIR/DEA does not quantify the amount of desert tortoise habitat that would be impacted by the Project, nor does it identify whether impacts to desert tortoise habitat are considered significant.

The Project is within the Northern and Eastern Colorado Desert Coordinated Management ("NECO") Plan area. The NECO Plan requires project proponents to provide compensatory mitigation (through land acquisition or a mitigation fee) for impacts to desert tortoise habitat.[92] For projects outside of a DWMA, the compensation ratio is 1:1 (1 acre of compensation land for every 1 acre disturbed).[93] The DEIR/DEA does not require the Applicant to provide compensatory mitigation for Project impacts to desert tortoise habitat, and thus, it does not adhere to the requirements of the NECO Plan.

Raven Management

The common raven is a known predator of the desert tortoise. The infrastructure and increase in human activities associated with renewable energy facilities benefit raven populations by providing perch and nest sites, and subsidies of food and water.[94]

The U.S. Fish and Wildlife Service ("USFWS") has concluded that approved renewable energy projects and associated transmission facilities should implement mitigation

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[89] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16.

[90] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. p. 13. [emphasis added].

[91] DEIR/DEA, p. 4-97.

[92] U.S. Bureau of Land Management. 2002. Northern and Eastern Colorado Desert Coordinated Management Plan and Final Environmental Impact Statement, Appendix D: Desert Tortoise Mitigation Measures. p. D-2.

[93] *Ibid.*

[94] Desert Managers Group. 2010 Nov. Renewable Energy Development in the California Desert: Common Raven Predation on the Desert Tortoise, November 2010 Summary. 8 pp. Available at: <http://www.dmg.gov/documents/20101130_RPT_Common_Raven_Predation_on_DT_USFWS.pdf>.

measures designed to reduce raven predation on desert tortoises at both the local and population level.[95] Each project applicant should develop an on-site plan to minimize availability of food sources and the potential for ravens to occupy the project site.[96] In addition, because it is not possible to completely exclude ravens from using project infrastructure, each project applicant should make a financial contribution to the USFWS's regional raven management plan.[97] Although the DEIR/DEA requires the Applicant to prepare a Trash Abatement Plan, it does not require a Raven Management Plan (which would include measures beyond trash abatement), nor does it require the Applicant to make a financial contribution to the USFWS's regional raven management plan. Because the DEIR/DEA fails to require sufficient mitigation to address the Project's contribution to the local and regional raven populations, impacts to the desert tortoise remain potentially significant.

Mojave Fringe-Toed Lizard

To mitigate for permanent habitat loss and direct impacts to Mojave fringe-toed lizards, the DEIR/DEA requires the Applicant to provide compensatory mitigation for impacts to stabilized or partially stabilized desert dune habitat (i.e., dune, sand ramp, or fine-sandy wash habitat). The DEIR/DEA indicates this measure can be satisfied through land acquisition or payment of a fee. If compensation lands are acquired, the Applicant is required to provide funding for the acquisition in fee title or in easement, initial habitat improvements, and long-term maintenance and management of the compensation lands.[98] These conditions are too vague to ensure effective mitigation that reduces Project impacts to a less-than-significant level.

First, the vegetation communities map provided in the DEIR/DEA does not depict stabilized or partially stabilized desert dune habitat.[99] As a result, it is unclear how the compensatory mitigation requirement would be calculated. Additionally, it is unclear how the proposed measure would mitigate "direct impacts to Mojave fringe-toed lizards."[100]

Second, the DEIR/DEA fails to provide any evidence that there are suitable mitigation sites in the Chuckwalla Valley. It also fails to establish conditions (e.g., occupancy by Mojave fringe-toed lizards) that ensure the mitigation site(s) has any value to the conservation of the species in the Chuckwalla Valley. Based on the cumulative impacts map (Figure 4), acquisition of mitigation sites in the Chuckwalla Valley may not be feasible. If this inference is correct, the County and BLM need to analyze the potential fate of the Chuckwalla Valley population, and justify the value that potential mitigation sites elsewhere would have to the overall conservation of the species.

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[95] U.S. Fish and Wildlife Service. 2010 May. Renewable Energy Development And Common Raven Predation on the Desert Tortoise: Summary. 3 pp.

[96] *Ibid.*

[97] *Ibid.*

[98] DEIR/DEA, p. 4-140.

[99] *Ibid*, Figure 3.2.4-1.

[100] *Ibid*, p. 4-140.

Third, the DEIR/DEA fails to identify the dollar amount if the Applicant elects to pay the fee in lieu of acquiring habitat. It also fails to establish a mechanism for ensuring the fee is used for Mojave fringe-toed lizard habitat acquisition, and that there is adequate funding for "initial habitat improvements and long-term maintenance and management."

Fourth, the DEIR/DEA does not establish success standards for the proposed mitigation, or a mechanism to ensure those standards are met. This issue is confounded because the DEIR/DEA does not designate an authority (e.g., CDFW) responsible for approving the Applicant's habitat compensation proposal.

Other Special-Status Species

Two special-status plant species and 11 special-status wildlife species were detected within the Project study area.[101] Additional special-status species have the potential to occur in the Project area.[102] According to the DEIR/DEA: "[h]abitat-based mitigation or other appropriate mitigation as discussed previously for desert tortoise and western burrowing owl shall provide mitigation for impacts to non-listed special-status species that inhabit overlapping suitable habitat."[103] This statement lacks credibility because (as discussed previously): (a) the DEIR/DEA does not require habitat-based mitigation for impacts to the desert tortoise; (b) the requirement for, and extent of, compensatory mitigation for the burrowing owl is contingent on the results of a pre-construction survey; and (c) the DEIR/DEA does not provide evidence that the proposed compensation lands would benefit the other special-status species that would be (or may be) affected by the Project.

Avian Collisions

The Applicant's *Avian and Bat Protection Plan* ("ABPP") outlines the approach that would be used to mitigate Project impacts to birds and bats. The ABPP recognizes the inherent difficulties in predicting the extent of bird and bat fatalities at the Project site.[104] As a result, the cornerstone of the ABPP is "adaptive management" based on post-construction fatality monitoring data. The adaptive management strategy presented in the ABPP is so poorly structured that is has little, if any, value in mitigating Project impacts to birds and bats.

<u>Adaptive Management Triggers</u>

The ABPP identifies various fatality thresholds that *may* trigger adaptive management and additional mitigation.[105] For example, the ABPP establishes a threshold of more than four total native bird fatalities/MW/year, more than 0.3 raptor fatalities/MW/year, or

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[101] *Ibid*, pp. 3-48 and -57. Includes species that Table 3.2.4-3 identifies as "present."
[102] *Ibid*, Tables 3.2.4-2 and -3.
[103] *Ibid*, p. 4-139.
[104] *Ibid*, Vol III, Appendix C4: Avian and Bat Protection Plan, p. 29.
[105] *Ibid*, p. 30.

more than three bat fatalities/MW/year.[106] This equates to 1,940 native birds, 145.5 raptors, or 1,455 bats per year. These are unacceptable levels of mortality that cannot go unmitigated.

Even if lower fatality thresholds are established, there is virtually zero possibility that adaptive management would be triggered because fatality monitoring would be limited to incidental detections made by facility operators and field engineers during normally scheduled activities.[107] This is not a scientifically acceptable approach.

In addition, the Applicant has committed to only three years of post-construction fatality monitoring, even though it expects avian abundance and species diversity in the Project area would vary widely each year.[108] This issue is confounded because the ABPP does not identify the sampling area, interval, or intensity. It also does not identify whether the trigger for adaptive management is based on *observed* fatalities, or *estimated* fatalities (i.e., adjusted for carcass removal and searcher efficiency). This is significant for a species that naturally occur at low densities (e.g., raptors), and that may have inherently few, but significant, mortalities.

The USFWS has developed monitoring methods to examine take at solar power facilities.[109] In addition, the CEC has been requiring all recently licensed solar projects to monitor the death and injury of birds from collisions with solar facility features.[110] Research by Klem (2009) identified several techniques that enable birds to avoid collisions with glass and other reflective surfaces.[111] In addition, the National Fish and Wildlife Forensics Laboratory (2014) recommended several mortality monitoring and avoidance measures for PV facilities.[112] The techniques described in these sources are feasible mitigation measures that should be required of the Project.

This concludes my comments on the DEIR/DEA.
Sincerely,

Scott Cashen, M.S.
Senior Biologist

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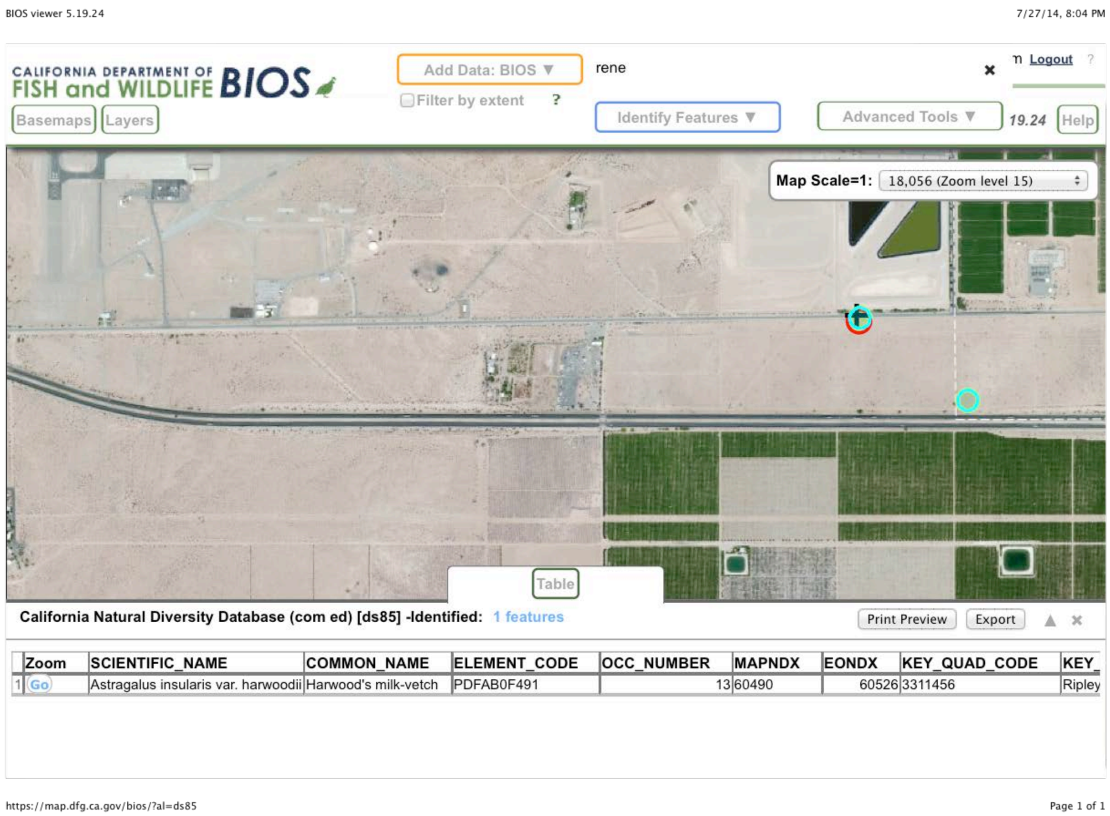
[106] *Ibid.*
[107] *Ibid*, p. 28.
[108] *Ibid*, p. 27 and DEIR/DEA, p. 4-139.
[109] USFWS, Pacific Southwest Region. 2011May 2. Monitoring Migratory Bird Take at Solar Facilities: An Experimental Approach.
[110] California Energy Commission. 2010 Jul. Supplemental Staff Assessment for the Calico Solar Project. p. C.2-230
[111] Klem D Jr. 2009. Preventing Bird-Window Collisions. The Wilson Journal of Ornithology 121(2):314–321.
[112] Kagan RA, TC Viner, PW Trail, EO Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. pp. 2, 3, 17, 20, and 24.



	Zoom	SCIENTIFIC_NAME	COMMON_NAME	ELEMENT_CODE	OCC_NUMBER	MAPNDX	EONDX	KEY_QUAD_CODE	KEY_
1	Go	Astragalus insularis var. harwoodii	Harwood's milk-vetch	PDFAB0F491	13	60490	60526	3311456	Ripley

Figure 1. California Natural Diversity Database record of Harwood's milk-vetch (blue-green circles) on the Project site. The SE location had 25 plants in 2004; an unknown number of plants were detected at the NW location in 2013.[113] Neither location was included on the maps provided in the DEIR/DEA.

[113] California Natural Diversity Database, Biogeograhic Data Branch, Department of Fish and Wildlife. 2014 Jul 1 (Version 5).

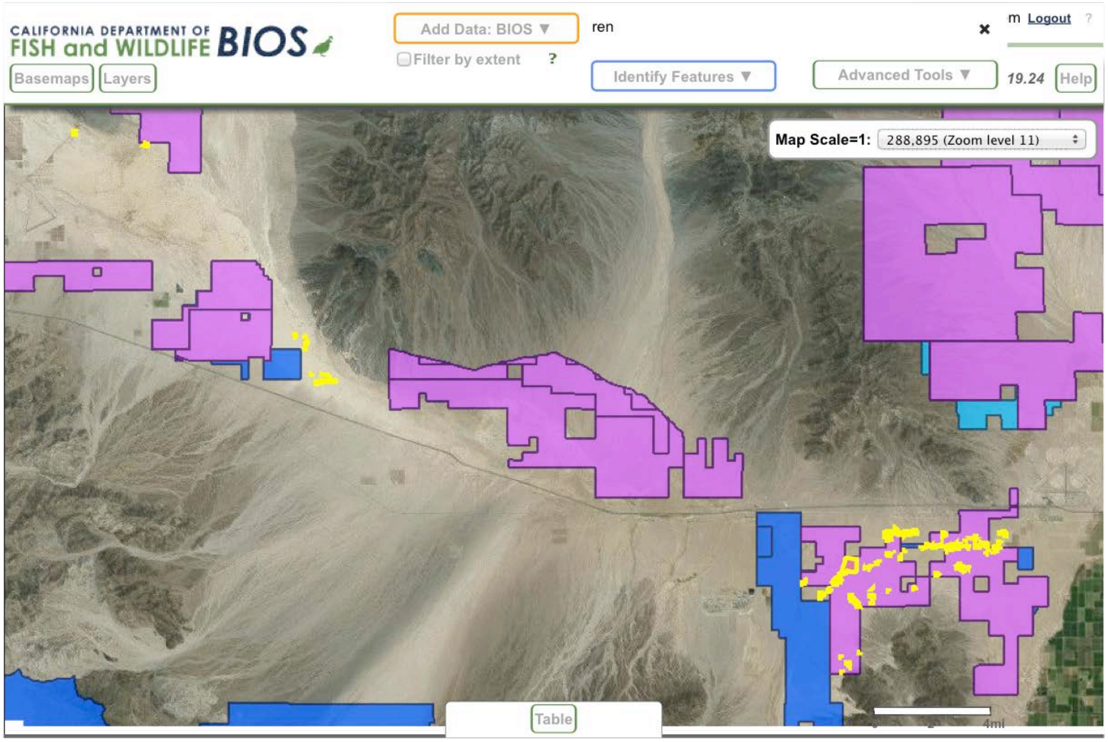


Figure 2. Existing, approved, and proposed renewable energy projects (blue and purple) in relation to CNNDB records of Harwood’s woollystar (yellow). Proposed Project is not depicted on the map.

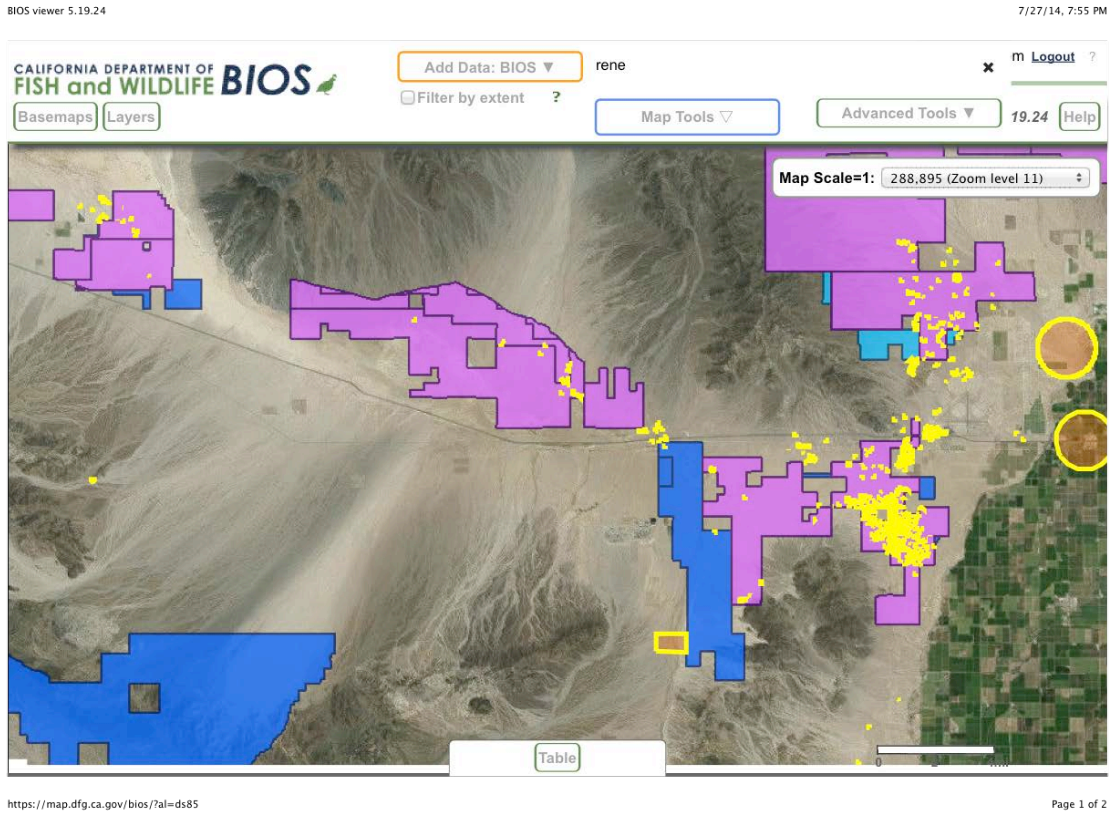
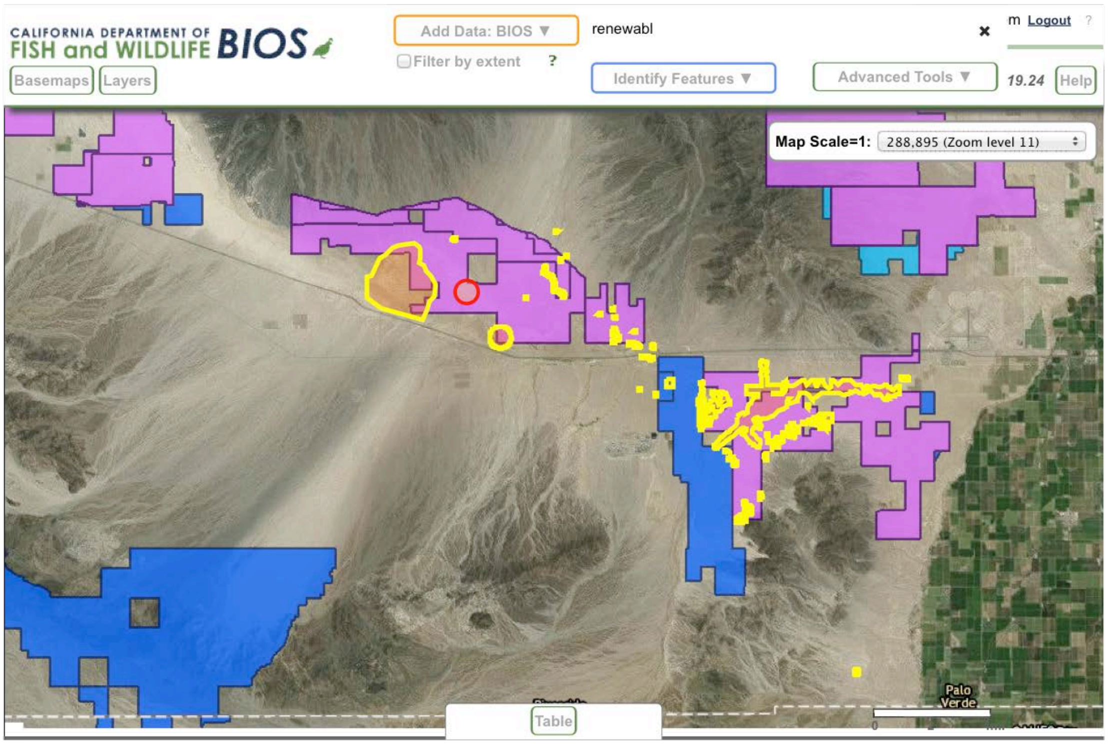


Figure 3. Existing, approved, and proposed renewable energy projects (blue and purple) in relation to CNNDB records of Harwood's milk-vetch (yellow). Proposed Project is not depicted on the map.

BIOS viewer 5.19.24 7/28/14, 5:06 PM



https://map.dfg.ca.gov/bios/?al=ds85 Page 1 of 2

Figure 4. Existing, approved, and proposed renewable energy projects (blue and purple) in relation to CNNDB records of Mojave fringe-toed lizard (yellow). These projects would impact most or all known Mojave fringe-toed lizard populations in the Chuckwalla Valley. Proposed Project is not depicted on the map.

Figure 5. Ponds adjacent to the boundary (yellow line) of the northern portion of the Project site.


Figure 6. Evaporation ponds (two empty) at Desert Harvest PV Solar Facility (left) and Sewage treatment ponds adjacent to the proposed Project site (right). Both images are at an elevation of approximately 3,000 feet above ground surface to facilitate size comparisons.

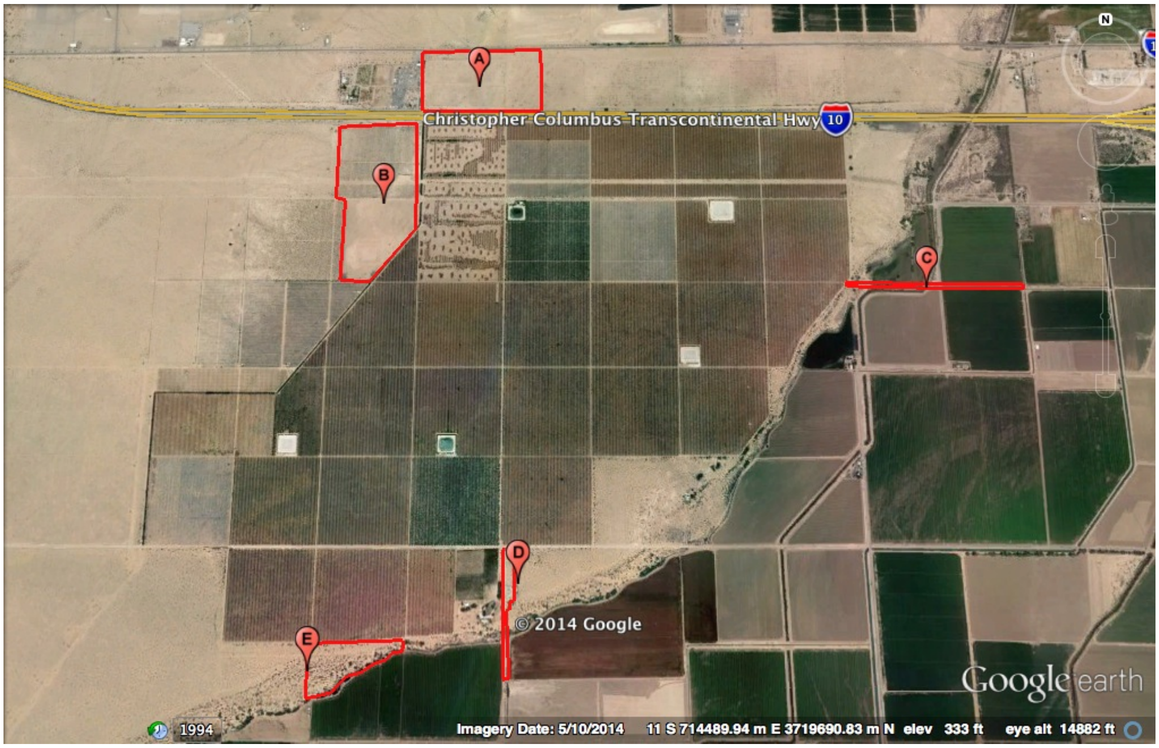


Figure 7. Other potential burrowing owl mitigation lands (red polygons) identified by the Applicant. Corresponds to *Western Burrowing Owl Monitoring and Mitigation Plan*, Figure 4.

Figure 8. Mitigation site “A.” Site is largely barren.

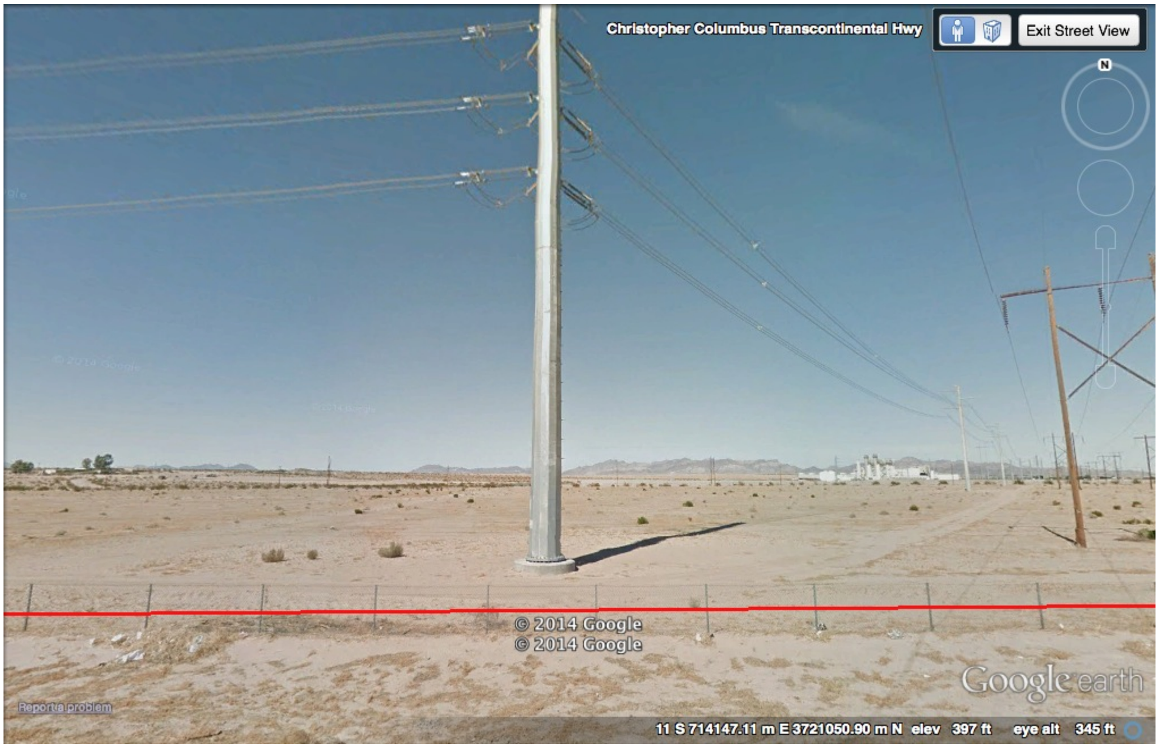


Figure 9. Google Earth Street View of Site A.

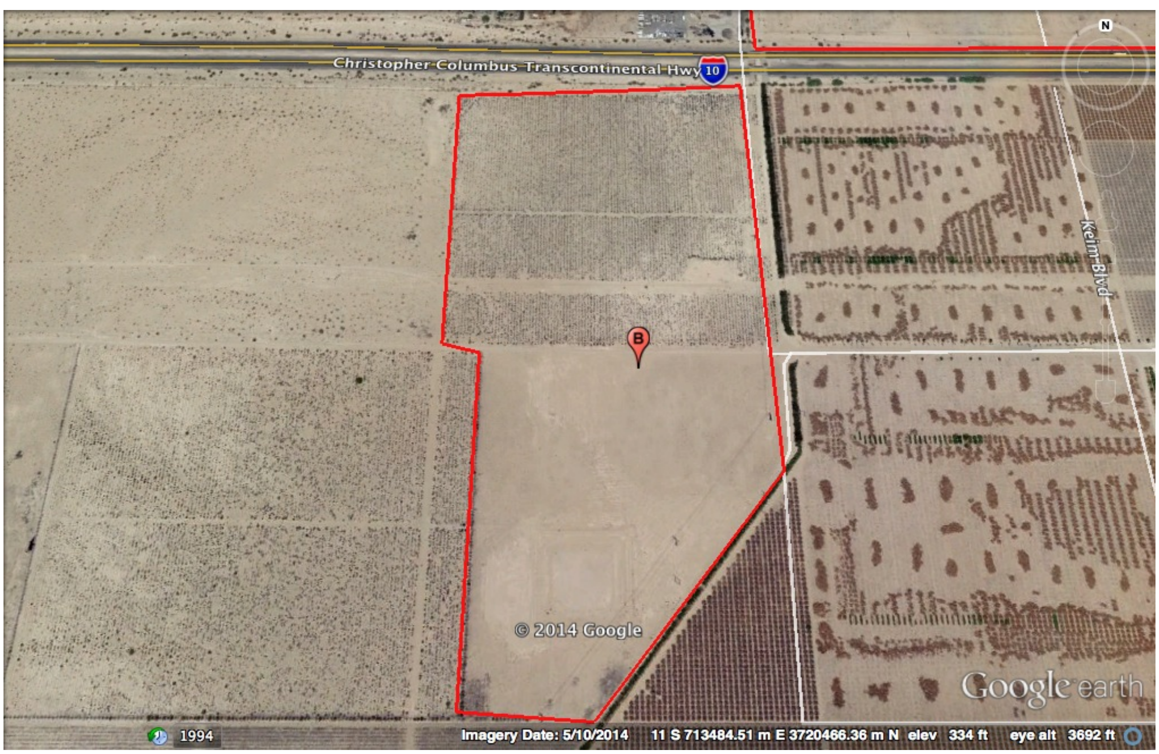


Figure 10. Mitigation site "B." Southern portion of site is largely barren; northern portion appears to be abandoned jojoba.

Figure 11. Mitigation site "C." Site appears to consist of road shoulder.

Figure 12. Mitigation Site "D." Site consists of rural residence and other unsuitable burrowing owl habitat.

Scott Cashen, M.S.

Senior Biologist / Forest Ecologist

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Scott Cashen has 20 years of professional experience in natural resources management. During that time he has worked as a field biologist, forester, environmental consultant, and instructor of Wildlife Management. Mr. Cashen currently operates an independent consulting business that focuses on CEQA/NEPA compliance issues, endangered species, scientific field studies, and other topics that require a high level of scientific expertise.

Mr. Cashen has knowledge and experience with many taxa, biological resource issues, and environmental regulations. This knowledge and experience has made him a highly sought after biological resources expert. To date, he has been retained as a biological resources expert for over 40 projects. Mr. Cashen's role in this capacity has encompassed all stages of the environmental review process, from initial document review through litigation support and expert witness testimony.

Mr. Cashen is a recognized expert on the environmental impacts of renewable energy development. He has been involved in the environmental review process for 28 renewable energy projects, and he has been a biological resources expert for more of California's solar energy projects than any other private consultant. In 2010, Mr. Cashen testified on 5 of the Department of the Interior's "Top 6 Fast-tracked Solar Projects" and his testimony influenced the outcome of each of these projects.

Mr. Cashen is a versatile scientist capable of addressing numerous aspects of natural resource management simultaneously. Because of Mr. Cashen's expertise in both forestry and biology, Calfire had him prepare the biological resource assessments for all of its fuels treatment projects in Riverside and San Diego Counties following the 2003 Cedar Fire. Mr. Cashen has led field studies on several special-status species, including plants, fish, reptiles, amphibians, birds, and mammals. Mr. Cashen has been the technical editor of several resource management documents, and his strong scientific writing skills have enabled him to secure grant funding for several clients.

AREAS OF EXPERTISE

- CEQA, NEPA, and Endangered Species Act compliance issues
- Comprehensive biological resource assessments
- Endangered species management
- Renewable energy
- Forest fuels reduction and timber harvesting
- Scientific field studies, grant writing and technical editing

EDUCATION

M.S. Wildlife and Fisheries Science - The Pennsylvania State University (1998)
B.S. Resource Management - The University of California, Berkeley (1992)

PROFESSIONAL EXPERIENCE

Litigation Support / Expert Witness

As a biological resources expert, Mr. Cashen reviews CEQA/NEPA documents and provides his client(s) with an assessment of biological resource issues. He then prepares written comments on the scientific and legal adequacy of the project's environmental documents (e.g., EIR). For projects requiring California Energy Commission (CEC) approval, Mr. Cashen has submitted written testimony (opening and rebuttal) in conjunction with oral testimony before the CEC.

Mr. Cashen can lead field studies to generate evidence for legal testimony, and he can incorporate testimony from his deep network of species-specific experts. Mr. Cashen's clients have included law firms, non-profit organizations, and citizen groups.

<u>REPRESENTATIVE EXPERIENCE</u>

Solar Energy Facilities

- Abengoa Mojave Solar Project
- Avenal Energy Power Plant
- Beacon Solar Energy Project
- Blythe Solar Power Project
- Calico Solar Project
- Calipatria Solar Farm II
- Carrizo Energy Solar Farm
- Catalina Renewable Energy Project
- Fink Road Solar Farm
- Genesis Solar Energy Project
- Heber Solar Energy Facility
- Imperial Valley Solar Project
- Ivanpah Solar Electric Generating
- Maricopa Sun Solar Complex
- Mt. Signal and Calexico Solar
- San Joaquin Solar I & II
- Solar Gen II Projects
- SR Solis Oro Loma
- Vestal Solar Facilities
- Victorville 2 Power Project

Geothermal Energy Facilities

- East Brawley Geothermal
- Mammoth Pacific 1 Replacement
- Western GeoPower Plant and

Wind Energy Facilities

- Catalina Renewable Energy Project
- Ocotillo Express Wind Energy
- San Diego County Wind Ordinance
- Tres Vaqueros Repowering Project
- Vasco Winds Relicensing Project

Biomass Facilities

- Tracy Green Energy Project

Development Projects

- Alves Ranch
- Aviano
- Chula Vista Bayfront Master Plan
- Columbus Salame
- Concord Naval Weapons Station
- Faria Annexation
- Live Oak Master Plan
- Napa Pipe
- Roddy Ranch
- Rollingwood
- Sprint-Nextel Tower

Project Management

Mr. Cashen has managed several large-scale wildlife, forestry, and natural resource management projects. Many of these projects have required hiring and training field crews, coordinating with other professionals, and communicating with project stakeholders. Mr. Cashen's experience in study design, data collection, and scientific writing make him an effective project manager, and his background in several different natural resource disciplines enable him to address the many facets of contemporary land management in a cost-effective manner.

<u>REPRESENTATIVE EXPERIENCE</u>

Wildlife Studies

- <u>Peninsular Bighorn Sheep Resource Use and Behavior Study:</u> (*CA State Parks*)
- <u>"KV" Spotted Owl and Northern Goshawk Inventory:</u> (*USFS, Plumas NF*)
- <u>Amphibian Inventory Project:</u> (*USFS, Plumas NF*)
- <u>San Mateo Creek Steelhead Restoration Project</u>: (*Trout Unlimited and CA Coastal Conservancy, Orange County*)
- <u>Delta Meadows State Park Special-status Species Inventory</u>: (*CA State Parks, Locke*)

Natural Resources Management

- <u>Mather Lake Resource Management Study and Plan</u> – (*Sacramento County*)
- <u>Placer County Vernal Pool Study</u> – (*Placer County*)
- <u>Weidemann Ranch Mitigation Project</u> – (*Toll Brothers, Inc., San Ramon*)
- <u>Ion Communities Biological Resource Assessments</u> – (*Ion Communities, Riverside and San Bernardino Counties*)
- <u>Del Rio Hills Biological Resource Assessment</u> – (*The Wyro Company, Rio Vista*)

Forestry

- <u>Forest Health Improvement Projects</u> – (*CalFire, SD and Riverside Counties*)
- <u>San Diego Bark Beetle Tree Removal Project</u> – (*SDG&E, San Diego Co.*)
- <u>San Diego Bark Beetle Tree Removal Project</u> – (*San Diego County/NRCS*)
- <u>Hillslope Monitoring Project</u> – (*CalFire, throughout California*)

Biological Resources

Mr. Cashen has a diverse background with biological resources. He has conducted comprehensive biological resource assessments, habitat evaluations, species inventories, and scientific peer review. Mr. Cashen has led investigations on several special-status species, including ones focusing on the foothill yellow-legged frog, mountain yellow-legged frog, desert tortoise, steelhead, burrowing owl, California spotted owl, northern goshawk, willow flycatcher, Peninsular bighorn sheep, red panda, and forest carnivores.

REPRESENTATIVE EXPERIENCE

Avian

- Study design and Lead Investigator - Delta Meadows State Park Special-Status Species Inventory *(CA State Parks: Locke)*
- Study design and lead bird surveyor - Placer County Vernal Pool Study *(Placer County: throughout Placer County)*
- Surveyor - Willow flycatcher habitat mapping *(USFS: Plumas NF)*
- Independent surveyor - Tolay Creek, Cullinan Ranch, and Guadacanal Village restoration projects *(Ducks Unlimited/USGS: San Pablo Bay)*
- Study design and Lead Investigator - Bird use of restored wetlands research *(Pennsylvania Game Commission: throughout Pennsylvania)*
- Study design and surveyor - Baseline inventory of bird species at a 400-acre site in Napa County *(HCV Associates: Napa)*
- Surveyor - Baseline inventory of bird abundance following diesel spill *(LFR Levine-Fricke: Suisun Bay)*
- Study design and lead bird surveyor - Green Valley Creek Riparian Restoration Site *(City of Fairfield: Fairfield, CA)*
- Surveyor - Burrowing owl relocation and monitoring *(US Navy: Dixon, CA)*
- Surveyor - Pre-construction raptor and burrowing owl surveys *(various clients and locations)*
- Surveyor - Backcountry bird inventory *(National Park Service: Eagle, Alaska)*
- Lead surveyor - Tidal salt marsh bird surveys (*Point Reyes Bird Observatory: throughout Bay Area*)
- Surveyor – Pre-construction surveys for nesting birds (*various clients and locations)*

Amphibian

- Crew Leader - Red-legged frog, foothill yellow-legged frog, and mountain yellow-legged frog surveys *(USFS: Plumas NF)*

- Surveyor - Foothill yellow-legged frog surveys *(PG&E: North Fork Feather River)*
- Surveyor - Mountain yellow-legged frog surveys *(El Dorado Irrigation District: Desolation Wilderness)*
- Crew Leader - Bullfrog eradication *(Trout Unlimited: Cleveland NF)*

Fish and Aquatic Resources

- Surveyor - Hardhead minnow and other fish surveys *(USFS: Plumas NF)*
- Surveyor - Weber Creek aquatic habitat mapping (*El Dorado Irrigation District: Placerville, CA*)
- Surveyor - Green Valley Creek aquatic habitat mapping *(City of Fairfield: Fairfield, CA)*
- GPS Specialist - Salmonid spawning habitat mapping *(CDFG: Sacramento River)*
- Surveyor - Fish composition and abundance study (*PG&E: Upper North Fork Feather River and Lake Almanor*)
- Crew Leader - Surveys of steelhead abundance and habitat use *(CA Coastal Conservancy: Gualala River estuary)*
- Crew Leader - Exotic species identification and eradication *(Trout Unlimited: Cleveland NF)*

Mammals

- Principal Investigator – Peninsular bighorn sheep resource use and behavior study (*California State Parks: Freeman Properties*)
- Scientific Advisor –Study on red panda occupancy and abundance in eastern Nepal *(The Red Panda Network: CA and Nepal)*
- Surveyor - Forest carnivore surveys *(University of CA: Tahoe NF)*
- Surveyor - Relocation and monitoring of salt marsh harvest mice and other small mammals *(US Navy: Skagg's Island, CA)*
- Surveyor – Surveys for Monterey dusky-footed woodrat. Relocation of woodrat houses (*Touré Associates: Prunedale*)

Natural Resource Investigations / Multiple Species Studies

- Scientific Review Team Member – Member of the science review team assessing the effectiveness of the US Forest Service's implementation of the Herger-Feinstein Quincy Library Group Act.
- Lead Consultant - Baseline biological resource assessments and habitat mapping for CDF management units *(CDF: San Diego, San Bernardino, and Riverside Counties)*

- Biological Resources Expert – Peer review of CEQA/NEPA documents (*Adams Broadwell Joseph & Cardoza: California)*
- Lead Consultant - Pre- and post-harvest biological resource assessments of tree removal sites *(SDG&E: San Diego County)*
- Crew Leader - T&E species habitat evaluations for Biological Assessment in support of a steelhead restoration plan *(Trout Unlimited: Cleveland NF)*
- Lead Investigator - Resource Management Study and Plan for Mather Lake Regional Park *(County of Sacramento: Sacramento, CA)*
- Lead Investigator - Biological Resources Assessment for 1,070-acre Alfaro Ranch property *(Yuba County, CA)*
- Lead Investigator - Wildlife Strike Hazard Management Plan *(HCV Associates: Napa)*
- Lead Investigator - Del Rio Hills Biological Resource Assessment *(The Wyro Company: Rio Vista, CA)*
- Lead Investigator – Ion Communities project sites (*Ion Communities: Riverside and San Bernardino Counties*)
- Surveyor – Tahoe Pilot Project: Validation of California's Wildlife Habitat Relationships (CWHR) Model *(University of California: Tahoe NF)*

Forestry

Mr. Cashen has five years of experience working as a consulting forester on projects throughout California. Mr. Cashen has consulted with landowners and timber operators on forest management practices; and he has worked on a variety of forestry tasks including selective tree marking, forest inventory, harvest layout, erosion control, and supervision of logging operations. Mr. Cashen's experience with many different natural resources enable him to provide a holistic approach to forest management, rather than just management of timber resources.

REPRESENTATIVE EXPERIENCE

- Lead Consultant - CalFire fuels treatment projects *(SD and Riverside Counties)*
- Lead Consultant and supervisor of harvest activities – San Diego Gas and Electric Bark Beetle Tree Removal Project *(San Diego)*
- Crew Leader - Hillslope Monitoring Program *(CalFire: throughout California)*
- Consulting Forester – Forest inventories and timber harvest projects *(various clients throughout California)*

Grant Writing and Technical Editing

Mr. Cashen has prepared and submitted over 50 proposals and grant applications. Many of the projects listed herein were acquired through proposals he wrote. Mr. Cashen's clients and colleagues have recognized his strong scientific writing skills and ability to generate technically superior proposal packages. Consequently, he routinely prepares funding applications and conducts technical editing for various clients.

PERMITS

U.S. Fish and Wildlife Service Section 10(a)(1)(A) Recovery Permit for the Peninsular bighorn sheep

CA Department of Fish and Game Scientific Collecting Permit

PROFESSIONAL ORGANIZATIONS / ASSOCIATIONS

The Wildlife Society (Conservation Affairs Committee member)

Cal Alumni Foresters

Mt. Diablo Audubon Society

OTHER AFFILIATIONS

Scientific Advisor and Grant Writer – *The Red Panda Network*

Scientific Advisor – *Mt. Diablo Audubon Society*

Grant Writer – *American Conservation Experience*

Scientific Advisor and Land Committee Member – *Save Mt. Diablo*

TEACHING EXPERIENCE

Instructor: Wildlife Management - The Pennsylvania State University, 1998

Teaching Assistant: Ornithology - The Pennsylvania State University, 1996-1997

Cashen Footnote #8

Query Criteria: Element Code is (AAABF01020)

Scaphiopus couchii **Element Code:** AAABF01020

Couch's spadefoot

Listing Status:	**Federal:**	None	**CNDDB Element Ranks:** **Global:**	G5
	State:	None	**State:**	S2S3
	Other:	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern		
Habitat:	**General:**	TEMPORARY DESERT RAINPOOLS THAT LAST A LEAST 7 DAYS, WITH WATER TEMPS > 15 C & WITH SUBTERRANEAN REFUGE SITES CLOSE BY.		
	Micro:	AN INSECT FOOD BASE ESPECIALLY TERMITES MUST BE AVAILABLE.		

Occurrence No.	1 **Map Index:** 41370	**EO Index:**	41370	**Element Last Seen:**	1993-03-02
Occ. Rank:	Unknown	**Presence:**	Presumed Extant	**Site Last Seen:**	1993-03-02
Occ. Type:	Natural/Native occurrence	**Trend:**	Unknown	**Record Last Updated:**	1999-07-12

Quad Summary: Mortmar (3311558)

County Summary: Riverside

Lat/Long:	33.55264 / -115.93716	**Accuracy:**	1/5 mile
UTM:	Zone-11 N3713061 E598665	**Elevation (ft):**	50
PLSS:	T07S, R10E, Sec. 22 (S)	**Acres:**	0.0

Location: NEAR THE COACHELLA CANAL, 0.7 MILES SE OF THE CONFLUENCE WITH HIDDEN SPRINGS CANYON, ~2 MILES NORTH OF MORTMAR.

Detailed Location: COORDINATES GIVEN AS: T7S, R10E, NW 1/4 OF THE NW 1/4 OF SECTION 22.

Ecological:

General: UNKNOWN NUMBER OBSERVED BREEDING BY KIM NICOL AND BOB MCKERNAN, 1993 (MCKERNAN FROM SAN BERNARDINO NATURAL HISTORY MUSEUM).

Owner/Manager: USBOR

Occurrence No.	2 **Map Index:** 42999	**EO Index:**	42999	**Element Last Seen:**	1989-08-13
Occ. Rank:	Unknown	**Presence:**	Presumed Extant	**Site Last Seen:**	1989-08-13
Occ. Type:	Natural/Native occurrence	**Trend:**	Unknown	**Record Last Updated:**	2000-05-23

Quad Summary: Palo Verde (3311446)

County Summary: Imperial

Lat/Long:	33.42237 / -114.73192	**Accuracy:**	1/10 mile
UTM:	Zone-11 N3700412 E710881	**Elevation (ft):**	230
PLSS:	T09S, R21E, Sec. 02 (S)	**Acres:**	0.0

Location: 0.75 MILE NORTH OF THE HIGHWAY 78 CROSSING OF PALO VERDE LAGOON/OUTFALL DRAIN, SOUTH OF PALO VERDE.

Detailed Location:

Ecological: HABITAT CONSISTS OF A FLOODED ALFALFA FIELD.

General: 4 ADULT MALES AND 1 ADULT FEMALE COLLECTED BY M. JENNINGS AND M. HAYES (CAS #173701-173705), 13 AUG 1989. (SVL RANGED FROM 56 MM TO 64 MM)

Owner/Manager: UNKNOWN

Occurrence No.	3	**Map Index:** 63522	**EO Index:**	63614		**Element Last Seen:**	2002-07-01
Occ. Rank:	Poor		**Presence:**	Presumed Extant		**Site Last Seen:**	2002-07-01
Occ. Type:	Natural/Native occurrence		**Trend:**	Unknown		**Record Last Updated:**	2005-12-28

Quad Summary: Palo Verde (3311446)

County Summary: Imperial

Lat/Long:	33.39347 / -114.74820	**Accuracy:**	80 meters
UTM:	Zone-11 N3697174 E709435	**Elevation (ft):**	238
PLSS:	T09S, R21E, Sec. 15 (S)	**Acres:**	0.0

Location: ALONG NORTH BAJA PIPELINE RIGHT-OF-WAY. 0.5 MI WEST OF OUTFALL DRAIN AND 1.5 MILES WEST OF HWY 78.

Detailed Location: TOAD FOUND ON RIGHT-OF-WAY MOVING EAST TOWARDS THE WASH AREA.

Ecological: DESERT SCRUB ON HIGH SLOPE RUNNING INTO WASH WITH TAMARISK, MESQUITE, PALO VERDE, ETC. SURROUNDING AREA IS COUNTY LANDFILL AND AGRICULTURAL FIELDS.

General: 1 TOAD FOUND AND RELOCATED TO CIBOLA NATIONAL WILDLIFE REFUGE.

Owner/Manager: BLM

Occurrence No.	4	**Map Index:** 73557	**EO Index:**	74525		**Element Last Seen:**	2007-02-01
Occ. Rank:	Good		**Presence:**	Presumed Extant		**Site Last Seen:**	2007-02-01
Occ. Type:	Natural/Native occurrence		**Trend:**	Unknown		**Record Last Updated:**	2009-02-09

Quad Summary: Mecca (3311651)

County Summary: Riverside

Lat/Long:	33.57069 / -116.07874	**Accuracy:**	80 meters
UTM:	Zone-11 N3714936 E585503	**Elevation (ft):**	-180
PLSS:	T07S, R09E, Sec. 08 (S)	**Acres:**	0.0

Location: BETWEEN HWY 111 & RAILROAD TRACKS, SOUTH OF 4TH ST, WEST OF MECCA.

Detailed Location:

Ecological: FLOODED DESERT SCRUB. A RAILROAD, HIGHWAYS, AGRICULTURAL FIELDS, SMALL TOWN DEVELOPMENT, AND SOME NATURAL HABITATS SURROUND LOCATION.

General: 1 ADULT OBSERVED DURING UNION PACIFIC RAILROAD SENSITIVE SPECIES PROJECT.

Owner/Manager: UNION PACIFIC

Occurrence No.	5	**Map Index:** 73558	**EO Index:**	74526		**Element Last Seen:**	2007-02-01
Occ. Rank:	Good		**Presence:**	Presumed Extant		**Site Last Seen:**	2007-02-01
Occ. Type:	Natural/Native occurrence		**Trend:**	Unknown		**Record Last Updated:**	2009-02-09

Quad Summary: Wister (3311535)

County Summary: Imperial

Lat/Long:	33.26487 / -115.56019	**Accuracy:**	80 meters
UTM:	Zone-11 N3681576 E634102	**Elevation (ft):**	-180
PLSS:	T10S, R14E, Sec. 30 (S)	**Acres:**	0.0

Location: ~3.0 MI NW OF NILAND, EAST SIDE OF RAILROAD TRACKS, NE OF THE INTERSECTION OF BEACH RD & GADWALL RD.

Detailed Location:

Ecological: FLOODED DESERT SCRUB. A RAILROAD, HIGHWAYS, AGRICULTURAL FIELDS, SMALL TOWN DEVELOPMENT, AND SOME NATURAL HABITATS SURROUND AREA.

General: 1 ADULT OBSERVED DURING UNION PACIFIC RAILROAD SENSITIVE SPECIES PROJECT.

Owner/Manager: UNION PACIFIC

Occurrence No.	6	**Map Index:** 88772	**EO Index:**	89786	**Element Last Seen:**	2012-08-27
Occ. Rank:	Unknown		**Presence:**	Presumed Extant	**Site Last Seen:**	2012-08-27
Occ. Type:	Natural/Native occurrence		**Trend:**	Unknown	**Record Last Updated:**	2013-04-12

Quad Summary: Roosevelt Mine (3311457)

County Summary: Riverside

Lat/Long:	33.55030 / -114.85451	**Accuracy:**	1/10 mile
UTM:	Zone-11 N3714358 E699186	**Elevation (ft):**	530
PLSS:	T07S, R20E, Sec. 24 (S)	**Acres:**	0.0

Location: ABOUT 3.4 MILES NW OF HODGE MINE, 4.4 MILES NNE OF WILEY WELL CAMPGROUND, N OF MULE MOUNTAINS, CHUCKWALLA VALLEY.

Detailed Location: MAPPED GENERALLY TO PROVIDED COORDINATES. DETECTION WAS INCIDENTAL AND MADE DURING BIRD POINT COUNT SURVEYS.

Ecological: LOW, LOOSE DUNES AND DESERT SCRUB WITH LITTLE LIVING VEGETATION. BRASSICA TOUNEFORTII, SALSOLA AUSTRALIS, CREOSOTE BRUSH SCRUB AND OENOTHERA DELTOIDES ARE THROUGHOUT THE AREA.

General: 1 COUCH'S SPADEFOOT TOAD OBSERVED "WALKING OUT IN THE LARGE WASH" ON 27 AUG 2012.

Owner/Manager: BLM

Cashen Footnote #41

The Wilson Journal of Ornithology

PREVENTING BIRD–WINDOW COLLISIONS

DANIEL KLEM JR[1]

Published by the
Wilson Ornithological Society

The Wilson Journal of Ornithology 121(2):314–321, 2009

PREVENTING BIRD–WINDOW COLLISIONS

DANIEL KLEM JR[1]

ABSTRACT.—Birds behave as if clear and reflective glass and plastic windows are invisible, and annual avian mortality from collisions is estimated in the billions worldwide. Outdoor flight cage and field experiments were used to evaluate different methods to prevent collisions between birds and windows. Stripe and grid patterns of clear UV-reflecting and UV-absorbing window coverings presented an effective warning that birds avoid while offering little or no obstructed view for humans. Birds used UV-reflected signals to avoid space occupied by clear and reflective sheet glass and plastic. Window coverings with effective UV-reflecting and UV-absorbing patterns as warning signals can prevent unintentional killing of birds from collisions with windows. One-way films that made the outer surface of windows opaque or translucent were successful in deterring bird strikes. Ceramic frit glass consisting of a visual pattern of densely spaced 0.32-cm diameter dots, 0.32 cm apart was an effective collision deterrent. Uniformly covering windows with decals or other objects that are separated by 5 to 10 cm was completely or near-completely effective in preventing strikes. Twice the number of window strikes occurred at non-reflective sheet glass compared to conventional clear panes. Continuous monitoring of windows revealed one in four bird strikes left no evidence of a collision after 24 hrs and, without continuous monitoring, 25% of bird strikes were undetected. *Received 11 September 2008. Accepted 19 January 2009.*

Avian mortality resulting from collisions with clear and reflective sheet glass and plastic is estimated to be in the billions worldwide (Klem 1990, 2006). Collisions are predicted and expected wherever birds and windows coexist (Klem 1989, 1990, 2006). Birds behave as if windows are invisible, and it is important to prevent this unintended killing, estimated to represent the largest human-associated source of avian mortality except habitat destruction (Klem 2006, 2009a, b). The diversity of species and the invisible threat suggest that birds in general are vulnerable to windows, but documented casualties of species of special concern indicates that avian mortality from window collisions is contributing to population declines of specific species and birds in general (Klem 2009a, b).

I evaluated several methods to prevent bird strikes at windows using previously effective outdoor flight cage and field experiments (Klem 1989, 1990). Most preventive treatments examined the use of ultraviolet (UV) signals to alert birds to windows, and the availability of materials affected the composition of what was tested in each experiment. The ability of birds to avoid clear plastic and the ability of one-way films, fritted glass, and feathers to prevent collisions were also evaluated. Specifically, I tested: (1) clear plastic with a UV-absorbing component, (2) single and uniform covering of multiple UV-reflecting maple leaves, (3) a string of colored contour feathers, (4) a one-way external film having an unobstructed view from inside and an obstructed view of dot pattern from outside, (5) a ceramic frit glass with a uniform covering of translucent dots, (6) a variety of UV-absorbing stripe patterns created by plastic strips, and different UV-absorbing and UV-reflecting complete covering, striped, and grid patterns created by external films.

METHODS

Flight cage and field experiments were conducted on a 0.2-ha open mowed grass suburban backyard surrounded and isolated from neighbors by mature shrubs and evergreens in Upper Macungie Township, Lehigh County, Pennsylvania (40° 34′ 35″ N, 75° 34′ 57″ W). Four field experiments were conducted on a 2-ha open rural area of mowed pasture bordered by second growth deciduous forest and shrubs in Henningsville, Berks County, Pennsylvania (40° 27′ 53″ N, 75° 40′ 07″ W).

Flight Cage Experiments.—These tests were conducted from 13 March to 30 April 2004. The basic design was reported previously by Klem (1990) and consisted of a trapezoidal flight cage 1.2 m high, 3.6 m in length, and 0.3 m wide at the narrow end and 2.6 m wide at the broad end. Five Dark-eyed Juncos (*Junco hyemalis*), one White-throated Sparrow (*Zonotrichia albicollis*), and one House

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Sparrow (*Passer domesticus*) were captured in March for use as subjects, housed in small cages, and tested from mid-March and throughout April. Except for the House Sparrow which was an adult female, age and gender of all other subjects were unknown; previous studies of collision casualties document equal vulnerability for all age and gender classes (Klem 1989).

Individuals were released from a holding box at the narrow end and forced to discriminate between left and right flight paths as they attempted to escape to wooded evergreen habitat visible outside the broad end of the cage. One half of the cage at the broad end was left unobstructed in all experiments. The other half was obstructed by clear plastic or objects tested to prevent bird strikes. During testing of a subject, the obstructed and unobstructed sides were changed for half the trials to ensure no bias flight path preference for one side or the other. Actual clear plastic was tested with two Dark-eyed Junco subjects to learn if they were capable of discriminating between clear plastic and unobstructed airspace. Previous studies revealed that Dark-eyed Junco subjects were not capable of discriminating between clear glass and unobstructed airspace (Klem 1990). Objects tested were hung on the obstructed side with clear monofilament line to appear as if taped, stuck, or applied as a coating to clear glass or plastic to prevent accidental collision injuries to subjects in subsequent experiments. No Institutional Animal Care and Use Committee existed during this study, but guidelines for the care of wild birds in research were followed (Gaunt and Oring 1999). All subjects were released unharmed at the end of the experimental period.

Eight flight cage experiments were conducted. Each experiment tested one to five subjects, and each subject flew a minimum of 10 trials per experiment with additional trials (up to 24) to clarify results (Table 1). A trial consisted of recording a subject passing through the unobstructed side of the cage or the side containing the object tested. If the subject chose the obstructed side it was scored as a window strike; if the subject flew through the unobstructed side it was scored as avoidance. Two to three objects were evaluated on any test day. Individuals were tested with a single object on any one test day, and subjects tested with more than one object were tested on different days. The objects tested were: (1) clear plastic with a UV-absorbing component, (2) single translucent UV-reflecting maple leaf (WindowAlert Decal) measuring 10 × 10 cm; (3) uniform covering of 12 UV-reflecting maple leaves as in #2, placed 10 cm apart in vertical columns and 5 cm apart in horizontal rows; (4) a single clear monofilament line attached to the quill of four colored (from top: red, blue, yellow, and green) contour feathers (FeatherGuard™) measuring 14.4–19.6 cm long and separated by 33 cm; (5) 0.32-cm thick vertically oriented 2.5-cm wide UV-absorbing plastic strips forming stripes separated by 10 cm; (6) vertically oriented 2.5-cm wide UV-absorbing strips forming stripes as in #5 but separated by 5 cm, (7) 2.5-cm wide UV-absorbing plastic strips forming stripes as in #5 but horizontally oriented and separated by 5 cm; and (8) ceramic frit glass uniformly covered with a pattern of translucent-appearing dots 0.32-cm in diameter separated by 0.32 cm. Binomial tests were used to examine the significance of each experiment (Siegel 1956).

Field Experiments.—The basic design of all field experiments was reported previously (Klem 1989, 1990) and consisted of wood-framed picture windows, accurately simulating those in houses; all were placed in the same habitat oriented in the same direction 1 m from a tree-shrub edge facing an open field (Klem 1989: figure 1). Each window measured 1.2 m wide × 0.9 m high and was mounted 1.2 m above ground. Plastic mesh trays were placed under each window to catch casualties. Three window units were used in the first and second experiments, and were separated by 4.2, 3.8, and 4.1 m. Three and seven window units were used in the third to sixth experiments separated by 7.8, 7.4, 7.9, 9.0, 7.4, and 8.3 m. A single platform feeder measuring 30.5 cm on a side and 1.2 m above ground mounted on crossed wooden-legs was centered and placed 10 m in front of each window to simulate a feeding station at a rural residential home. Feed consisted of a 1:1 mixture of black-oil sunflower seeds and white proso millet. All feeders were kept full throughout each experiment. No object was permitted at the same window on consecutive days for all experiments, and each object test-

TABLE 1. Preventive methods used in outdoor flight cage experiments to examine avoidance of bird–window collisions.

Preventive method Species tested	Number tested	Number significantly avoiding method[a]	Number test trials	Avoidance	Non-avoidance	*P*
Clear sheet plastic						
Dark-eyed Junco	2	0	14	8	6	0.395
			10	6	4	0.377
Single UV-reflecting maple leaf in center of pane						
Dark-eyed Junco	5	1	16	15	1	<0.001
			17	7	10	0.834
			10	2	8	0.989
			15	7	8	0.696
			10	5	5	0.623
Uniform covering of 12 UV-reflecting maple leaves, 10 cm separating 2 vertical columns, 5 cm separating 6 horizontal rows						
Dark-eyed Junco	4	2	24	18	6	0.011
			10	4	6	0.828
			10	2	8	0.989
			12	10	2	0.019
Feathers on monofilament line						
Dark-eyed Junco	1	0	18	11	7	0.240
White-throated Sparrow	1	0	10	4	6	0.828
UV-absorbing 2.5 cm wide stripes forming vertical columns 10 cm apart						
Dark-eyed Junco	5	1	10	6	4	0.377
			10	10	0	<0.001
			10	8	2	0.055
			10	6	4	0.377
			10	7	3	0.172
UV-absorbing 2.5 cm wide stripes forming vertical columns 2.5 cm apart						
Dark-eyed Junco	5	3	10	10	0	<0.001
			10	8	2	0.055
			10	10	0	<0.001
			10	8	2	0.055
			10	9	1	0.011
UV-absorbing 2.5 cm wide stripes forming horizontal rows 5.0 cm apart						
Dark-eyed Junco	5	5	10	10	0	<0.001
			10	10	0	<0.001
			16	13	3	0.011
			15	12	3	0.018
			10	10	0	<0.001
Ceramic frit pane with translucent dot pattern, 0.32 cm diameter dots separated by 0.32 cm spaces						
Dark-eyed Junco	5	5	10	10	0	<0.001
			12	10	2	0.019
			18	13	5	0.048
			10	10	0	<0.001
			10	10	0	<0.001
House Sparrow	1	1	10	9	1	0.011

[a] Binomial tests were used to examine if results of 10 to 24 trials per subject differed ($P < 0.05$) from the expected equal distribution.

ed in each experiment was randomly assigned and moved to a new window unit daily. Windows were checked each day 30 min after first light and checked and changed daily 30 min before last light for all experiments. Windows were covered with opaque tarps and not monitored during inclement weather such as high winds, rain, or snow.

The parameter measured in all experiments was the number of detectable bird strikes. A strike was recorded when either dead or injured birds were found beneath a window, or when fluid or a blood smear, feather, or body smudge was found on the glass. The data are likely incomplete and conservative because some strikes may not have left evidence of a collision (Klem 1989, 1990, Klem et al. 2004). Predators and scavengers also are known to remove some injured or dead birds (Klem 1981, Klem et al. 2004). The length of each experiment was ascertained by the number of recorded strikes required to statistically evaluate the differences between treatments. The experiments for some species occurred during non-breeding and migratory periods, but previous studies indicate no seasonal difference in the ability of birds to avoid windows (Klem 1989).

The first experiment was conducted over 20 days from 5 to 27 December 2005 and tested the clear glass control, non-reflective clear glass pane exhibiting no glare when viewed from any angle, and the same plastic strips and spacing used in flight cage experiment #6; the 0.32-cm thick edges of the plastic strips were visible as translucent lines except when viewed from directly in front of the window.

The second experiment was conducted over 50 days from 1 February to 29 March 2006 and tested the clear glass control, complete covering of a commercially available clear UV-absorbing film supplied by CPFilms Inc. (Martinsville, VA, USA), and the same clear UV-absorbing film cut and applied as 2.5 cm wide UV-absorbing strips forming stripes separated by 5 cm of clear glass; no edgings of the strips were visible from any angle of view.

The third experiment was conducted over 90 days from 22 November 2006 to 23 February 2007 and tested five commercially available exterior window films by CPFilms Inc. UV measurements for wavelengths between 300 and 380 nm were recorded with a Cary 5000 Spectrophotometer. The clear glass control transmitted 74.6% UV while each of the films absorbed most UV, allowing UV transmittance of 0.13% or less. Each film type reflected 8.8% UV or less. The experimental windows were: (1) clear glass control; (2) complete covering of clear UV-absorbing film applied to exterior glass surface (UVC-O), (3) same as #2 but applied to interior glass surface (UVC-I); (4) complete covering of UV-absorbing REX20 film transmitting 20% and reflecting 65% visible light, having a high reflective quality; (5) complete covering of UV-absorbing REX35 film transmitting 35% and reflecting 55% visible light, having a high reflective quality; (6) complete covering of UV-absorbing NEX1020 film containing a metallic layer with a moderate reflective quality, and (7) complete covering of UV-absorbing RK20 Rynar film with a low reflective quality.

The fourth experiment was conducted over 50 days from 10 March to 3 May 2007 and retested the clear glass control, UVC-O film applied as 2.5 cm wide vertically oriented strips forming stripes separated by 2.5 cm clear glass, and commercially available CollidEscape film supplied by Large Format Digital Inc. (Edgerton, WI, USA) applied to the exterior glass surface, permitting a relatively unobstructed view looking at the inside surface of a covered pane and a completely obstructed view looking at the outside surface. Windows covered in CollidEscape appear uniformly white.

The fifth experiment was conducted over 90 days from 29 October 2007 to 9 February 2008 and tested a new clear UV-reflecting film, alone and in combination with existing exterior clear UV-absorbing film from CPFilms Inc. The new clear film reflected 80% UV. The experimental windows were: (1) clear glass control; (2) complete covering of clear UV-reflecting film applied to exterior surface (CUV-O); (3) same as #2 but applied to interior glass surface (CUV-I); (4) 2.5-cm wide UV-reflecting film strips forming stripes oriented vertically and separated by 5 cm UV-absorbing film strips forming stripes oriented vertically and applied to the outside glass surface (S-1R); (5) 5-cm wide UV-reflecting film strips forming stripes oriented vertically and separated by 2.5 cm UV-absorbing film strips forming stripes oriented vertically and applied to the outside glass surface (S-2R-O); (6) same as #5 but applied to the interior glass surface (S-2R-I); and (7) a grid pattern consisting of 10-cm wide UV-reflecting vertical columns separated by 2.5-cm wide UV-absorbing vertical columns, and 8-cm wide UV-reflecting horizontal rows separated by 2.5-cm wide UV-absorbing horizontal rows applied to the outside glass surface (GRID).

The sixth experiment was conducted over 50 days from 29 February to 25 April 2008 and retested the clear glass control and clear UV-reflecting and UV-absorbing films CUV-O, S-1R, and S-2R-O.

All windows were continuously monitored for 17 hrs over 4 days (6, 12, 24, and 30 Jan 2007) during the fourth experiment to learn if strikes occurred without leaving any visible evidence. Additionally, 60 hrs of continuous observation were conducted over 14 days (11, 13, 14, 17, 18, 21, 25, and 28 Mar and 3, 7, 8, 10, 14, and 15 Apr 2008) during the sixth experiment to observe active avoidance or failure to avoid the experimental windows. The flight path of individual birds moving from a platform feeder toward a window was recorded and assessed as active avoidance if the bird changed direction immediately in front and passed around or over a window.

I used SPSS (SPSS Inc. 2006) for all statistical analyses of the field experiments. Chi-square goodness-of-fit was used to evaluate experimental results: number of strikes per treatment compared to a uniform distribution of strikes across all treatments per experiment. Test results were considered statistically significant when $P < 0.05$.

RESULTS

Flight Cage Experiments.—Dark-eyed Juncos did not discriminate between clear plastic and unobstructed airspace. There was mixed discrimination among Dark-eyed Juncos and individual White-throated and House sparrows compared with other preventive methods evaluated (Table 1). Only the UV-absorbing 2.5-cm wide horizontally oriented plastic strips forming stripes separated by 5 cm and the ceramic frit dots uniformly covering the entire window resulted in statistically significant avoidance for all subjects. The UV-reflecting maple leaves were more effective in alerting birds to a barrier when applied in enough numbers to be separated by 10 cm in vertical columns and 5 cm in horizontal rows; a single UV-reflecting maple leaf in the center of a window was ineffective in alerting four of five subjects to the presence of a clear window barrier.

Field Experiments.—Forty-two strikes were recorded in the first experiment; 17 (41%) were fatal. The number of strikes differed significantly across all treatments with 14 (33%) at the clear glass control, 28 (67%) at the non-reflective glass, and none at the vertically oriented 2.5-cm UV-absorbing plastic strips forming stripes separated by 5 cm ($\chi^2 = 28.0$, df = 2, $P = 0.001$). Species numbers and window at which fatalities occurred were: two White-throated Sparrows and three House Sparrows at the clear glass control; and four Northern Cardinals (*Cardinalis cardinalis*), two House Finches (*Carpodacus mexicanus*), four White-throated Sparrows, and two Dark-eyed Juncos at the non-reflecting glass.

Fifty-five strikes were recorded in the second experiment; 11 (20%) were fatal. The number of strikes differed significantly across all treatments with 35 (64%) at the clear glass control, 12 (22%) at the complete UV-absorbing film covering, and 8 (14%) at the vertically oriented 2.5-cm wide UV-absorbing film strips forming stripes separated by 5 cm ($\chi^2 = 23.2$, df = 2, $P = 0.001$). Species numbers and window at which fatalities occurred were: two Northern Cardinals and one Dark-eyed Junco at the clear glass control; two White-throated Sparrows, two Song Sparrows (*Melospiza melodia*), and one House Sparrow at the complete UV-absorbing film covering; and one White-throated Sparrow, one Song Sparrow, and one House Sparrow at the vertically oriented 2.5-cm wide UV-absorbing film strips forming stripes separated by 5 cm.

One-hundred and ninety-four strikes were recorded in the third experiment; 20 (10%) were fatal. The total number of strikes differed significantly across all treatments, with 51 (26%) at the clear glass control, 24 (12%) at UVC-O, 20 (10%) at UVC-I, 30 (15%) at REX20, 24 (12%) at REX35, 21 (11%) at NEX1020, and 24 (12%) at RK20 ($\chi^2 = 25.0$, df = 6, $P < 0.001$). Species killed and the windows at which fatalities occurred were: one White-throated Sparrow, one American Tree Sparrow (*Spizella arborea*), five Dark-eyed Juncos, and two House Finches at the clear glass control; one Black-capped Chickadee (*Poecile atricapillus*), one White-throated Sparrow, two House Finches, and one Northern Cardinal at UVC-O; one House Finch at UVC-I; two American Tree Sparrows at REX20; two Dark-eyed Juncos at REX35; and one Mourning Dove (*Zenaida macroura*) at RK20.

Seventy-seven strikes were recorded in the fourth experiment; two (3%) were fatal. The total number of strikes differed significantly across all treatments, with 49 (64%) at the clear glass control, 27 (35%) at the vertically oriented 2.5-cm wide UV-absorbing film strips forming stripes separated by 5 cm, and one (1%) at the CollidEscape covered window ($\chi^2 = 44.99$, df = 2, $P = 0.001$). Eight (30%) of the 27 strikes at the window with the UV-absorbing film stripes occurred over film, there were 14 (52%) strikes at clear glass between film, and five (18%) strikes included parts of both film and non-film areas; there was no significant difference between striped and no striped impact sites ($\chi^2 = 1.64$, df = 1, $P = 0.20$).

Eighty-six strikes were recorded in the fifth experiment; 13 (15%) were fatal. The total number of strikes differed significantly across all treatments with 60 (70%) at the clear glass control, eight (9%) at CUV-O, seven (8%) at CUV-I, two (2%) at S-1R, one (1%) at S-2R-O, four (5%) at S-2R-I, and four (5%) at the GRID ($\chi^2 = 219.23$, df = 6, $P < 0.001$). All 13 fatalities occurred at the clear glass control and were: one Black-capped Chickadee, one White-breasted Nuthatch (*Sitta carolinensis*), two House Finches, one American Goldfinch (*Carduelis tristis*), one American Tree Sparrow, and seven Dark-eyed Juncos.

Fifty-five strikes were recorded in a validating sixth experiment retesting selected treatments of experiment #5; 11 (20%) were fatal. The total number of strikes differed significantly across all treatments, with 38 (69%) at the clear glass control, 11 (20%) at CUV-O, three (5.5%) at S-1R, and three (5.5%) at S-2R-O ($\chi^2 = 60.13$, df = 3, $P = 0.001$). Species numbers and windows at which fatalities occurred were: one Black-capped Chickadee, two American Tree Sparrows, and five Dark-eyed Juncos at the clear glass control, and two American Tree Sparrows and one Dark-eyed Junco at CUV-O.

Flight paths of 67 individual birds flying from the bird feeders toward the windows were recorded during 60 hrs of continuous observation over 14 days to examine the movements of individuals during the sixth experiment. Six (55%) of 11 individuals flying toward the clear glass control moved to avoid and five (45%) hit the window. Fourteen (93%) of 15 individuals flying toward CUV-O moved to avoid and one (7%) hit the window. All 24 individuals flying toward S-1R moved to avoid the window. Fifteen (88%) of 17 individuals flying toward S-2R-O moved to avoid and two (12%) hit the window. One strike in four left no evidence of a collision lasting 24 hrs based on 17 hrs of continuous observation.

DISCUSSION

The application of clear and reflective UV-absorbing films to the exterior of windows offered some protection from strikes by reducing the deceptive quality of reflections. The use of clear UV-absorbing external films to create stripe patterns had mixed results. The incremental use of 0.32-cm thick plastic strips used to form stripes and then external films in experiments were attempts to create UV signals to learn if test subjects and birds flying in the wild would behave as if they could see and avoid the treated panes. All attempts to create protective patterns visible to birds using a UV-absorbing plastic and film offered a weak UV-reflecting signal, no greater than 13% UV-reflectance. A new clear UV-reflecting exterior film that produced a UV-reflecting signal with 80% reflectance offered an improved opportunity to meaningfully test the utility of UV signals to deter bird–window collisions. The promise of UV signals serving to alert birds to danger was uncertain given that lower wavelengths of UV, blue, and purple colors are often associated with attraction behavior, sexual selection, and finding food (Burkhardt 1982, Bennett and Cuthill 1994, Vitala et al. 1995, Bennett et al. 1996, Hunt et al. 1998).

Color signals used by birds and other animals as warnings or an alert to danger (aposematic coloration) are most often in the upper visual wavelengths perceived as yellows, or-anges, and reds. Supporting the questionable value of UV signals to deter window strikes were comparative records of strike rates at wind turbines painted with UV-reflecting and conventional non-UV-reflecting paints (Young et al. 2003). Notwithstanding the ability to attract, it is reasonable to suspect that UV signals could also be used to alert birds to the presence of clear and reflective sheet glass and plastic. Repeated validating field experiments supplemented by detailed recording of avoidance by individual birds revealed that a combination of UV-reflecting and UV-absorbing stripe and grid patterns were effective in preventing bird–window collisions. These results document that birds were able to recognize the window-covering UV stripes and grid pattern as barriers to avoid. Applications that combine alternating and contrasting UV-reflecting and UV-absorbing patterns to existing clear and reflective windows have promise of preventing bird strikes while offering little or no visual distraction for humans.

The results of both flight cage and field experiments provide additional confirmation that birds behave as if clear sheet glass and plastic in the form of windows are invisible, and that several methods are available to effectively prevent bird–window collisions. The clarity and lack of any visible cues best explains twice as many strikes at the non-reflective glass pane compared to a conventional clear window. These findings support the interpretation that decals or other objects such as feathers placed on or hung in front of a window are ineffective at preventing bird strikes when used alone. Increasing their numbers so they uniformly cover the window surface, and separating decals or strings of feathers and beads by 5 to 10 cm provides complete or near-complete avoidance.

One-way films that result in a complete opaque or translucent covering when viewed from outside, but only weakly diminish the view from inside, were expected and confirmed to be effective strike deterrents. The uniformly dense dot pattern created as ceramic frit was effective in alerting birds to the presence of a glass barrier. The presence of dotted ceramic frit glass in the science building at Swarthmore College in Swarthmore, Pennsylvania, USA since installation has experienced as few as two known collisions a year (E. C. Everbach, pers. comm.). This same dotted ceramic frit glass has experienced no known collisions at a corridor in the renovated science building on the campus of Muhlenberg College in Allentown, Pennsylvania, but a dozen collision fatalities have been documented at conventional clear glass panes elsewhere in this same building for 1 year since installation (DK, pers. obs.). The dot or other objects creating patterns of visual noise must be placed on the exterior surface of windows to be visible; exceptions are at see-through sites such as corridors and where glass walls meet at corners and where protective patterns will be visible when placed on interior surfaces.

These experiments further reveal that strike frequency at intensely monitored sites is likely to be incomplete and conservative because some impacts may not leave any evidence of a collision. Moreover, predators and scavengers may have removed some casualties that were not detected such as a Northern Shrike (*Lanius excubitor*) that was seen taking a window casualty during the final field experiment (Klem 1981, Klem et al. 2004).

Methods using UV signals to alert birds to window hazards should have special utility because they offer visual cues in wavelengths that birds are known to see but humans do not (Burkhardt 1982, Bennett and Cuthill 1994, Vitala et al. 1995, Bennett et al. 1996, Hunt et al. 1998). The promise of using UV signals to prevent collisions between birds and windows is especially relevant to architectural professionals for addressing and eliminating avian injury and mortality by retrofitting existing buildings and using new types of glass and plastic panes in new construction.

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Cashen Footnote #42

Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis

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Executive Summary

This report summarizes data on bird mortality at three solar energy facilities in southern California: Desert Sunlight, Genesis, and Ivanpah. These facilities use different solar technologies, but avian mortality was documented at each site. Desert Sunlight is a photovoltaic facility, Genesis employs a trough system with parabolic mirrors, and Ivanpah uses a power tower as a focal point for solar flux.

FINDINGS

Trauma was the leading cause of death documented for remains at the Desert Sunlight and Genesis sites. Trauma and solar flux injury were both major causes of mortality at the Ivanpah site. Exposure to solar flux caused singeing of feathers, which resulted in mortality in several ways. Severe singeing of flight feathers caused catastrophic loss of flying ability, leading to death by impact with the ground or other objects. Less severe singeing led to impairment of flight capability, reducing ability to forage and evade predators, leading to starvation or predation. Our examinations did not find evidence for significant tissue burns or eye damage caused by exposure to solar flux.

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

These solar facilities appear to represent "equal-opportunity" hazards for the bird species that encounter them. The remains of 71 species were identified, representing a broad range of ecological types. In body size, these ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders

(swallows) to strictly aquatic feeders (grebes) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species, and nocturnal as well as diurnal species were represented. Although not analyzed in detail, there was also significant bat and insect mortality at the Ivanpah site, including monarch butterflies. It appears that Ivanpah may act as a "**mega-trap,**" attracting insects which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

			Foraging Zone			**Residency Status**	
SITE	No. Remains	Identifiable Remains	Air	Terr	Water	Resident	Migrant
Ivanpah	141	127	28	85	14	63	64
Genesis	31	30	12	12	6	20	10
Desert Sun	61	56	7	22	27	18	38
TOTALS	233	213	47	119	47	101	112

CONCLUSIONS AND RECOMMENDATIONS

In summary, three main causes of avian mortality were identified at these facilities: impact trauma, solar flux, and predation. Birds at all three types of solar plants were susceptible to impact trauma and predators. Predation was documented mostly at the photovoltaic site, and in many cases appeared to be associated with stranding or nonfatal impact trauma with the panels, leaving birds vulnerable to resident predators. Solar flux injury, resulting from exposures to up to 800° F, was unique to the power tower facility. Our findings demonstrate that a broad ecological variety of birds are vulnerable to morbidity and mortality at solar facilities, though some differential mortality trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present; and insectivores at Ivanpah, where insects are attracted to the solar tower.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions should include:

Monitoring/detection measures*:*

1) Install video cameras sufficient to provide 360 degree coverage around each tower to record birds (and bats) entering and exiting the flux

2) For at least two years (and in addition to planned monitoring protocol), conduct daily surveys for birds (at all three facilities), as well as insects and bats (in the condenser building at Ivanpah) around each tower at the base of and immediately adjacent to the towers in the area cleared of vegetation. Timing of daily surveys can be adjusted to minimize scavenger removal of carcasses as recommended by the TAC. Surveys in the late afternoon might be optimal for bird carcasses, and first light for bat carcasses.

3) Use dogs for monitoring surveys to detect dead and injured birds that have hidden themselves in the brush, both inside and outside the perimeter of the facility

4) To decrease removal of carcasses, implement appropriate raven deterrent actions

Bird Mortality Avoidance Measures:

1) Increase cleared area around tower at Ivanpah to decrease attractive habitat; at least out to fence

2) Retrofit visual cues to existing panels at all three facilities and incorporate into new panel design. These cues should include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other

3) Suspend power tower operation during peak migration times for indicated species

4) Avoid vertical orientation of mirrors whenever possible, for example tilt mirrors during washing

5) Properly net or otherwise cover ponds

6) Place perch deterrent devices where indicated, eg. on tower railings near the flux field

7) Employ exclusionary measures to prevent bats from roosting in and around the condenser facility at Ivanpah.

It must be emphasized that we currently have a very incomplete knowledge of the scope of avian mortality at these solar facilities. Challenges to data collection include: large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; rapid degradation of carcass quality hindering cause of death and species determination; and inconsistent documentation of carcass history.

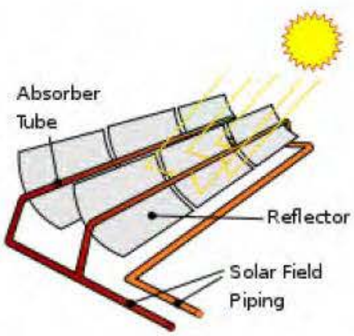
To rectify this problem, video cameras should be added to the solar towers to record bird mortality and daily surveys of the area at the base of and immediately adjacent to the towers should be conducted. At all the facilities, a protocol for systematic, statistically-rigorous searches for avian remains should be developed, emphasizing those areas where avian mortality is most likely to occur. Investigation into bat and insect mortalities at the power tower site should also be pursued.

Finally, there are presently little data available on how solar flux affects birds and insects. Studies of the temperatures experienced by objects in the flux; of the effects of high temperatures on feather structure and function; and of the behavior of insects and birds in response to the flux and related phenomena (e.g. "light clouds") are all essential if we are to understand the scope of solar facility effects on wildlife.

Introduction

The National Fish and Wildlife Forensics Laboratory was requested to determine cause of death for birds found at facilities that generate electricity from solar energy. Solar generating facilities can be classified into three major types: photovoltaic sites, trough systems and solar power towers. There is much written about these systems so this report will not include any technical details, but simply mention the differences and their potential impact on birds.

1) **Photovoltaic systems** directly convert the sun's light into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the photovoltaic cells. An example of this type of solar power plant is Desert Sunlight Solar Farm (AKA First Solar).



2) **Trough systems** are composed of parabolic mirrors which focus and reflect the sun to a tube that converts the heat from the sun into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the trough structures. An example of this type of solar power plant is Genesis Solar Energy Project.

3) **Solar power towers** use thousands of mirrors to reflect the solar energy to a tower, where water in a boiler is converted to steam, generating the electricity. The perceived threat to birds is associated traumatic impact with the mirrors and the danger associated with the heat produced by the mirrors. An example of this type of solar power plant is Ivanpah Solar Electric Generating System.

Methods

Carcasses were collected at the different solar power plant sites by either US Fish and Wildlife Service employees or by energy company staff. The collection of the carcasses was opportunistic; that is, not according to a pre-determined sampling schedule or protocol. There was no attempt to quantify the number of carcasses that scavengers or predators removed from the solar facilities' grounds, or to compare the distribution of carcasses inside and outside the boundaries of the solar facility sites.

Additionally, three USFWS/-OLE staff, including two Forensics Lab staff (EOE and RAK), visited the Ivanpah Solar plant from October 21 – 24, 2013. Their on-site observations are included in this report.

A total of 233 birds collected from three different facilities were examined; 141 from a solar thermal power tower site (Ivanpah, Bright Source Inc.), 31 from a parabolic trough site (Genesis, NextEra Energy Inc.) and 61 from a photovoltaic (PV) panel site (Desert Sunlight, First Solar Inc.). Nine of the Ivanpah birds were received fresh; 7 of those were necropsied during a site visit by a Forensics Laboratory pathologist (RAK). The rest of the birds were received frozen and allowed to thaw at room temperature prior to species identification and necropsy. Species determination was made by the Forensics Laboratory ornithologist (PWT) for all birds either prior to necropsy or, for those necropsied on-site, from photos and the formalin-fixed head. All data on carcass history (location of the carcass, date of collection and any additional observations) were transcribed, although these were not available for all carcasses.

As part of the gross pathological examination, whole carcasses were radiographed to help evaluate limb fractures and identify any metal foreign bodies. Alternate light source examination using an Omnichrome Spectrum 9000+ at 570 nm with a red filter helped rule in or out feather burns by highlighting subtle areas of feather charring (Viner et al., 2014). All birds or bird parts from Ivanpah without obvious burns were examined with the alternate light source, as well as any bird reportedly found near a power line and a random sub-sample of the remaining birds from Genesis and Desert Sunlight (Viner, T. C., R. A. Kagan, and J. L. Johnson, 2014, Using an alternate light source to detect electrically singed feathers and hair in a forensic setting. Forensic Science International, v. 234, p. e25-e29).

Carcass quality varied markedly. If carcasses were in good post mortem condition, representative sections of heart, lung, kidney, liver, brain and gastrointestinal tract as well as any tissues with gross lesions were collected and fixed in 10% buffered formalin. Full tissue sets were collected from the fresh specimens. Formalin-fixed tissues were routinely processed for histopathology, paraffin-embedded, cut at 4 µm and stained with hematoxylin and eosin. Tissues from 63 birds were examined microscopically: 41 from Ivanpah, 1 from Genesis and 21 from Desert Sunlight.

Birds with feather burns were graded based on the extent of the lesions. Grade 1 birds had curling of less than 50% of the flight feathers. Grade 2 birds had curling of 50% or more of the flight feathers. Grade 3 birds had curling and visible charring of contour feathers (Figure 1).

Figure 1: Three grades of flux injury based on extent and severity of burning. Grade 1 (top); Yellow-rumped Warbler with less than 50% of the flight feathers affected (note sparing of the yellow rump feathers). Grade 2 (middle); Northern Rough-winged Swallow initially found alive but unable to fly, with greater than 50% of the flight feathers affected. Grade 3 (bottom); MacGillivray's Warbler with charring of feathers around the head, neck, wings and tail.

Bird Species Recovered at Solar Power Facilities

Tables 1-4 and Appendix 1 summarize 211 identifiable bird remains recovered from the three solar facilities included in this study. These birds constitute a taxonomically diverse assemblage of 71 species, representing a broad range of ecological types. In body size, these species ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders (e.g. swifts and swallows) to strictly aquatic feeders (pelicans and cormorants) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species. Nocturnal as well as diurnal species were represented.

In Tables 1-4 and Appendix 1, bird species are categorized into very general ecological types by foraging zone and residency status. Foraging Zones were "air" (a significant portion of foraging activity performed in the air), "terrestrial" (including foraging both in vegetation and on the ground), and "water" (foraging associated with water, including waders as well as aquatic birds). Residency Status was "resident" (for breeding or year-round residents) and "migrant" (for both passage migrants and non-breeding-season residents). For a number of species, the appropriate classification for residency status was uncertain, due to a lack of detailed knowledge of the sites. The present classification is based on published range maps, and is subject to revision as more information becomes available.

This dataset is not suitable for statistical analysis, due to the opportunistic and unstandardized collection of avian remains at the facilities, and the lack of baseline data on bird diversity and abundance at each site. Nevertheless, a few conclusions can be noted. First, these data do not support the idea that these solar facilities are attracting particular species. Of the 71 bird species identified in remains, only five species were recovered from all three sites. These five were American Coot, Mourning Dove, Lesser Nighthawk, Tree Swallow, and Brown-headed Cowbird, again emphasizing the ecological variety of birds vulnerable to mortality at the solar facilities. Over two-thirds (67%) of the species were found at only a single site

(Appendix 1). That being said, the Desert Sunlight facility had particularly high mortality among waterbirds, suggesting a need to render the ponds at that site inaccessible or unattractive to these species.

The diversity of birds dying at these solar facilities, and the differences among sites, suggest that there is no simple "fix" to reduce avian mortality. These sites appear to represent "equal-opportunity" mortality hazards for the bird species that encounter them. Actions to reduce or mitigate avian mortality at solar facilities will need to be designed on a site-specific basis, and will require much more data on the bird communities at each site, and on how mortality is occurring. Carefully-designed mortality studies might reveal significant patterns of vulnerability that are not evident in these data.

Table 1. Summary data on avian mortality at the three solar sites included in this study. See summary for discussion of Foraging Zone and Residency Status categories.

				Foraging Zone			Residency Status	
SITE	**No. Species**	**No. Remains**	**Identifiable Remains**	**Air**	**Terr**	**Water**	**Resident**	**Migrant**
Ivanpah	49	141	127	26	85	14	63	64
Genesis	15	31	30	12	12	6	20	10
Desert Sun	33	61	56	7	22	27	18	38
TOTALS	71	233	213	47	119	47	101	112

Table 2. Species identified from avian remains at the Desert Sunlight photovoltaic solar facility. MNI = minimum number of individuals of each species represented by the identifiable remains. In some cases (e.g. Cinnamon/Blue-winged Teal), closely related species could not be distinguished based on the available remains, but the Foraging Zone and Residency Status could still be coded, due to the ecological similarities of the species involved. Total identified birds = 56.

DESERT SUNLIGHT		Zone	Residency	MNI
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	1
Eared Grebe	*Podiceps nigricollis*	water	migrant	3
Sora	*Porzana carolina*	water	migrant	1
American Avocet	*Recurvirostra americana*	water	migrant	1
Cinnamon/Blue-winged Teal	*Anas discors/clypeata*	water	migrant	1
Western Grebe	*Aechmophorus occidentalis*	water	migrant	9
Brown Pelican	*Pelecanus occidentalis*	water	migrant	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	2
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	1
Yuma Clapper Rail	*Rallus longirostris*	water	resident	1
American Coot	*Fulica americana*	water	migrant	5
Mourning Dove	*Zenaida macroura*	terr	resident	3
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
Costa's Hummingbird	*Calypte costae*	air	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Black-throated/Sage Sparrow	*Amphispiza sp.*	terr	resident	1
Black Phoebe	*Sayornis nigricollis*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	2
Common Raven	*Corvus corax*	terr	resident	1
Horned Lark	*Eremophila alpestris*	terr	migrant	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	1
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	1
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	1
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
Western Tanager	*Piranga ludoviciana*	terr	migrant	2
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1

Table 3. Species identified from avian remains at the Genesis trough system solar facility. Total identified birds = 30.

GENESIS		Zone	Residency	MNI
Eared Grebe	*Podiceps nigricollis*	water	migrant	2
Great Blue Heron	*Ardea herodias*	water	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Ring-billed Gull	*Larus delawarensis*	water	migrant	2
California Gull	*Larus californianus*	water	resident	1
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Say's Phoebe	*Sayornis saya*	air	resident	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	5
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	1
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Chipping Sparrow	*Spizella passerina*	terr	resident	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	6

Table 4. Species identified from avian remains at the Ivanpah power tower solar facility. Total identified birds = 127

IVANPAH		Zone	Residency	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	4
Cooper's Hawk	*Accipiter cooperii*	air	migrant	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Peregrine Falcon	*Falco peregrinus*	air	resident	1
American Coot	*Fulica americana*	water	migrant	7
Sora	*Porzana carolina*	water	migrant	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	2
Greater Roadrunner	*Geococcyx californianus*	terr	resident	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	1
Mourning Dove	*Zenaida macroura*	terr	resident	11
Barn Owl	*Tyto alba*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	3
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
White-throated Swift	*Aeronautes saxatalis*	air	resident	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	1
Northern Flicker	*Colaptes auratus*	terr	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	3
Warbling Vireo	*Vireo gilvus*	terr	migrant	1
Common Raven	*Corvus corax*	terr	resident	2
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Verdin	*Auriparus flaviceps*	terr	resident	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	1
American Pipit	*Anthus rubescens*	terr	migrant	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	1
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	14
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Yellow Warbler	*Setophaga petechia*	terr	migrant	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	2
Lazuli Bunting	*Passerina amoena*	terr	migrant	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	3
Chipping Sparrow	*Spizella passerina*	terr	resident	3
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	3
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	2
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	6

IVANPAH		Zone	Residency	MNI
Pine Siskin	*Spinus pinus*	terr	migrant	1
House Finch	*Carpodacus mexicanus*	terr	resident	13
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	3

Cause of Death of Birds Found at the Solar Power Plants

Photovoltaic facility (Desert Sunlight):

Sixty-one birds from 33 separate species were represented from Desert Sunlight. Due to desiccation and scavenging, a definitive cause of death could not be established for 22 of the 61 birds (see Table 5). Feathers could be examined in all cases, however, and none of the 61 bird remains submitted from the PV facility had visible evidence of feather singeing, a clear contrast with birds found at Ivanpah.

Blunt force impact trauma was determined to have been the cause of death for 19 Desert Sunlight birds including two Western Grebes (*Aechmophorus occidentalis*) and one each of 16 other species. Impact (blunt force) trauma is diagnosed by the presence of fractures and internal and/or external contusions. In particular, bruising around the legs, wings and chest are consistent with crash-landings while fractures of the head and/or neck are consistent with high-velocity, frontal impact (such as may result from impacting a mirror).

Predation was the immediate cause of death for 15 birds. Lesions supporting the finding of predation included decapitation or missing parts of the body with associated hemorrhage (9/15), and lacerations of the skin and pectoral muscles. Eight of the predated birds from Desert Sunlight were

Figure 2: Predation trauma (top) resulting in traumatic amputation of the head and neck (American Avocet) and impact trauma (bottom) causing bruising of the keel ridge of the sternum (Brown Pelican).

grebes, which are unable to easily take off from land. This suggests a link between predation and stranding and/or impact resulting from confusion of the solar panels with water (see Discussion).

Parabolic trough facility (Genesis):

Thirty-one birds were collected from this site. There were 15 species represented. Those found in the greatest numbers were Brown-headed Cowbirds and Cliff Swallows, though no more than 6 individuals from any given species were recovered. Overall, carcass quality was poor and precluded definitive cause of death determination in 17/31 birds (Table 5). Identifiable causes of death consisted of impact trauma (6/31) and predation trauma (2/31). Necropsy findings were similar to those at Desert Sunlight with fractures and hemorrhage noted grossly. Predation trauma was diagnosed in two birds, a Cliff Swallow and a Ring-billed Gull.

Power tower facility (Ivanpah):

Ivanpah is the only facility in this study that produces solar flux, which is intense radiant energy focused by the mirror array on the power-generating tower. Objects that pass through this flux, including insects and birds, encounter extreme heat, although the extent of heating depends on many variables, including the duration of exposure and the precise location in the flux beam.

From Ivanpah, 141 birds were collected and examined. Collection dates spanned a period of one year and five months (July 2012 to December 2013) and included at least seven months of construction during which time the towers were not actively fluxing (2013). There were 49 species represented (Table 4). Those found in the greatest numbers were Yellow-rumped Warblers (*Setophaga coronata;* 14), House Finches (*Carpodacus mexicanus*; 13), Mourning Doves (*Zenaida macroura*; 11) and American Coots (*Fulica americana*; 7). Yellow-rumped Warblers and House Finches were found exclusively at the power tower site.

Solar flux injury was identified as the cause of death in 47/141 birds. Solar flux burns manifested as feather curling, charring, melting and/or breakage and loss. Flight feathers of the tail and/or wings were invariably affected. Burns also tended to occur in one or more of the following areas; the sides of the body (axillae to pelvis), the dorsal coverts, the tops and/sides of the head and neck and the dorsal body wall (the back). Overlapping portions of feathers and light-colored feathers were often spared (Figures 3 and 4).

Figure 3: contour feather from the back of a House Finch with Grade 3 solar flux injury. The feather has curling and charring limited to the exposed tip.

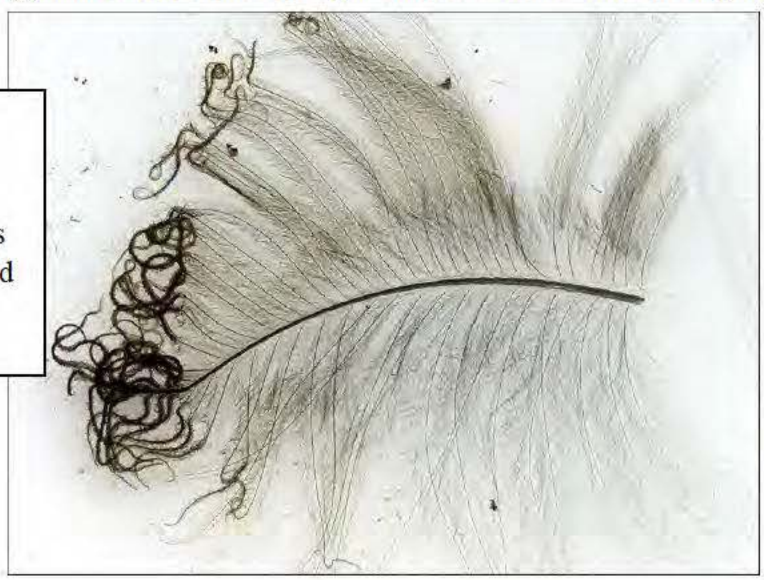


Figure 4: Feather from a Peregrine Falcon with Grade 2 solar flux injury. Note burning of dark feather bands with relative sparing of light bands.

The yellow and red rumps of Yellow-rumped Warblers and House Finches respectively remained strikingly unaffected (See Figure 1). Charring of head feathers, in contrast, was generally diffuse across all color patterns. A pattern of spiraling bands of curled feathers across or around the body and wings was often apparent.

Table 5. Cause of death (COD) data

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

Eight birds were assigned a feather damage Grade of 1 with curling of less than 50% of the flight feathers. Six of these had other evidence of acute trauma (75%). Five birds were Grade 2, including three birds that were found alive and died shortly afterwards. Of these birds, 2 (the birds found dead) also had evidence of acute trauma. Twenty-eight birds were Grade 3; with charring of body feathers. Of these birds, 21/28

(28%) had other evidence of acute trauma. Remaining carcasses (6) were incomplete and a grade could not be assigned.

Twenty-nine birds with solar flux burns also had evidence of impact trauma. Trauma consisted of skull fractures or indentations (8), sternum fractures (4), one or more rib fractures (4), vertebral fractures (1), leg fracture (3), wing fracture (1) and/or mandible fracture (1). Other signs of trauma included acute macroscopic and/or microscopic internal hemorrhage. Location found was reported for 39 of these birds; most of the intact carcasses were found near or in a tower. One was found in the inner heliostat ring and one was found (alive) on a road between tower sites. The date of carcass collection was provided for 42/47. None were found prior to the reported first flux (2013).

Figure 5: The dorsal aspect of the wing from a Peregrine Falcon (the same bird as shown in Figure 4) with Grade 2 lesions. Note extensive curling of feathers without visible charring. This bird was found alive, unable to fly, emaciated and died shortly thereafter. These findings demonstrate fatal loss of function due to solar flux exposure in the absence of skin or other soft tissue burns.

Among the solar flux cases, a variety of bird species were affected though all but one (a raptor) was a passerine (Appendix 2). House Finches and yellow-rumped Warblers were most often represented (10/47 and 12/47 respectively). For the birds in which species could be determined (41/47), insects were a major

dietary component in all but two species. These were an unidentified hummingbird (*Selasphorus*) species (known to include insects in the diet) and a Peregrine Falcon (a species that feeds on small birds).

Four birds were reportedly found alive and taken to a wildlife rehabilitation center where they died one to a few days later (exact dates were not consistently provided). Three had Grade 2 feather burns and one had Grade 3 feather burns. None had other evidence of trauma. Body condition was reduced in all of the birds (two considered thin and two emaciated) based on a paucity of fat stores and depletion of skeletal muscling. The four birds were of four different species and consisted of three passerines and one raptor.

The second most commonly diagnosed cause of death at the Ivanpah facility was impact (or blunt force) trauma (24/141 birds). Necropsy findings were as previously described at the Desert Sunlight facility. Impact marks were reported on heliostat mirrors adjacent to the carcasses in 5 cases and mirrors were described as being vertically-oriented in 5 cases. Specific carcass locations were reported for 18 of the birds. Those birds were found in a variety of areas; below heliostats (8/18), in or near tower and powerblock buildings (4/18), on roads (2/18), below power lines (2/18), in the open (1/18) and by a desert tortoise pen (1/18).

Predation was determined to be the cause of death for five of the birds. A coot and a Mourning Dove were found with extensive trauma and hemorrhage to the head and upper body consisting of lacerations, crush trauma and/or decapitation. One of the birds (an American Coot) was found near a kit fox shelter site. One bird (Northern Mockingbird) was found near the fence line and the third (a Mourning Dove) in an alley way. Two more birds (an unidentified sparrow and an American Pipit) were observed being eaten by one of the resident Common Ravens.

Discussion of Cause of Death of Birds Found at the Solar Power Plants

Impact trauma:

Sheet glass used in commercial and residential buildings has been well-established as a hazard for birds, especially passerines (Klem 1990, 2004, 2006; Loss et al. 2014). A recent comprehensive review estimated that between 365-988 million birds die annually by impacting glass panels in the United States alone (median estimate 599 million; Loss et al. 2014). Conditions that precipitate window strike events include the positioning of vegetation on either side of the glass and the reflective properties of the window. Glass panels that reflect trees and other attractive habitat are involved in a higher number of bird collisions.

The mirrors and photovoltaic panels used at all three facilities are movable and generally directed upwardly, reflecting the sky. At the Ivanpah facility, when heliostats are oriented vertically (typically for washing or installation, personal communication, RAK) they appear to pose a greater risk for birds. Of the eight birds reported found under a heliostat, heliostats were vertically-oriented in at least 5 cases. (D Klem Jr., DC Keck, KL Marty, AJ Miller Ball, EE Niciu, and CT Platt. 2004. Effects of window angling, feeder placement, and scavengers on avian mortality at plate glass. Wilson Bulletin, 116(1):69-73; D Klem Jr. 2006. Glass: A deadly conservation issue for birds. Bird Observer 34(2):73-81; D Klem Jr. 1990.

Collisions between birds and windows: mortality and prevention. Journal of Field Ornithology 61:120–128; Loss, S.R., T. Will, S.S.Loss, and P.P. Marra. 2014. Bird-building collisions in the United States: Estimates of annual mortality and species vulnerability. Condor 116: 8-23). Studies with aquatic insects have found that vertically-oriented black glass surfaces (similar to solar panels) produced highly polarized reflected light, making them highly attractive (Kriska, G., P. Makik, I. Szivak, and G. Horvath. 2008. Glass buildings on river banks as "polarized light traps" for mass-swarming polarotactic caddis flies. Naturwissenschaften 95: 461-467).

A desert environment punctuated by a large expanse of reflective, blue panels may be reminiscent of a large body of water. Birds for which the primary habitat is water, including coots, grebes, and cormorants, were over-represented in mortalities at the Desert Sunlight facility (44%) compared to Genesis (19%) and Ivanpah (10%). Several factors may inform these observations. First, the size and continuity of the panels differs between facilities. Mirrors at Ivanpah are individual, 4 x 8' panels that appear from above as stippling in a desert background (Figure 6). Photovoltaic panels at Desert Sunlight are long banks of adjacent 27.72 x 47.25" panels (70 x 120 cm), providing a more continuous, sky/water appearance. Similarly, troughs at Genesis are banks of 5 x 5.5' panels that are up to 49-65 meters long.

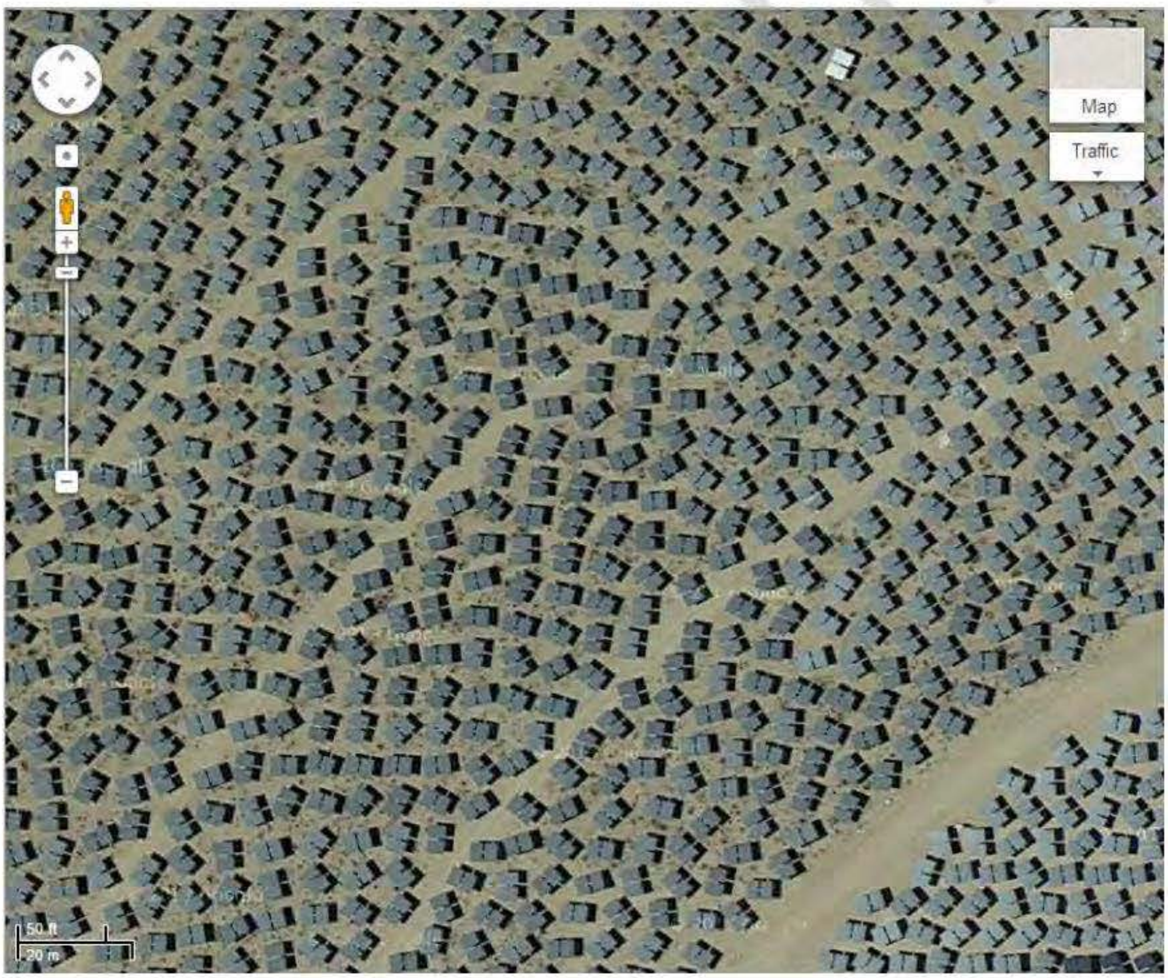


Figure 6: The Ivanpah Solar Electric Generating System as seen via satellite. The mirrored panels are 5 x 8 feet.

There is growing concern about "polarized light pollution" as a source of mortality for wildlife, with evidence that photovoltaic panels may be particularly effective sources of polarized light in the environment (see Horvath et al. 2010. Reducing the maladaptive attractiveness of solar panels to polarotactic insects. Conservation Biology 24: 1644-1653, and ParkScience, Vol. 27, Number 1, 2010; available online at: http://www.nature.nps.gov/parkscience/index.cfm?ArticleID=386&ArticleTypeID=5; as well as discussion of this issue in the Desert Sunlight Final Environmental Impact Statement, Chapter 4, pp. 14-15).

Variables that may affect the illusory characteristics of solar panels are structural elements or markings that may break up the reflection. Visual markers spaced at a distance of 28 cm or less have been shown to reduce the number of window strike events on large commercial buildings (City of Toronto Green Development Standard; Bird-friendly development guidelines. March 2007). Mirrors at the Ivanpah facility are unobscured by structures or markings and present a diffuse, reflective surface. Photovoltaic panels at Desert Sunlight are arranged as large banks of small units that are 60 x 90 cm. The visually uninterrupted expanse of both these types of heliostat is larger than that which provides a solid structure visual cue to passerines. Parabolic troughs at Genesis have large, diffusely reflective surfaces between seams that periodically transect the bank of panels at 5.5' intervals. Structures within the near field, including the linear concentrator and support arms, and their reflection in the panels and may provide a visual cue to differentiate the panel as a solid structure.

The paper by Horvath et al cited above provides experimental evidence that placing a white outline and/or white grid lines on solar panels significantly reduced the attractiveness of these panels to aquatic insects, with a loss of only 1.8% in energy-producing surface area (p. 1651). While similar detailed studies have yet to be carried out with birds, this work, combined with the window strike results, suggest that significant reductions in avian mortality at solar facilities could be achieved by relatively minor modifications of panel and mirror design. This should be a priority for further research.

Finally, ponds are present on the property of the Desert Sunlight and Genesis facilities. The pond at Genesis is netted, reducing access by migratory birds, while the pond at Desert Sunlight is open to flighted wildlife. Thus, birds are both attracted to the water feature at Desert Sunlight and habituated to the presence of an accessible aquatic environment in the area. This may translate into the misinterpretation of a diffusely reflected sky or horizonal polarized light source as a body of water.

Stranding and Predation:

Predation is likely linked to panel-related impact trauma and stranding. Water birds were heavily over-represented in predation mortalities at Desert Sunlight. Of the 15 birds that died due to predation, 14 make their primary habitat on water (coots, grebes, a cormorant, and an avocet). A single White-winged Dove was the only terrestrial-based predation mortality in the submitted specimens. This is in contrast to blunt trauma mortalities at Desert Sunlight in which 8 of the 19 birds determined to have died of impact trauma were water species.

Locations of the birds when found dead were noted on several submissions. Of the birds that died of predation for which locations were known, none were located near ponds. The physiology of several of

these water birds is such that locomotion on land is difficult or impossible. Grebes in particular have very limited mobility on land and require a run across water in order to take off (Jehl, J. R., 1996. Mass mortality events of Eared Grebes in North America. Journal of Field Ornithology 67: 471-476). Thus, these birds likely did not reach their final location intentionally. Ponds at the PV and trough sites are fenced, prohibiting terrestrial access by predators. Birds on the water or banks of the pond are inaccessible to resident predators. Therefore, it is unlikely that the birds were captured at the pond and transported by a predator into the area of the panels. Attempts to land or feed on the panels because of their deceptive appearance may have injured the birds to the point that they could not escape to safety, or inadvertently stranded the birds on a substrate from which they could not take flight. We believe that an inability to quickly flee after striking the panels and stranding on the ground left these birds vulnerable to opportunistic predators. At least two types of predators, kit foxes and ravens, have been observed in residence at the power tower and PV facilities and ravens have been reported at the trough site (personal communication and observation, RAK). Additionally, histories for multiple birds found at the tower site document carcasses found near kit fox shelters or being eaten or carried by a raven.

Solar Flux:

Avian mortality due to exposure to solar flux has been previously explored and documented (McCrary, M. D., McKernan, R. L., Schreiber, R. W., Wagner, W. D., and Sciarrotta, T. C. Avian mortality at a solar energy power plant. Journal of Field Ornithology, 57(2): 135-141). Solar flux injury to the birds of this report, as expected, occurred only at the power tower facility. Flux injury grossly differed from other sources of heat injury, such as electrocution or fire. Electrocution injury requires the bridging of two contact points and is, therefore, seen almost exclusively in larger birds such as raptors. Contact points tend to be on the feet, carpi and/or head and burns are often found in these areas. Electrocution causes deep tissue damage as opposed to the surface damage of fire or solar flux. Other sequelae include amputation of limbs with burn marks on bone, blood vessel tears and pericardial hemorrhage. Burns from fires cause widespread charring and melting of feathers and soft tissues and histopathologic findings of soot inhalation or heat damage to the respiratory mucosa. None of these were characteristics of flux injury. In the flux cases small birds were over-represented, had burns generally limited to the feathers and internal injuries attributable to impact. Flux injury inconsistently resulted in charring, tended to affect feathers along the dorsal aspects of the wings and tail, and formed band-like patterns across the body (Divincenti, F. C., J. A. Moncrief, and B. A. Pruitt. 1969. Electrical injuries: a review of 65 cases. The Journal of Trauma 9: 497-507).

Proposed mechanisms of solar flux-related death follow one or a combination of the following pathways:

- impact trauma following direct heat damage to feathers and subsequent loss of flight ability
- starvation and/or thermoregulatory dysfunction following direct heat damage to feathers
- shock
- soft tissue damage following whole-body exposure to high heat
- ocular damage following exposure to bright light.

Necropsy findings from this study are most supportive of the first three mechanisms.

Loss of feather integrity has effects on a bird's ability to take off, land, sustain flight and maneuver. Tail feathers are needed for lift production and maneuverability, remiges are needed for thrust and lift and feathers along the propatagium and coverts confer smoothness to the avian airfoil. Shortening of primary flight feathers by as little as 1.6 cm with loss of secondary and tertiary remiges has been shown to eliminate take-off ability in house sparrows further demonstrating the importance of these feathers (Brown, R. E., and A. C. Cogley, 1996. Contributions of the propatagium to avian flight: Journal of Experimental Zoology 276: 112-124). Loss of relatively few flight feathers can, therefore, render a bird unable or poorly-able to fly. Birds encountering the flux field at Ivanpah may fall as far as 400 feet after feather singeing. Signs of impact trauma were often observed in birds with feather burns and are supportive of sudden loss of function (Beaufrere, H., 2009. A review of biomechanic and aerodynamic considerations of the avian thoracic limb. Journal of Avian Medicine and Surgery 23: 173-185).

Birds appear to be able to survive flux burns in the short term, as evidenced by the collection of several live birds with singed feathers. Additionally, Forensic Lab staff observed a falcon or falcon-like bird with a plume of smoke arising from the tail as it passed through the flux field. Immediately after encountering the flux, the bird exhibited a controlled loss of stability and altitude but was able to cross the perimeter fence before landing. The bird could not be further located following a brief search (personal observation, RAK and EOE). Birds that initially survive the flux exposure and are able to glide to the ground or a perch may be disabled to the point that they cannot efficiently acquire food, escape predators or thermoregulate. Observations of emaciation in association with feather burns in birds found alive is supportive of debilitation subsequent to flux exposure. More observational studies and follow-up are required to understand how many birds survive flux exposure and whether survival is always merely short-term. As demonstrated by the falcon, injured birds (particulary larger birds), may be ambulatory enough to glide or walk over the property line indicating a need to include adjacent land in carcass searches.

There was evidence of acute skin burns on the heads of some of the Grade 3 birds that were found dead. But interestingly, tissue burn effects could not be demonstrated in birds known to have survived short periods after being burned. Hyperthermia causing instantaneous death manifests as rapid burning of tissue, but when death occurs a day or later there will be signs of tissue loss, inflammation, proteinic exudate and/or cellular death leading to multisystemic organ failure. The beginnings of an inflammatory response to injury can be microscopically observed within one to a few hours after the insult and would have been expected in any of the four birds found alive. Signs of heat stroke or inhalation of hot air should have been observable a day or more after the incident. Rather, in these cases extensive feather burns on the body largely appeared to be limited to the tips of the feathers with the overlapping portions insulating the body as designed. This, in conjunction with what is likely only a few seconds or less spent in the flux, suggests that skin or internal organ damage from exposure to high temperatures in solar flux may not be a major cause of the observed mortality.

Ocular damage following light exposure was also considered but could not be demonstrated in the submitted birds. In the four birds that initially survived, there were no signs of retinal damage, inflammation or other ocular trauma. Given the small sample size, this does not preclude sight impairment as a possible sequela but clinical monitoring of survivors would be needed to draw more definitive conclusions.

Other/Undetermined:

Powerline electrocution was the cause of death for one bird (a juvenile Common Raven) at the Ivanpah facility. Electrocution at these solar facilities is a potential hazard but, thus far, appears to be an uncommon cause of death.

Smashed birds (13/233) were found at all three locations. Detailed carcass collection information was provided for 6; all were found on roads. Though poor carcass quality in all cases precluded definitive cause death determination, circumstances and carcass condition suggest vehicle trauma as the cause of deaths. The relatively low numbers of vehicle collisions may be attributed to slow on-site vehicle speeds and light traffic. Vehicle collisions, therefore, do not appear to be a major source of mortality and would be expected to decrease as construction ends.

There was a large number of birds (85/233) for which a cause of death could not be determined due to poor carcass condition. The arid, hot environment at these facilities leads to rapid carcass degradation which greatly hinders pathology examination. Results were especially poor for birds from the Genesis facility, where the cause of death(s) for 23/31 (74%) could not be determined. These results underscore the need for carcasses to be collected soon after death. More frequent, concerted carcass sweeps are advised.

Insect mortality and solar facilities as "mega-traps"

An ecological trap is a situation that results in an animal selecting a habitat that reduces its fitness relative to other available habitats (Robertson, B.A. and R.L. Hutto. 2006. A framework for understanding ecological traps and an evaluation of existing evidence. Ecology 87: 1075-1085; Robertson, B.A., J.S. Rehage, and Sih, A. 2013. Ecological novelty and the emergence of evolutionary traps. Trends in Ecology and Evolution 28: 552-560).

A wide variety of circumstances may create ecological traps, ranging from subtle (songbirds attracted to food resources in city parks, where they are vulnerable to unnaturally high populations of predators) to direct (birds are attracted to oil-filled ponds, believing it to be water, and become trapped). It appears that solar flux facilities may act as "**mega-traps,**" which we define as artificial features that attract and kill species of multiple trophic layers. The strong light emitted by these facilities attract insects, which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

OLE staff observed large numbers of insect carcasses throughout the Ivanpah site during their visit. In some places there were hundreds upon hundreds of butterflies (including monarchs, *Danaus plexippus*) and dragonfly carcasses. Some showed singeing, and many appeared to have just fallen from the sky. Careful observation with binoculars showed the insects were active in the bright area around the boiler at the top of the tower. It was deduced that the solar flux creates such a bright light that it is brighter than the surrounding daylight. Insects were attracted to the light and could be seen actively flying the height of the tower. Birds were also observed feeding on the insects. At times birds flew into the solar flux and ignited. Bird carcasses recovered from the site showed the typical singed feathers. The large populations of insects

may also attract indigenous bat species, which were seen roosting in structures at the base of the power tower.

Monarch butterflies in North America – both east and west of the Rocky Mountains – have been documented to be in decline (see the North American Monarch Conservation Plan, available at: http://www.mlmp.org/Resources/pdf/5431_Monarch_en.pdf). Proposed causes include general habitat loss and specific loss of milkweed, upon which the butterflies feed and reproduce. Considering the numerous monarch butterfly carcasses seen at the Ivanpah facility, it appears that solar power towers could have a significant impact on monarch populations in the desert southwest. Analysis of the insect mortality at Ivanpah, and systematic observations of bird/insect interactions around the power tower, is clearly needed.

Bird species affected by solar flux include both insectivores (e.g. swallows, swifts, flycatchers, and warblers) and raptors that prey on insect-feeding birds. Based on observations of the tower in flux and the finding of large numbers of butterflies, dragonflies and other insects at the base of the tower and in adjacent buildings it is suspected that the bright light generated by solar flux attracts insects, which in turn attracts insectivores and predators of insectivores. Waterbirds and other birds that feed on vegetation were not found to have solar flux burns. Birds were observed perching and feeding on railings at the top of the tower, apparently in response to the insect aggregations there.

Further, dead bats found at the Ivanpah site could be attracted to the large numbers of insects in the area. Nineteen bats from the condenser area of the power tower facility have been submitted to NFWFL for further evaluation. These bats belong to the Vespertilionidae and Molossidae families, which contain species considered by the Bureau of Land Management to be sensitive species in California. Preliminary evaluation revealed no apparent singing of the hair, and analysis is ongoing.

Solar flux and heat associated with solar power tower facilities

Despite repeated requests, we have been unsuccessful in obtaining technical data relating to the temperature associated with solar flux at the Ivanpah facility. The following summarizes the information we have gathered from other sources.

The Ivanpah solar energy generating facility consists of mirrors that reflect sunlight to a tower. In the tower sits a boiler that generates steam which then powers a turbine.

Figure 7 Ivanpah solar power facilities http://ivanpahsolar.com/about

At the top of a 459 foot tall tower sits a boiler (solar receiver) that is heated by the sun rays reflected by 300,000 mirrors, called solar heliostats. When the concentrated sunlight strikes the boiler tubes, it heats the water to create superheated steam. The high temperature steam is then piped from the boiler to a turbine where electricity is generated (http://ivanpahsolar.com/about visited on 01/20/2014).

If all the solar heliostats are focused on the solar tower the beams multiply the strength of sunlight by 5000 times, and this generates temperatures at the solar tower in excess of 3600° Fahrenheit (> 1982° Celsius). Since steel melts at 2750° Fahrenheit (1510° Celsius), only a percentage of heliostats are focused on the solar receiver so that) the optimal temperature at the tower is approximately 900° Fahrenheit (~482° Celsius) ("How do they do it" Wag TV for Discovery Channel, Season 3, Episode 15, "Design Airplane Parachutes, Create Solar Power, Make Sunglasses" Aired August 25, 2009).

Figure 8: Seville solar power facility (http://inhabitat.com/sevilles-solar-power-tower)

A solar steam plant in Coalinga that also uses heliostat technology for extracting oil is on record stating that the steam generator is set to about 500° Celsius. (http://abclocal.go.com/kDSn/story?section=news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Temperatures measured by the authors at the edge of the solar complex on the surface of a heliostat were approximately 200° Fahrenheit (~93° Celsius). Therefore, there is a gradient of temperature from the edge of the solar field to the tower that ranges from 200° to 900° Fahrenheit.

There is a phenomenon that occurs when the heliostats are focused on the tower and electricity is being generated. The phenomenon can be described as either a circle of clouds around the tower or, at times, a cloud formed on the side that is receiving the solar reflection. It appears as though the tower is creating clouds. Currently we propose two hypotheses of why this "cloud" is formed. The first hypothesis is simply the presumption that the high heat associated with towers is condensing the air, and forming the

Figure 9: Tower 1 (bright white) is shown under power. Tower 2 (black) is not operating.

clouds. The second hypothesis is that this phenomenon does not represent clouds at all rather it is a place in space where the heliostats that are not being used to generate heat are focused. Under this scenario, it is a place where the mirrors focus the excess energy not being used to generate electricity.

Ivanpah employees and OLE staff noticed that close to the periphery of the tower and within the reflected solar field area, streams of smoke rise when an object crosses the solar flux fields aimed at the tower. Ivanpah employees used the term "streamers" to characterize this occurrence.

When OLE staff visited the Ivanpah Solar plant, we observed many streamer events. It is claimed that these events represent the combustion of loose debris, or insects. Although some of the events are likely that, there were instances in which the amount of smoke produced by the ignition could only be explained by a larger flammable biomass such as a bird. Indeed OLE staff observed birds entering the solar flux and igniting, consequently becoming a streamer.

OLE staff observed an average of one streamer event every two minutes. It appeared that the streamer events occurred more frequently within the "cloud" area adjacent to the tower. Therefore we hypothesize that the "cloud" has a very high temperature that is igniting all material that traverses its field.
One possible explanation of this this phenomenon is that the "cloud" is a convergent location where heliostats are "parked" when not in use. Conversely it undermines the condensation hypothesis, given that birds flying through condensation clouds will not spontaneously ignite.

Temperatures required to burn feathers

Many of the carcasses recovered from the Ivanpah Solar plant after the plant became operational showed singing of feathers as shown in Figure 10.

Figure 10: Singed feathers from a Northern Rough-winged Swallow

In order to investigate at what temperature feathers burn/singe, we exposed feathers to different air temperatures. Each feather was exposed to a stream of helium and air for 30 seconds. The results indicate that at 400° Celsius (752° Fahrenheit) after 30 seconds the feather begins to degrade. But at 450° and

Figure 11: Results of exposing feathers to different temperatures (in degrees Celsius)

500° Celsius (842° and 932° Fahrenheit respectively) the feathers singed as soon as they made contact with the superheated air (Figure 11). Therefore, when singed birds are found, it can be inferred that the temperatures in the solar flux at the time a bird flew through it was at least 400° Celsius (752° Fahrenheit). This inference is consistent with the desired operating temperature of a power tower solar boiler (482° Celsius).

The fact that a bird will catch on fire as it flies through the solar flux has been confirmed by a Chevron engineer who works at the Coalinga Chevron Steam plant, a joint venture of Chevron and BrightSource Solar.
(http://abclocal.go.com/kDSn/story?section= news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Conclusions and Recommendations

In summary, three main causes of avian mortality were identified at these facilities; impact trauma, predation and solar flux. Birds at all three types of solar plants were susceptible to impact trauma and predators. Solar flux injury was unique to the power tower facility. Solar facilities, in general, do not appear to attract particular species, rather an ecological variety of birds are vulnerable. That said, certain mortality and species trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions include placing perch-guards on power tower railings near the flux field, properly netting or otherwise covering ponds, tilting heliostat mirrors during washing and suspending power tower operation at peak migration times.

Visual cues should be retrofitted to existing panels and incorporated into new panel design. These cues may include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other. This arrangement has been shown to significantly reduce the number of passerines hitting expanses of windows on commercial buildings. Spacing of 10 cm eliminates window strikes altogether. Further exploration of panel design and orientation should be undertaken with researchers experienced in the field (Daneil Klem Jr. of Muhlenberg College) to determine causes for the high rate of impact trauma, and designs optimized to reduce these mortalities.

Challenges to data collection included rapid degradation of carcass quality hindering cause of death and species determination; large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; and inconsistent documentation of carcass history. Searcher efficiency has been shown to have varying influences on carcass recovery with anywhere from 30% to 90% detection of small birds achieved in studies done at wind plants (Erickson et al., 2005). Scavengers may also remove substantial numbers of carcasses. In studies done on agricultural fields, up to 90% of small bird carcasses were lost within 24 hours (Balcomb, 1986; Wobeser and Wobeser, 1992). OLE staff observed apparently resident ravens at the Ivanpah power tower. Ravens are efficient scavengers, and could remove large numbers of small bird carcasses from the tower vicinity. (Erickson, W. P., G. D. Johnson, and D. P. Young, Jr., 2005, A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions: U S Forest Service General Technical Report PSW, v. 191, p. 1029-1042; Balcomb, R., 1986, Songbird carcasses disappear rapidly from agricultural fields: Auk, v. 103, p. 817-820; Wobeser, G., and A. G. Wobeser, 1992, Carcass disappearance and estimation of mortality in a simulated die-off of small birds: Journal of Wildlife Diseases, v. 28, p. 548-554.)

Given these variables it is difficult to know the true scope of avian mortality at these facilities. The numbers of dead birds are likely underrepresented, perhaps vastly so. Observational and statistical studies to account for carcass loss may help us to gain a better sense of how many birds are being killed. Complete histories would help us to identify factors (such as vertical placement of mirrors) leading to mortalities. Continued monitoring is also advised as these facilities transition from construction to full operation. Of especial concern is the Ivanpah facility which was not fully-functioning at the time of the latest carcass submissions. In fact, all but 7 of the carcasses with solar flux injury and reported dates of collection were found at or prior to the USFWS site visit (October 21-24, 2013) and, therefore, represent flux mortality from a facility operating at only 33% capacity. Investigation into bat and insect mortalities at the power tower site should also be pursued.

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Appendix 1. List of all 71 species recovered from the three solar energy sites. In this table, remains of closely related taxa that could not be definitively identified (e.g. Cinnamon/Blue-winged Teal and Black-throated/Sage Sparrow) are assigned to the biogeographically more likely taxon. In all such cases, the possible taxa are ecologically similar. All of these species are MBTA-listed.

SPECIES		Zone	Residency	Sites	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	DS,IV	5
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	DS	1
Western Grebe	*Aechmorphorus occidentalis*	water	migrant	DS	9
Eared Grebe	*Podiceps nigricollis*	water	migrant	DS,GN	5
Brown Pelican	*Pelecanus occidentalis*	water	migrant	DS	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	DS	2
Great Blue Heron	*Ardea herodias*	water	migrant	GN	1
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	DS	1
Cooper's Hawk	*Accipiter cooperii*	air	migrant	IV	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	IV	1
American Kestrel	*Falco sparverius*	air	resident	GN,IV	2
Peregrine Falcon	*Falco peregrinus*	air	resident	IV	1
American Coot	*Fulica americana*	water	migrant	DS, IV	12
Yuma Clapper Rail	*Rallus longirostris yumanensis*	water	resident	DS	1
Sora	*Porzana carolina*	water	migrant	DS,IV	2
American Avocet	*Recurvirostra americana*	water	migrant	DS	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	IV	2
Ring-billed Gull	*Larus delawarensis*	water	migrant	GN	2
California Gull	*Larus californianus*	water	resident	GN	1
Greater Roadrunner	*Geococcyx californianus*	terr	resident	IV	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	IV	1
Mourning Dove	*Zenaida macroura*	terr	resident	DS, IV	14
White-winged Dove	*Zenaida asiatica*	terr	resident	DS,GN	2
Barn Owl	*Tyto alba*	terr	resident	IV	1
Lesser nighthawk	*Chordeiles acutipennis*	air	resident	DS,GN,IV	7
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	DS,IV	2
White-throated Swift	*Aeronautes saxatalis*	air	resident	IV	1
Costa's Hummingbird	*Calypte costae*	air	resident	DS	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	IV	1
Northern Flicker	*Colaptes auratus*	terr	resident	IV	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	DS,IV	2
Say's Phoebe	*Sayornis saya*	air	resident	GN	2
Black Phoebe	*Sayornis nigricollis*	air	resident	DS	1
Loggerhead shrike	*Lanius ludovicianus*	terr	resident	DS,IV	5
Warbling Vireo	*Vireo gilvus*	terr	migrant	IV	1
Common Raven	*Corvus corax*	terr	resident	DS,IV	3
Horned Lark	*Eremophila alpestris*	terr	migrant	DS	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	DS,GN,IV	5

SPECIES		Zone	Residency	Sites	MNI
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	GN	5
No. Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	IV	2
Verdin	*Auriparus flaviceps*	terr	resident	IV	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	IV	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	IV	1
American Pipit	*Anthus rubescens*	terr	migrant	IV	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	IV	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	IV	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	IV	14
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	IV	1
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	GN	1
Townsend's warbler	*Setophaga townsendi*	terr	migrant	DS,IV	4
Yellow Warbler	*Setophaga petechia*	terr	migrant	IV	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	IV	1
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	IV	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	DS,IV	4
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	DS	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	DS,IV	4
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	DS,GN	2
Lazuli Bunting	*Passerina caerulea*	terr	migrant	IV	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	IV	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	IV	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	IV	3
Chipping Sparrow	*Spizella passerina*	terr	resident	GN,IV	4
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	DS,IV	4
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	DS,IV	3
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	IV	6
Pine Siskin	*Spinus pinus*	terr	migrant	IV	1
House Finch	*Carpodacus mexicanus*	terr	resident	IV	13
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	DS,IV	5
Brown-headed Cowbird	*Molothrus ater*	terr	resident	DS,GN,IV	8
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	DS	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	GN	2

Species recovered from one site: 47
two sites: 18
three sites: 5

Appendix 2. Species with solar flux burns

Common Name	Scientific name	
Yellow-rumped warbler	*Setophaga coronata*	12
House finch	*Carpodacus mexicanus*	10
Chipping sparrow	*Spizella passerina*	2
Unidentified warbler	*Parulidae*	2
Verdin	*Auriparus flaviceps*	2
Great-tailed grackle	*Quiscalus mexicanus*	2
Lucy's warbler	*Oreothlypis luciae*	1
Wilson's warbler	*Cardellina pusilla*	1
MacGillivray's warbler	*Oporornis tolmei*	1
Black-throated gray warbler	*Setophaga nigrescens*	1
Townsend's warbler	*Setophaga townsendi*	1
Orange-crowned warbler	*Oreothlypis celata*	1
Blue-gray gnatcatcher	*Polioptila caerulea*	1
Unidentified swallow	*Hirundinidae*	1
Northern rough-winged swallow	*Stelgidopteryx serripennis*	1
Warbling vireo	*Vireo gilvus*	1
Unidentified hummingbird	*Selasphorus sp.*	1
Unidentified passerine	Passeriformes	1
Unidentified finch	*Carpodacus sp.*	1
Lazuli bunting	*Passerina caerulea*	1
Unidentified sparrow	*Spizella species*	1
Unidentified blackbird	*Icteridae*	1
Peregrine falcon	*Falco peregrinus*	1

Cashen Footnote #78

DISTRIBUTION AND ABUNDANCE OF WESTERN BURROWING OWLS (*ATHENE CUNICULARIA HYPUGAEA*) IN SOUTHEASTERN CALIFORNIA

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ABSTRACT—During the 2006 and 2007 breeding seasons, we conducted a systematic survey for western burrowing owls (*Athene cunicularia hypugaea*) across the portions of California's southeastern deserts that had never been systematically surveyed for the species. We found few or no western burrowing owls in northern and eastern portions of the Mojave Desert or in the Sonoran Desert (excluding Palo Verde Valley). However, there was a substantial concentration of burrowing owls in the western Mojave Desert, which we estimated to contain ≤560 (*SE* = 268) breeding pairs. We also documented 179 breeding pairs along the banks of water-conveyance structures in Palo Verde Valley in the Sonoran Desert region. These two disjunct populations comprise a significant portion of the population of burrowing owls in California.

RESUMEN—Durante las épocas de reproducción del 2006 y 2007, se realizó un estudio sistemático de tecolotes llaneros occidentales (*Athene cunicularia hypugaea*) de las zonas de los desiertos del sudeste de California que nunca habían sido muestreados sistemáticamente para esta especie. Encontramos pocos o ningún tecolote llanero occidental ni en las partes nortes y orientales del desierto Mojave ni en el desierto Sonora (excluyendo el valle de Palo Verde). Sin embargo, encontramos una concentración notable de tecolotes llaneros en la parte occidental del desierto Mojave, que se estimó contener <560 (*SE* = 268) parejas reproductoras. Asimismo, documentamos 179 parejas de tecolotes llaneros en las orillas de las estructuras de conducción de agua en el valle Palo Verde del desierto Sonora. Estas dos poblaciones separadas de tecolotes llaneros comprenden una parte significativa de la población total de California.

The western burrowing owl (*Athene cunicularia hypugaea*) has declined in recent decades across much of its range (Wedgwood, 1978; James and Ethier, 1989; Sheffield, 1997*a*; Holroyd et al., 2001; Wellicome and Holroyd, 2001; DeSante et al., 2007), including California, where it is classified as a species of special concern (Gervais et al., 2008; Shuford and Gardali, 2008). Primary causes of the decline likely have included loss of grassland and agricultural habitats to urbanization (Trulio and Chromczak, 2007) and conversion of lands to inhospitable crops, such as orchards and vineyards (Gervais et al., 2008). Populations in Imperial Valley and in some other areas of the state, where agricultural practices permit, thrive at much higher densities than populations in natural grasslands (DeSante et al., 2004). Other suggested causes of decline include eradication of fossorial mammals (Zarn, 1974; Holroyd et al., 2001; J. V. Remsen, Jr., in litt.) and exposure to pesticides and other contaminants (Haug et al., 1993; Sheffield, 1997*b*; Gervais and Anthony, 2003). Each of these factors, and potentially others, may be important in California, which hosts one of the largest populations of western burrowing owls of any state or Canadian province (Barclay, 2007).

Excluding the desert and Great Basin regions, DeSante et al. (2007) estimated the breeding population in California was 9,266 pairs in 1993. Although burrowing owls occupy the vast deserts of southeastern California (Garrett and Dunn, 1981), estimates of size of populations for these areas based on systematic surveys have not been published. Anecdotal information indicates that burrowing owls generally are scarce in the region, particularly in easternmost portions (Garrett and Dunn, 1981), and that a substantial concentration occurs along the Colorado River in Palo Verde Valley (Gervais et al., 2008). However, quantitative, survey-based estimates of size of populations and knowledge of distributional patterns are needed for prioritizing conservation efforts in California (Burkett and Johnson, 2007).

During the breeding seasons of 2006 and 2007, as part of a larger California-wide survey (Wilkerson and Siegel, 2010), we conducted a systematic survey of portions of the deserts in southeastern California, which had not been surveyed previously. We used results of our survey to characterize patterns of distribution and abundance throughout the region and to estimate size of populations.

Materials and Methods—We divided previously unsurveyed portions of the breeding range of burrowing owls in southeastern California into four regions: northern Mojave Desert-eastern Sierra Nevada, western Mojave Desert, eastern Mojave Desert, and Sonoran Desert. We excluded Imperial and Coachella valleys because they were surveyed previously by DeSante et al. (2007). Following methods used by DeSante et al. (2007), we used ArcGIS software to divide the four regions into 5 by 5-km blocks, oriented and referenced according to the Universal Transverse Mercator (UTM) system. Surveying effort was stratified by elevational subregion because populational densities of burrowing owls generally are higher in lowland areas throughout California than in upland areas (DeSante et al., 2007). For logistical reasons, we discarded blocks that could not be accessed by roads, and then we stratified sampling effort among remaining blocks by region and subregion, randomly selecting as many blocks as we believed our field crew could survey within the time allotted in each region. We also identified additional historic breeding blocks where burrowing owls had been detected during any year beginning in 1981. Historic breeding blocks were identified by querying the California Natural Diversity Database (California Department of Fish and Game, in litt.) and consulting with knowledgeable researchers and birders with local expertise.

Boundaries of our northern Mojave Desert-eastern Sierra Nevada region corresponded to portions of Inyo and Mono counties in the Jepson areas mapped as Mojave Desert and eastern Sierra Nevada by Hickman (1993) and the California Gap Analysis Project (1998), along with a small, disjunct, but ecologically similar area southeast of Topaz Lake. We divided this region into lowland and upland subregions. Any block with ≥5% of land area <1,220 m elevation was included in the lowland subregion. Blocks with >95% of elevation >1,220 m were included in the upland subregion. The 1,830-m elevational contour was the upper limit for inclusion in the upland subregion; blocks with <5% of their area <1,830 m elevation were excluded from sampling. These elevational boundaries were somewhat higher than those established for other regions by DeSante et al. (2007), reflecting overall higher elevation of most land in eastern California.

Our western Mojave Desert region was bounded by the Transverse Range and Sierra Nevada, but it also included areas of the Kern Plateau at elevations <1,830 m. Except for inclusion of the Kern Plateau, boundaries matched those of the western portion of the Jepson area mapped as Mojave Desert by Hickman (1993) and the California Gap Analysis Project (1998). East of the Sierra Nevada, the border of Inyo County defined the northern boundary. Stratification by elevation in the western Mojave Desert region was the same as in the northern Mojave Desert-eastern Sierra Nevada region.

Our eastern Mojave Desert region was limited primarily to the eastern one-half of San Bernardino County, south of Inyo County to the Nevada-California state line. Boundaries match those of the southeastern portion of the Jepson area mapped as Mojave Desert by Hickman (1993) and the California Gap Analysis Project (1998). In southeastern San Bernardino County, from Cadiz Valley eastward, the eastern Mojave Desert region shares an irregular zig-zag border with the Sonoran Desert region to the south. Stratification by elevation in the eastern Mojave Desert region was the same as in the northern Mojave Desert-eastern Sierra Nevada region.

Boundaries of our Sonoran Desert region matched the Jepson area mapped as Sonoran Desert by Hickman (1993) and California Gap Analysis Project (1998), excluding Coachella and Imperial valleys, which bisect the region into two disjunct portions. The minimal land area in the Sonoran Desert region >1,220 m elevation was rocky and mountainous; characteristics that made it inhospitable habitat for burrowing owls. Thus, we did not survey an upland subregion in this region; any block with ≥5% land area <1,220 m elevation was included in the region.

After an intensive training session at the beginning of each field season, crew members surveyed blocks using methods developed by DeSante et al. (2007). Surveyors visually scanned all of the accessible area in their blocks at least once during morning (dawn to 1000 h) or late-afternoon (1600 h to dusk) during 1 May–30 June 2006 and 2007, when breeding burrowing owls were likely to be feeding nestlings or recently fledged young.

We provided surveyors with 1:24,000-scale topographic maps with boundaries of blocks and locations of burrowing owls known or suspected to have bred anytime beginning in 1981. Surveyors delineated extent of appropriate habitat in their block, used binoculars or spotting scopes to visually scan all areas of appropriate habitat, and plotted locations of any detections on their maps. Observers could survey habitat on foot, by automobile, or using both methods, but when surveying by automobile they were instructed to stop at least every 800 m, exit the vehicle, and scan in all directions. For each detection, surveyors provided a count of burrowing owls seen (identified to age and sex when possible) and the number of breeding pairs those individuals were believed to represent. For counts of pairs, observers were instructed to assume that lone adults had unseen mates, and represented pairs. Surveyors provided a detailed assessment of how much of each block they surveyed adequately. In some instances, this was well under 100%, due to lack of access to private property or physiographic barriers.

We estimated number of breeding pairs of burrowing owls in each subregion and region. We calculated minimum number of breeding pairs on each randomly selected block that we surveyed as the quotient of number of pairs counted divided by area of the block that was surveyed adequately. We then averaged minimum densities of populations across randomly selected blocks surveyed in each subregion. Estimates were reported with standard errors

For each subregion and region we also totaled minimum number of pairs counted, as the sum of all pairs on randomly selected blocks, all pairs on historic breeding blocks, and, in a few instances, pairs that were detected incidentally on blocks that were not officially surveyed. Because this method included data from blocks that were not randomly selected, we did not use them to extrapolate an estimate of size of population for the entire subregion or region, but rather to establish a minimum number of pairs in the subregion or region, i.e., the number of pairs actually counted.

For each subregion, we considered our best estimate of the number of pairs to be the larger of the extrapolated estimate of number of pairs, based only on results from randomly selected blocks, or the actual number of pairs counted, pooling data from randomly selected blocks and historic breeding blocks. We then summed the best estimate for each subregion to obtain best estimates of number of pairs in each region. In regions and subregions where the best estimate reflected actual number of pairs counted, or when estimated number of pairs was zero, we were unable to provide standard errors of the estimates.

RESULTS—We surveyed 38 blocks in the northern Mojave Desert-eastern Sierra Nevada region; 36 randomly selected blocks and 2 historic breeding blocks. Surveys of both random and historic breeding blocks failed to yield any burrowing owls. However, we detected one pair incidentally while traveling across an otherwise unsurveyed block ca. 5 km east of where boundaries of Kern, Inyo, and San Bernardino counties converge. Because no burrowing owl was detected in randomly selected or historic breeding blocks in this region, our random-sample-based estimates of size of populations for both lowland and upland subregions was zero. However, one pair was detected incidentally on a lowland block, so our best estimate for the lowland subregion (Table 1) is the minimum number of pairs we counted, i.e., one pair. Our best estimate for the upland subregion is zero pairs and our best estimate for number of pairs in the entire northern Mojave Desert-eastern Sierra Nevada region also was the minimum number of pairs we counted, i.e., one pair.

We surveyed 67 blocks in the western Mojave Desert region; 48 randomly selected blocks and 19 historic breeding blocks. Surveys of random blocks yielded 25 pairs and surveys of historic breeding blocks yielded 79 pairs, for a total of 94 pairs of burrowing owls detected in the region. In the 42 randomly selected, lowland blocks we surveyed, we detected 25 pairs, yielding a random-sample-based estimate of 560 ± 268 pairs throughout the lowland subregion (Table 1). This estimate was greater than the total number of pairs detected in the lowland subregion (25 pairs on randomly selected blocks plus 79 pairs on historic breeding blocks), so it serves as our best estimate for pairs in the lowland subregion. No burrowing owl was detected on randomly selected upland blocks in the region, so our best estimate for the upland subregion was zero pairs, and our estimate for the entire western Mojave Desert region was 560 ± 268 pairs. However, pairs we detected were clustered mostly in Antelope, Apple, and Lucerne valleys, where agriculture and residential areas generally were more concentrated than elsewhere in the region. Although we also detected a few pairs northward as far as Ridgecrest and eastward to Barstow, extrapolating results from these three valleys across the region as a whole may have overestimated the number of pairs in the region. Conversely, because we did not survey all blocks within the three valleys where we detected numerous pairs, and because we did detect numerous pairs on random blocks elsewhere in the region, our minimum count of 94 pairs in the region is an underestimate of the actual size of population. Actual number of pairs may be between our extrapolated best estimate of 560 pairs and the minimum count of 94 pairs.

We surveyed 45 blocks in the eastern Mojave Desert region; 43 randomly selected blocks and two historic breeding blocks. Surveys of random blocks yielded one pair of burrowing owls in the southeastern portion of the region, while surveys of historic breeding blocks yielded none, for a total of one pair detected in the region. In the 41 randomly selected lowland blocks, we located one pair of burrowing owls, yielding a random-sample-based estimate of 32 ± 32 pairs throughout the lowland subregion. Because we detected no pair on the two lowland-historic-breeding blocks, our best estimate for the lowland subregion was 32 ± 32 pairs. None was detected on the six randomly selected upland blocks in the region and there was no upland-historic-breeding block to survey, so our best estimate for the upland subregion was zero pairs. Our

TABLE 1—Number of blocks surveyed, number of pairs of western burrowing owls (*Athene cunicularia hypugaea*) detected, and estimates of size of populations in desert regions of southeastern California, 2006–2007.

		Random and historic breeding blocks			Random blocks only					
Region	Total area of region (km^2)	Number of blocks surveyed	Km^2 surveyed (percentage of region)	Number of pairs detected	Number of blocks surveyed	Km^2 surveyed (percentage of region)	Number of pairs detected	Mean number of pairs per block (*SE*)	Estimated number of pairs (*SE*)	Best estimate of number of pairs (*SE*)
Northern Mojave Desert-eastern Sierra Nevada										
Lowland	17,731	28	432 (2.4)	1	28	431 (2.4)	0	0.00	0	1
Upland	7,826	10	153 (2.0)	0	8	103 (1.3)	0	0.00	0	0
All	25,557	38	585 (2.2)	1	36	534 (2.1)	0	0.00	0	1
Western Mojave Desert										
Lowland	23,525	61	1,362 (5.8)	94	42	902 (3.8)	25	0.60 (0.29)	560 (268)	560 (268)
Upland	1,725	6	128 (7.4)	0	6	128 (7.4)	0	0.00	0	0
All	25,250	67	1,490 (5.9)	94	48	1,030 (4.1)	25		560 (268)	560 (268)
Eastern Mojave Desert										
Lowland	31,767	42	825 (2.6)	1	40	775 (2.4)	1	0.03 (0.03)	32 (32)	32 (32)
Upland	2,037	3	55 (2.7)	0	3	55 (2.7)	0	0.00	0	0
All	33,804	45	880 (2.6)	1	43	830 (2.5)	1		32 (32)	32 (32)
Sonoran Desert										
All	18,470	47	751 (4.1)	179	31	413 (2.2)	18	0.58 (0.58)	429 (429)	179

estimate for number of pairs in the entire eastern Mojave Desert region was 32 ± 32 pairs.

We surveyed 47 blocks in the Sonoran Desert region; 31 randomly selected blocks and 16 historic breeding blocks. We considered the entire region to be lowland. Surveys of random blocks yielded 18 pairs of burrowing owls, all in one block in Palo Verde Valley, while surveys of historic breeding blocks yielded 161 pairs (distributed across 14 contiguous blocks in Palo Verde Valley), for a total of 179 pairs detected in the region. In the 31 randomly selected lowland blocks, we detected 18 pairs of burrowing owls, yielding a random-sample-based estimate of 429 ± 429 pairs throughout the Sonoran Desert region. However, we do not trust this estimate, because the entire count of pairs was within Palo Verde Valley. Because we fully surveyed all blocks that encompassed Palo Verde Valley (one was randomly selected and the others were historic breeding blocks), we considered our best estimate of the number of pairs in the Sonoran Desert region to be our minimum count of pairs in Palo Verde Valley, i.e., 179 pairs.

DISCUSSION—Our survey of southeastern California represents the first systematic survey to assess size of populations of burrowing owls across this portion of the state. Burrowing owls were distributed heterogeneously within the study area. We detected few or none in the northern Mojave Desert-eastern Sierra Nevada region, the eastern Mojave Desert region, and the Sonoran Desert region (excluding Palo Verde Valley). However, we detected larger aggregations of burrowing owls in the western Mojave Desert region, and in one small area of the Sonoran Desert region, i.e., Palo Verde Valley.

Our count of 179 pairs in Palo Verde Valley largely corroborated anecdotal knowledge about the area (Gervais et al., 2008). In the valley, burrowing owls comprised a substantial aggregation in an area that was contained in 15 contiguous blocks. As in Imperial Valley (DeSante et al., 2004; Rosenberg and Haley, 2004), a large population of burrowing owls nest along the banks of earthen and concrete irrigation canals and other water-conveyance structures in Palo Verde Valley.

Perhaps, the most striking result of our survey was the large number of pairs that were occupying the western Mojave Desert region. Our best estimate for number of pairs in the region is comparable to number of pairs estimated to occur in the Middle Central Valley region by DeSante et al. (2007), and is exceeded in numerical importance with respect to the statewide population only by Imperial Valley and Southern Central Valley regions (DeSante et al., 2007).

Our survey method likely contained sources of error. As DeSante et al. (2007) pointed out, the inability of observers to reliably detect all burrowing owls in surveyed areas (Conway and Simon, 2003; Conway et al., 2008), particularly in desert areas with limited access, may have biased our counts toward low estimates. Perhaps, even more problematic than relatively low probability of detection, there was the possibility that detection during our study may have varied substantially across blocks and regions. Factors such as number of access roads and physiographic characteristics could have affected the proportion of pairs in a given area that we were able to detect. An additional complication is that surveyors were unable to gain access to some military installations to conduct surveys.

Even with potential sources of error, our results indicated a high level of spatial heterogeneity in populations throughout southeastern California, particularly in the western Mojave and Sonoran desert regions. This spatial heterogeneity, combined with logistical constraints that required us to sample such a vast area, suggests that both our minimum counts and our estimates of size of populations with their large standard errors should be interpreted cautiously. Nevertheless, we believe that the broad patterns in distribution and abundance that we report are meaningful for guiding conservation planning efforts and that documenting exact locations of 275 pairs of burrowing owls will provide a useful baseline for assessing future changes.

High spatial variability, especially combined with low sampling efficiency, makes precise estimates of size of populations difficult, but it may also present opportunities for conservation. If most burrowing owls in southeastern California are concentrated in a small number of relatively restricted areas, then monitoring and safeguarding them should be easier than it would be otherwise. Occupied areas can be prioritized for conservation efforts.

Although our study was not designed specifically to identify or test conservation actions, our results have some implications for conserving burrowing owls. In Palo Verde Valley, like the much larger population in Imperial Valley, burrowing owls are highly dependent on banks of irrigation canals and other water-conveyance structures for nesting. The most important actions for safeguarding the population in Palo Verde Valley would center on maintaining the existing character of these human-made structures so that they retain their attractiveness for nesting, and managing roads and canals to minimize destruction of burrows, particularly during the breeding season. In Imperial Valley, activities associated with maintenance of roads inadvertently destroyed nests, causing direct mortality of nestlings and adults, and possibly spurring dispersal of surviving adults (Caitlin and Rosenberg, 2006).

Unlike burrowing owls in Palo Verde Valley, those we detected in the western Mojave Desert generally were not associated with water-conveyance structures, which are less common in the region. Rather, breeding sites in the western Mojave Desert that we located were concentrated in or along edges of scrublands (creosotebush *Larrea tridentata*, saltbush *Atriplex*, and desert scrub), on the periphery of urban areas, and in active or fallow agricultural fields. Conservation measures for populations in the western Mojave Desert should be focused more on maintaining and enhancing quality of desert-grassland areas and reducing introduced sources of mortality on the periphery of residential and agricultural areas. Our results demonstrate that desert regions of southeastern California comprise a significant portion of the statewide population of burrowing owls.

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ATTACHMENT B

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August 1, 2014

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Subject: Comments on the Blythe Mesa Solar Project, Blythe, California

Dear Ms. Quinn:

We have reviewed the June 2014 Draft Environmental Impact Report/Environmental Assessment (DEIR/EA) for the Blythe Mesa Solar Project (Project) which would generate 485 megawatts of electricity from photovoltaic panels installed on 3,587 acres. The Project, described as Alternative 1 in the DEIR/EA, also includes:

- An 8.4-mile generation interconnection (gen-tie) line along a 73-acre corridor;
- Interior collection power lines;
- Up to three on-site substations (each approximately 90,000 square feet);
- Up to two operation and maintenance (O&M) buildings (approximately 3,500 square feet each);
- Associated communication facilities and site infrastructure; and
- Two primary off-site access roads and several interior access roads.

Our comments address inadequacies in the analysis of impacts from Hazardous Waste, Hydrology and Water Quality, and Air Quality. The DEIR/EA fails to include a thorough analysis of potential hazards that would result from disturbance of soils within the 5.6 square-mile area of the Project site and the associated gen-tie line. The DEIR/EA also fails to properly assess risks that would result from emissions of toxic air contaminants and criteria air pollutants during construction. Preparation of a revised DEIR/EA is necessary to analyze these impacts and to mitigate them as necessary.

Hazards and Hazardous Waste

No Phase I ESA was Prepared for the Project Area

The DEIR/EA states (p. 4-204):

> Potential existing hazards were assessed based on information contained in the Phase I DataMap Area Study prepared for the parcels comprising the Project area.

This statement is misleading. The DEIR/EA does not include a Phase I Environmental Site Assessment (ESA) for the Project Site. The DEIR/EA includes only an Environmental Data Resources, Inc. (EDR) "Data Map Area Study," attached as Appendix F. The EDR Data Map Area Study is a computerized records search of hazardous waste sites in and around the Project area (excluding the gen-tie line corridor).

In no way does the EDR Data Map Area Study constitute a Phase I ESA which is routinely conducted to support the analysis of project impacts in the Hazards and Hazardous Waste analysis in Environmental Impact Reports prepared pursuant to CEQA. The EDR Data Map Area Study clearly states that that the report cannot be relied upon for a determination of risk by including this disclaimer (Appendix F, p. 4):

> Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property.

Developers prepare Phase I ESAs for inclusion with CEQA documents to identify hazardous waste issues that may pose a risk to the public, workers, or the environment and which may require further investigation, including environmental sampling and cleanup. For example, Phase I ESAs were completed for all three adjacent large-scale solar projects, including the McCoy project (2011), the Rio Mesa project (2011) and the Blythe Solar Power project (2009).

By failing to conduct a Phase I ESA for the Project site, including the gen-tie line, the DEIR/EA ignores a process that is routinely followed under CEQA proceedings to determine impacts from hazards and hazardous waste. Without a Phase I ESA, conclusions reached in the DEIR/EA about risks from environmental conditions are unreliable. A revised DEIR/EA should be prepared to include an analysis of hazardous conditions that may exist at the Project site made on the basis of a Phase I ESA and a Phase II ESA, if necessary, which includes the collection and analysis of soil and water samples.

The Phase I for the revised DEIR/EA should be conducted according to industry practices. Protocol for performing a Phase I ESA have been established by the US EPA and the American Society for Testing and Materials Standards (ASTM)[1] and include the following steps, in addition to the computerized mapping conducted for the Project site in the EDR Data Map Area Study:

[1] http://www.astm.org/Standards/E1527.htm

- an inspection;
- interviews with people knowledgeable about the property; and
- recommendations for further actions to address potential hazards.

Phase I ESAs conclude with the identification of any “recognized environmental conditions” (RECs) and recommendations to address such conditions. A REC is the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property.[2] If RECs are identified, then a Phase II ESA is generally conducted, to include the collection of soil, soil vapor and groundwater samples to identify the extent of any contamination and the need for cleanup to reduce exposure potential to the public. Results of sampling that is conducted under the Phase II ESA should be included in the revised DEIR/EA along with an analysis that compares sample results to Soil sampling to regulatory human health screening levels (such as Environmental Screening Levels and California Human Health Screening Levels) and discussed in a revised DEIR/EA. If concentrations exceed screening levels, mitigation methods to minimize exposure to construction workers and nearby residents must be implemented, including mandatory issuance of respirators, onsite dust monitoring, and fenceline dust monitoring.

The failure to conduct a Phase I ESA for the Project disregards an environmental due-diligence process that is routine for CEQA and NEPA documentation. A revised DEIR/EA should be prepared to properly disclose hazards and hazardous materials conditions on the basis of a Phase I ESA for the entire 3,587 acre Project site, to include a 73-acre corridor of the 8.4-mile gen-tie line that extends beyond the solar array boundary. If the Phase I ESA identifies any recognized environmental conditions, a Phase II ESA to include the collection and analysis of samples for chemical analysis should be conducted. If hazardous conditions are found, all appropriate mitigation measures should be identified to prevent the exposure of workers and neighbors to conditions that would present health risks during construction and operation of the Project.

Hazards Pose Potential Risks to Workers and Neighboring Residents

The DEIR/EA fails to identify two important and very real potential hazards: (1) residual pesticides that may remain in soil from extensive agricultural operations in the Project area; and (2) ordinance and munitions that may be present from operations conducted at what was the Blythe Army Airfield (now Blythe Airport) during World War II. No mitigation is identified in the DEIR/EA that would address these potential hazards.

Residual Pesticides

Project site soils may contain residual pesticides, including DDT, from the application of pesticides used in agricultural production. The DEIR/EA states (p. 3-21):

[2] Ibid.

> The predominant crop on Palo Verde Mesa is citrus (refer to the Biological Resources Technical Report in Appendix C1). Approximately 24 percent of the solar facility site was previously disturbed by agricultural or military activities.

Farming in the area of the project was initiated in the 1970s, and 1,319 acres of Project land has been previously irrigated (p. 3-21). Use of the land for agriculture in the 1970s indicates a potential for organochlorine pesticides to have been used within Project boundaries. Organochlorine pesticides, such as DDT, DDE, and chlordane, were used in the US from the 1940s[3] until they were banned in the 1970s. The presence of DDT in soils as a result of pesticide application in the area of the Project is indicated by the listing of the Palo Verde Outfall Drain, located 18 miles south, as impaired by DDT under Section 303(d) of the Clean Water Act (p. 3-130).

The U.S. EPA has determined DDT and DDE, a breakdown product, to be probable human carcinogens.[4] DDT is also known to affect the nervous system.[5] Exposure to DDT can result in headaches, nausea, and convulsions[6] as well as damage to the liver and nervous and reproductive system impairments.[7] Chlordane has also been classified as a probable human carcinogen by the U.S. EPA and exposure can result in neurological effects such as headaches, irritability, dizziness, and nausea.[8]

Despite being banned for about 40 years, organochlorine pesticides can persist in soil for hundreds of years.[9] The Department of Toxic Substances Control (DTSC) states:

> DDT is ubiquitous to California soil due to heavy agricultural usage prior to cancellation in 1972. Therefore, agricultural land which is currently being developed or considered for new uses … frequently contains DDT.[10]

The only description of pesticide use and the potential for residual pesticide contamination to exist in Project site soils is as follows (DEIR/EA, p. 4-206):

> Portions of the proposed Project area are in agricultural production. As a result, there is a potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater. Should there be chemically impacted soils (i.e., fuels, pesticides, herbicides) be present *[sic]* in the Project area, the risk of exposure to human health is not believed to be a significant concern (refer to Environmental Data Resources, Inc. [EDR] report in Appendix F of this Draft EIR/EA). The construction of the proposed Project would

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[3] U.S. EPA, DDT – A Brief History and Status. http://www.epa.gov/pesticides/factsheets/chemicals/ddt-brief-history-status.htm

[4] *See* U.S. EPA, DDT. http://www.epa.gov/pbt/pubs/ddt.htm; and U.S. EPA, DDE. http://www.epa.gov/ttnatw01/hlthef/dde.html

[5] ToxFAQs, *DDT, DDE, DDD*, http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=80&tid=20

[6] U.S. EPA, DDE. http://www.epa.gov/ttnatw01/hlthef/dde.html

[7] U.S. EPA, DDT. http://www.epa.gov/pbt/pubs/ddt.htm

[8] U.S. EPA, Chlordane. http://www.epa.gov/ttnatw01/hlthef/chlordan.html

[9] *Ibid.*, p. 3

[10] Office of the Science Advisor, DDT in Soil: Guidance for the Assessment of Health Risks to Humans. http://www.dtsc.ca.gov/AssessingRisk/upload/chap8.pdf, p. 11

> require minimal grading for the foundations of the substations and O&M buildings; therefore, it is anticipated that workers' exposure to impacted soils would be at low-level concentrations.

This description of the potential for residual "low-level concentrations" of pesticides in soil is wholly inadequate and misleading. It is inadequate because: (1) there is no analysis of actual pesticide use for agricultural lands within the Project boundary – concentrations of pesticides in soil may be in fact quite high; (2) there has been no sampling to indicate if soils are "chemically impacted" and therefore, there is no way to know when and where those soils may be contacted by construction crews and risks that would result from dermal contact or inhalation; and (3) risks to human health are dismissed as "not believed to be a significant concern" without any analysis. On the last point, the DEIR/EA is particularly misleading because of the reference to the EDR Data Map Area Study which includes no analysis of "risk of exposure to human health" as claimed. The misguided attempt by the DEIR/EA to point to the EDR Data Map Area Study as informative on health risk only proves the point that a Phase I ESA is necessary, as made above, to determine if any environmental conditions exist that may need further investigation.

The DEIR/EA also fails to recognize a City of Blythe policy that requires a Phase I ESA, and a follow-up Phase II ESA if necessary, on lands formerly used for agricultural operations. The City's General Plan 2025 states:

> Results have indicated that near surface soils often contain trace residue of pesticides used on the fields from decades of agricultural use. The presence and concentration of near surface pesticides can only be accurately characterized by site-specific sampling, testing and assessment of exposure risk to future inhabitants. Two potential outcomes may occur based on the findings: 1) no further action recommended with respect to potential residual pesticides in near surface soils; or, 2) additional action through further testing and mitigation may be required. As a result it has become the City's policy to require a Phase I ESA for any land development project in the City on land that has historically been used in agricultural or industrial operations and follow up Phase II Assessments when the Phase 1 ESA indicates the possibility of historic hazardous material usage at the site of a proposed project. The goal of this policy is to insure that potential public health and safety issues are addressed and mitigated.[11]

This policy would apply to the 14 parcels of land for the solar array that are located within the City of Blythe (p. 1-3).

Construction workers involved in grubbing, pile installation, trenching and grading, activities all envisioned in the DEIR/EA (p. 2-12), would be subject to health risks from pesticide-contaminated soils, if present. People in adjacent residences, one as close as 260 feet and nine within 1,000 feet, would also be potentially at risk. The Mesa Verde Park is also nearby -- within 2,200 feet of the Project (p. 3-38). Preventing human exposure under these two scenarios is precisely why the City of Blythe policy was crafted; however, the DEIR/EA was apparently prepared without any knowledge of the policy because it was not mentioned. Fugitive dust control measures, to comply with Mojave Desert Air Quality

[11] http://ca-blythe.civicplus.com/documents/13/32/34/3_9%20Public%20Safety%20and%20Hazards(Jan_07).pdf

Management District (MDAQMD) Rule 403, are identified in the DIER but these measures may not be effective for the protection of human health from contaminants which may be found in soil and sorbed to dust particles. Therefore, the dust control measures cannot be considered adequate mitigation.

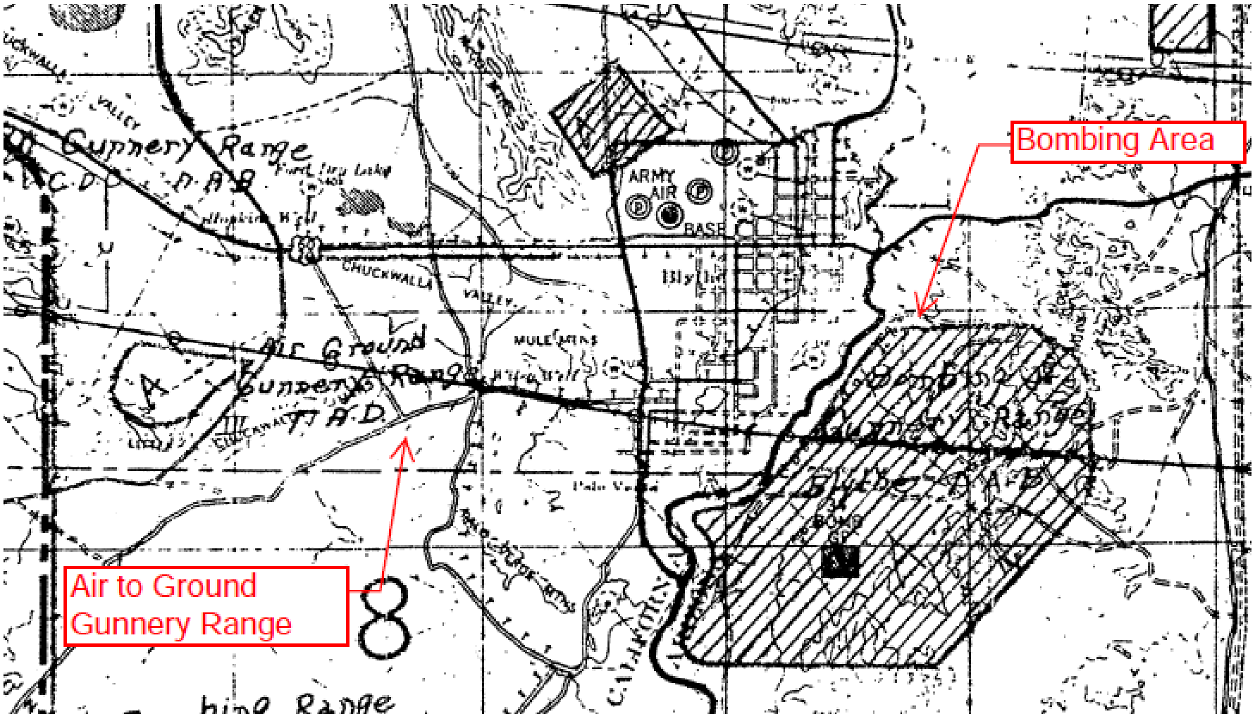
Consistent with policy in the Blythe General Plan, a revised DEIR/EA should be prepared, to include a Phase I ESA, which evaluates the potential for pesticides to be found at the Project site. Any indication of the presence of potentially hazardous conditions to construction workers or to nearby residents during construction should be evaluated in a Phase II Environmental Site Assessment, which include soil sampling. If pesticides are identified as a concern, the soil sampling should be undertaken at Project site in accordance with California Department of Toxics Substances Control (DTSC) guidelines for sampling former agricultural lands.[12] Sampling results should be compared to California regulatory human health screening levels, to determine potential risks to public health. If results exceed screening levels, appropriate mitigation to protect worker health and the health of nearby residents should be identified in a revised DEIR/EA to reduce the potential for dermal contact with contaminated soils and dust inhalation, including respiratory protection and protective equipment (including gloves and protective suits).

Former Military Activities

The Project is located adjacent to the Blythe Airport which was formerly known as the Blythe Army Airfield. The Blythe Army Airfield (BAAF) is categorized as a Formerly Used Defense Site (FUDs) and was used during World War II from 1942 to 1944 for pilot and crew training for the Second Air Force heavy bombardment crew. In 1943, the base housed 7,500 personnel, 75 heavy bombers, and utilized 650 buildings.[13] Because a Phase I was not conducted, hazards from the activities at BAAF were not identified in the DEIR/EA. The computer-generated EDR Data Map Area Study also failed to identify BAAF as a FUDs site adjacent to the Project site.

A practice bombing range associated with BAAF underlies an area adjacent to the Project. A World War II-vintage map identifies a “Firing and Bombing Area” just east of the of the Project boundary (Attachment 1). Although mapped to be outside the Project area, errant bombs dropped by inexperienced trainees may be present within Project boundaries. Additionally, an “Air to Ground Gunnery Range” generally underlies an area that is proposed for a 73-acre portion of the 4.8 mile gen-tie line corridor that extends west of the solar arrays.

[12] http://www.dtsc.ca.gov/Schools/upload/Ag-Guidance-Rev-3-August-7-2008-2.pdf
[13] http://deserttrainingcenter.com/Blythe%20Army%20Airfield.htm



The DEIR/EA fails to identify activities at BAAF as potentially posing a risk to construction crews who may come in contact with unexploded ordnance (UXO) and munitions and explosives of concern (MEC) related to the practice bombs and the ordnance used at the air to ground gunnery range. Records about specific practice bombing activities and gunnery training in these areas are not available, but use of explosives and other chemicals in the practice bombs may pose chemical and explosion hazards to construction workers and future site personnel. Bullets, which may contain lead, and other munitions used in the air to ground gunnery range, including incendiary devices, may also pose a hazard to construction crews who may disturb soil in that area when installing the gen-tie line.

The only discussion of the BAAF is in the context of cultural resources (Section 3.2.5) which does include this note:

> A portion of the BAAB [Blythe Army Airbase] (approx. 383 acres) extends into the Project APE [Area of Potential Effects], including one standing utility building; remains of demolished warehouses, barracks, and hospital; other infrastructure (fire hydrants, manholes); and three clusters of refuse.

No discussion of hazards that may exist from activities at BAAF is included in the DEIR/EA. Potential contaminants associated with that part of the BAAF that is within the Project APE, as identified above, should also be evaluated in Phase I ESA to be included in a DEIR/EA. The need for a Phase I to evaluate UXO and related concerns is demonstrated by the fact that a REC was identified for UXO at a solar project to the west of the Project. A Phase I conducted for the Rice Solar Project identified UXO used in conjunction with the Rice Army Airfield to be a REC.[14] Further evaluation of the UXO was recommended.

To ensure the safety of construction workers and site personnel involved in the operation of the Project, an evaluation of military operations should be conducted in a Phase I ESA along with any necessary soil sampling in a Phase II ESA. A UXO survey should also be conducted by trained personnel and included in a revised DEIR/EA. The need to conduct such investigations was demonstrated at the neighboring Blythe Solar Power Project (BSPP), located just west of Blythe. During construction of the BSPP, seven UXO-related findings were reported to the California Energy Commission.[15]

Other Potential Hazards

The DEIR/EA fails to identify other potential hazards across the vast area of the Project site that are typically associated with large scale desert solar projects, including waste dumps, debris piles, burn pits, abandoned buildings, spills, storage tanks, drums, and illegal drug labs. These types of features, if unregulated, will not show up on a computer generated EDR Data Map Area Study and are best identified through a thorough field inspection. A field inspection is a required component of a Phase I ESA but as noted, a Phase I ESA has not been conducted for the Project.

A revised DEIR/EA should be prepared to include a field inspection, per standard practice under a Phase I ESA, to identify hazardous conditions. The field inspection should take into account the large area of the Project and plan for adequate time in the field for reconnaissance.

Valley Fever Potential was Inadequately Evaluated and Mitigated

The DEIR/EA includes only a very brief analysis of Valley Fever, and fails to provide for effective mitigation to prevent a potential increase of contracting Valley Fever from Project Construction. Also known by the scientific name coccidioidomycosis, Valley Fever is an infectious disease caused by inhaling the spores of a soil-dwelling fungus. According to the County of Riverside Department of Public Health, Valley Fever is known to occur in the eastern part of the county[16] and the area near Blythe has been mapped as endemic for Valley Fever.

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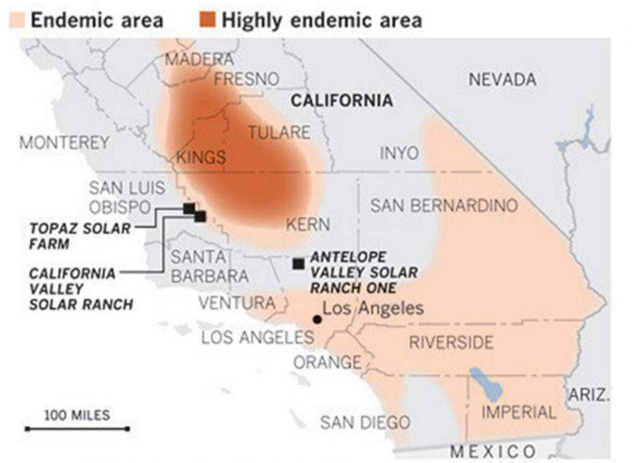
[14] http://www.energy.ca.gov/sitingcases/ricesolar/documents/applicant/afc/Volume_2/RSEP_Appendix_5.14A_URS%20Ph%201%20ESA.pdf

[15] Hagemann comments on the McCoy Solar Energy Project, August 22, 2012, p. 9.

[16] http://www.rivcohealthdata.org/home/images/DOWNLOADS/PUBLICATIONS/MONTHLY_BULLETIN/2012/2012-08%20%7C%20Impact%20of%20Valley%20Fever%20in%20Riverside%20County,%202006-2010.pdf



Sources: California Dept. of Public Health, California Correctional Health Care Services. Graphics reporting by JULIE SHEER

A revised DEIR/EA should be prepared to evaluate the potential for an increased incidence of Valley Fever to result from Project construction, operation and decommissioning. The DEIR/EA should also evaluate mitigation measures specific to reducing the occurrence of Valley Fever in workers and the public.

Valley Fever is caused by inhaling the spores of a soil-dwelling fungus, *Coccidioides immitis.*[17] The spores become airborne when infected soils are disturbed during construction activities, agricultural operations, dust storms, or during earthquakes. On October 19, 2012, an article was published explaining that between 1990 and 2008, more than 3,000 people died in the United States from Valley Fever with about half in California.[18] In recent years, reported Valley Fever cases in southwestern US states have increased dramatically.[19]

No known cure exists for the disease and there is no vaccine.[20] Common symptoms of Valley Fever include fatigue, fever, cough, headaches, breathing difficulties, rash, muscle aches, and joint pain. Advanced symptoms are marked by chronic pneumonia, meningitis, skin lesions and bone or joint infections. Pneumonia stemming from Valley Fever becomes evident 13 weeks after infection.[21]

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17 http://www.cdc.gov/fungal/diseases/coccidioidomycosis/definition.html

18 Jennifer Y. Huang, Benjamin Bristow, Shira Shafir, and Frank Sorvillo, Coccidioidomycosis-associated Deaths, United States, 1990–2008; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3559166/

19 Center for Disease Control; Fungal Pneumonia: A Silent Epidemic, Coccidioidomycosis (Valley Fever); http://www.cdc.gov/fungal/pdf/cocci-fact-sheet-sw-us-508c.pdf

20 http://www.cdc.gov/fungal/diseases/coccidioidomycosis/risk-prevention.html.

21 *See, e.g.*, Lisa Valdivia, David Nix, Mark Wright, Elizabeth Lindberg, Timothy Fagan, Donald Lieberman, Prien Stoffer, Neil M. Ampel, and John N. Galgiani, Coccidioidomycosis as a Common Cause of Community-acquired Pneumonia, Emerging Infectious Diseases, v. 12, no. 6, June 2006; http://europepmc.org/articles/PMC3373055.

Project construction, operation and decommissioning will generate dust which is one of the primary routes of exposure for contracting Valley Fever.[22] The nearest sensitive receptor, is located 260 feet from the project site (p. 3 – 38). One of the most at-risk populations include construction workers[23]. A scientific article on occupational exposures to Valley Fever notes that "[l]abor groups where occupation involves close contact with the soil are at greater risk, especially if the work involves dusty digging operations."[24] One study reported that at study sites, "generally 50% of the individuals who were exposed to the dust or were excavating dirt at the sites were infected."[25]

The disease is debilitating and prevents those who have contracted Valley Fever from working.[26] The longest period of disability from occupational exposure in California is to construction workers, with 62% of the reported cases resulting in over 60 days of lost work.[27] Another study estimated the average hospital stay for each (non-construction work) case of coccidioidomycosis at 35 days.[28]

The potentially exposed population is much larger than construction workers on or adjacent to the Project site because dust generated during Project construction will carry the very small spores – 0.002-0.005 millimeters in diameter – into other areas, potentially exposing large non-Project-related populations.[29,30]

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[22] Rafael Laniado-Laborin, Expanding Understanding of Epidemiology of Coccidioidomycosis in the Western Hemisphere, Ann. N.Y. Acad. Sci., v. 111, 2007, pp. 20-22; Frederick S. Fisher, Mark W. Bultman, Suzanne M. Johnson, Demosthenes Pappagianis, and Erik Zaborsky, Coccidioides Niches and Habitat Parameters in the Southwestern United States, a Matter of Scale, Ann. N.Y. Acad. Sci., No. 1111, 2007, pp. 47-72 ("All of the examined soil locations are noteworthy as generally 50% of the individuals who were exposed to the dust or were excavating dirt at the sites were infected."); http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detail.

[23] Lawrence L. Schmelzer and R. Tabershaw, Exposure Factors in Occupational Coccidioidomycosis, Am. J. Public Health Nations Health, v. 58, no. 1, 1968, pp. 107-113, Table 3; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1

[24] *Ibid*, p. 110.

[25] Frederick S. Fisher, Mark W. Bultman, Suzanne M. Johnson, Demosthenes Pappagianis, and Erik Zaborsky, Coccidioides Niches and Habitat Parameters in the Southwestern United States, a Matter of Scale, Ann. N.Y. Acad. Sci., No. 1111, 2007, pp. 47-72; http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detail.

[26] Frank E. Swatek, Ecology of *Coccidioides Immitis*, Mycopathologia et Mycologia Applicata, V. 40, Nos. 1-2, pp. 3-12, 1970.

[27] Schmelzer and Tabershaw, 1968, Table 4 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1,

[28] Demosthenes Pappagianis and Hans Einstein, Tempest from Tehachapi Takes Toll or Coccidioides Conveyed Aloft and Afar, West J. Med., v. 129, Dec. 1978, pp. 527-530; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1238466/pdf/westjmed00256-0079.pdf.

[29] Schmelzer and Tabershaw, 1968, p. 110; Pappagianis and Einstein, 1978 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1,

[30] Pappagianis and Einstein, 1978, p. 527 ("The northern areas were not directly affected by the ground level windstorm that had struck Kern County but the dust was lifted to several thousand feet elevation and, borne on high currents, the soil and arthrospores along with some moisture were gently deposited on sidewalks and automobiles as "a mud storm" that vexed the residents of much of California." The storm originating in Kern

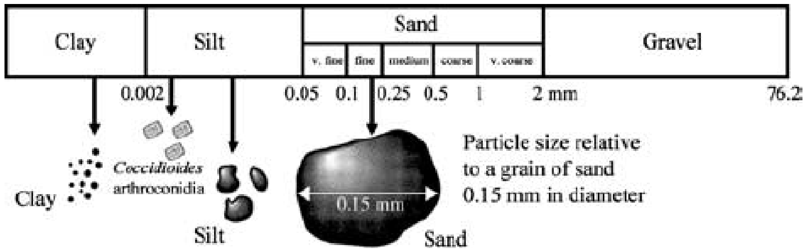

Figure 4: Size of cocci spores compared to soil particles (in mm)
(from: Fisher et al., 2007, Fig. 3)

Valley Fever spores have been documented to travel as much as 500 miles[31] and, thus, dust raised during construction could potentially expose a large number of people hundreds of miles away.

In the past few years, several incidences of severe dust storms and reported cases of Valley Fever occurred during construction of photovoltaic energy projects. The construction of the First Solar Antelope Valley Solar Ranch One in Kern County was halted in April 2013 due to the company's failure to bring the facility in compliance with ambient air quality standards.[32] Dust from the project, in general, has led to complaints of respiratory distress by local residents and a concern of Valley Fever, as well as increased reports of Dry Land Distemper in horses.[33]

At two photovoltaic solar energy projects in San Luis Obispo County, Topaz Solar Farm and California Valley Solar Ranch, 28 construction workers contracted Valley Fever.[34] One worker digging into the soil inhaled dust and subsequently became ill. A blood sample obtained from the worker confirmed Valley Fever.[35]

The current drought conditions in California, declared a State of Emergency by Governor Brown on January 17, 2013,[36] may increase the occurrence of Valley Fever cases[37]. During drought years, the

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County, for example, had major impacts in the San Francisco Bay Area and Sacramento) http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detail.

[31] David Filip and Sharon Filip, Valley Fever Epidemic, Golden Phoenix Books, 2008, p. 24.

[32] Herman K. Trabish, GreenTech Media, Construction Halted at First Solar's 230 MW Antelope Valley Site, April 22, 2013; http://www.greentechmedia.com/articles/read/Construction-Halted-At-First-Solars-230-MW-Antelope-Valley-Site.

[33] *Ibid.*

[34] Julie Cart, Los Angeles Times, 28 Solar Workers Sickened by Valley Fever in San Luis Obispo County May 01, 2013; available at http://articles.latimes.com/2013/may/01/local/la-me-ln-valley-fever-solar-sites-20130501.

[35] *Ibid*.

[36] State of California, Office of Governor Edmund G. Brown, Governor Brown Declares Drought State of Emergency, January 17, 2014; http://gov.ca.gov/news.php?id=18368 .

[37] Gosia Wozniacka, Associated Press, Fever Hits Thousands in Parched West Farm Region, May 5, 2013, citing Prof. John Galgiani, Director of the Valley Fever Center for Excellence at the University of Arizona; http://abcnews.go.com/m/story?id=19113795.

number of organisms competing with *Coccidioides ssp.* is thought to decrease while the fungus remains alive but dormant. When rain does occur, the spores germinate and multiply because of a decreased number of competing organisms.
Prison inmates may be disproportionately more vulnerable to Valley Fever. Valley Fever has been blamed for 62 deaths among California prison inmates statewide. Annually, 200 prisoners are hospitalized 5,000 days for treatment of Valley Fever conditions at an estimated care cost of about $23.4 million. African-American and Filipino inmates are particularly susceptible to Valley Fever, along with prisoners with weakened immune systems.[38] The Chuckawalla Valley State Prison and the Ironwood State Prison are located about 10 miles west of the western extent of the Project's solar array. Valley Fever spores, potentially disturbed by Project construction, may cause an increased incidence in the disease at the prisons, an impact not considered in the DEIR/EA.

Mitigation for Valley Fever is discussed only briefly in the DEIR/EA and the measures that are identified would not be effective in preventing the incidence of the disease. The DEIR/EA states (p. 4-215):

> A dust abatement plan as required by the MDAQMD would minimize the spread of fungal spores, thereby reducing potential for contracting Valley Fever during construction

The DEIR/EA proposes only standard dust mitigation measures which may be marginally effective in reducing the incidence of Project-related Valley Fever. The dust abatement plan required by MDAQMD Rule 403 does not consider suppression methods that would be effective for controlling and minimizing exposure to Valley Fever spores, which are considerably different from the measure considered in a dust abatement plan.

Conventional dust control measures that target PM10 and visible dust are not generally effective at controlling Valley Fever.[39] Valley Fever spores are 1 to 3 microns in diameter[40], and can be far smaller than particles of dust, which measure 2.5 to 100 microns in diameter. A particle 50 microns in diameter is considered to be the smallest particle visible to the eye. Therefore, because *Coccidioides ssp.* spores are generally smaller than dust, they have the potential to spread much farther in air than dust, without detection by human eyesight. The spores, whose size is well below what is detectable by human vision, may be present in air that appears clear and dust free.

Airborne spores with low settling rates can remain aloft for long periods and be carried hundreds of miles from their point of origin. Implementation of standard dust control measures will likely not provide sufficient protection for both site workers and the general public.

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[38] http://www.pe.com/articles/valley-676206-prisons-fever.html
[39] *See, e.g.*, Cummings and others, 2010, p. 509; Schneider et al., 1997, p. 908 ("Primary prevention strategies (*e.g.*, dust-control measures) for coccidioidomycosis in endemic areas have limited effectiveness.").
[40] http://www.engr.psu.edu/iec/abe/database/fCoccil.htm

Several agencies and scientific studies have developed precautions to protect workers and the public from Valley Fever. The California Departments of Public Health and Industrial Relations recommend the following measures to protect workers and the public:[41]

1. Determine if the worksite is in an area where Valley Fever is consistently present. Check with your local health department to determine whether cases have been known to occur in the proximity of your work area.
2. Train workers and supervisors on the location of Valley Fever endemic areas, how to recognize symptoms of illness … and ways to minimize exposure. Encourage workers to report respiratory symptoms that last more than a week to a crew leader, foreman, or supervisor.
3. Limit workers' exposure to outdoor dust in disease-endemic areas. For example, suspend work during heavy wind or dust storms and minimize amount of soil disturbed.
4. When soil will be disturbed by heavy equipment or vehicles, wet the soil before disturbing it and continuously wet it while digging to keep dust levels down.
5. Heavy equipment, trucks, and other vehicles generate heavy dust. Provide vehicles with enclosed, air-conditioned cabs and make sure workers keep the windows closed. Heavy equipment cabs should be equipped with high efficiency particulate air (HEPA) filters. Two-way radios can be used for communication so that the windows can remain closed but allow communication with other workers.
6. Consult the local Air Pollution Control District regarding effective measures to control dust during construction. Measures may include seeding and using soil binders or paving and laying building pads as soon as possible after grading.
7. When digging a trench or fire line or performing other soil-disturbing tasks, position workers upwind when possible.
8. Place overnight camps, especially sleeping quarters and dining halls, away from sources of dust such as roadways.
9. When exposure to dust is unavoidable, provide NIOSH-approved respiratory protection with particulate filters rated as N95, N99, N100, P100, or HEPA. Household materials such as washcloths, bandanas, and handkerchiefs do not protect workers from breathing in dust and spores.

   Respirators for employees must be used within a Cal/OSHA compliant respiratory protection program that covers all respirator wearers and includes medical clearance to wear a respirator, fit testing, training, and procedures for cleaning and maintaining respirators.

   Different classes of respirators provide different levels of protection according to their Assigned Protection Factor (see table below). Powered air-purifying respirators have a battery-powered

[41] California Department of Public Health and California Department of Industrial Relations, Hazard Evaluation System & Information Service, Preventing Work-Related Coccidioidomycosis (Valley Fever), June 2013; available at http://www.cdph.ca.gov/programs/hesis/Documents/CocciFact.pdf.

blower that pulls air in through filters to clean it before delivering it to the wearer's breathing zone. PAPRs will provide a high level of worker protection, with an APF of 25 or 1000 depending on the model. When PAPRs are not available, provide a well-fitted NIOSH-approved full-face or half-mask respirator with particulate filters.

Fit-tested half-mask or filtering facepiece respirators are expected to reduce exposure by 90% while still allowing about 10% faceseal leakage which can result in an unacceptable risk of infection when digging where Valley Fever spores are present.

Respiratory Protection for Reducing Dust and Spore Exposure

	Respirator Type (worn with particulate filters)	**Assigned Protection Factor (APF)**	**Expected Reduction of Exposure to Dust and Spores (%)**
	No respirator	None	0
Increasing Protection ↓	Half-mask respirator (elastomeric or filtering facepiece)	10	90
	Powered air-purifying respirator with loose-fitting face covering	25	96
	Full-face respirator	50	98
	Some powered air-purifying respirators are designed to offer higher protection (check with manufacturer)	1000	99.9

The Kern County Public Health Services Department recommends:[42]

1. Practice general prevention measures.
2. Determine if the work site is in a high risk Valley Fever area (contact the Kern County Public Health Services Department).
3. Obtain a health assessment prior to being exposed to Valley Fever.
4. Use non-susceptible workers.
5. Use machinery and vehicles with enclosed cabs and use air conditioning.
6. Use dust masks appropriate for the activity performed.
7. Remove dusty clothing and store in plastic bags until washed.

Two other studies have developed additional recommendations to minimize the incidence of Valley Fever. The U.S. Geological Survey (USGS) has developed recommendations to protect geological field workers in endemic areas.[43] An occupational study of Valley Fever in California workers also developed

[42] Kern County Public Health Services Department, What Is Valley Fever, Prevention; http://kerncountyvalleyfever.com/what-is-valley-fever/prevention/.

[43] Fisher et al. 2000. http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detai.

recommendations to protect those working and living in endemic areas.[44] These two sources identified the following measures, in addition to those identified by the County's Public Health Department, to minimize exposure to Valley Fever:

1. Pretest soils to determine if each work location is within an endemic area.
2. Implement a vigorous program of medical surveillance.
3. Implement aggressive enforcement of respiratory use where exposures from manual digging are involved.
4. Test all potential employees for previous infection to identify the immune population and assign immune workers to operations involving known heavy exposures.
5. Hire resident labor whenever available, particularly for heavy dust exposure work.
6. All workers in endemic areas should use dust masks to protect against inhalation of particles as small as 0.4 microns. Mustaches or beards may prevent a mask from making an airtight seal against the fact and thus should be discouraged.
7. Establish a medical program, including skin tests on all new employees, retesting of susceptible employees, prompt treatment of respiratory illness in susceptible employees; periodic medical examination or interview to discover a history of low grade or subclinical infection, including repeated skin testing of susceptible employees.

None of these measures, as recommended by county, state and federal agencies, were considered for the Project in the DEIR/EA. These measures are feasible to implement and would substantially reduce significant public health impacts. A revised DEIR/EA should be prepared to more thoroughly consider Valley Fever impacts from Project construction and to consider a full range of mitigation measures.

Hydrology and Water Quality

Construction may Further Impair Water Quality

The DEIR/EA states:

> Ground disturbance related to construction of the Project could potentially degrade water quality through the inadvertent release of residual pesticides from former agricultural lands (p. 4-232)

The release of residual pesticides from construction could further degrade water quality in the region of the Project. Within the Project region, one water body is listed as impaired on the Clean Water Act Section 303(d) list. The Palo Verde Outfall Drain and Lagoon are listed as impaired by DDT (p. 3-130). The US EPA has stated a Total Maximum Daily Load (TMDL) is needed to reduce loading of DDT to the Palo Verde Outfall Drain.[45] A TMDL limits the amount of contamination that would be discharged to an impaired water body.

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[44] Schmelzer and Tabershaw, 1968, pp. 111 – 113 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1,.

[45] http://iaspub.epa.gov/tmdl_waters10/attains_waterbody.control?p_list_id=CAR7154000019990205131951&p_cycle=&p_report_type=

Surface water flow from the Project area to the Palo Verde Outfall Drain is described in an appendix to the DEIR as follows:

> Precipitation in the form of sheet flow typically flows overland toward the edge of the Mesa. In areas used for agriculture, flow may be diverted by earthen berms or irrigation ditches. Sheet flow eventually reaches the edge of the Mesa and flows into the canal and drain system of the Palo Verde Valley south of 10th Street. This system eventually returns water to the Colorado River via the Outfall Drain, approximately 18 miles south of the Project. (Appendix C5, Review of Federal Waters, p. 7).

A revised DEIR/EA should recognize the need for a Palo Verde Drain DDT TMDL and the impact Project construction may have on the impaired water quality in the Drain and on the Colorado River, to which the Drain is tributary.

Mitigation specific to the reduction of potential DDT contributions to the Palo Verde Drain Watershed should be identified in a revised DEIR/EA. Best management practices identified in the DEIR/EA (p. 4-235) to “minimize impacts to water quality” (BMP-1, BMP-2, BMP-9, BMP-13, BMP-14, and BMP-15) are not specific to organochlorine pesticides and may not be effective in reducing the discharge of contaminants such as DDT. Mitigation measures to consider in a revised DEIR/EA may need to include a limitation or avoidance of ground disturbing activities in areas where DDT and other organochlorine pesticides were historically applied in in areas where sampling, as recommended under a Phase II ESA, would identify residual concentrations of pesticides.

Air Quality

The Project, according to our review, poses two potentially significant impacts to air quality: (1) generation of PM10 emissions during construction above the threshold; and (2) emissions of diesel particulate matter during construction would pose health risks to nearby residents. A revised DEIR should be prepared to address these impacts and to provide for mitigation as appropriate.

Scientific Resources Associated (SRA) prepared an Air Quality and Global Climate Change Technical Report (AQTR) to address air quality issues that are anticipated to arise from Project construction, operation, and decommissioning, which was provided as Appendix B to the DEIR/EA. We identified several methodological inaccuracies within the Report that inappropriately altered the determination of significance to below the applicable thresholds with regards to daily fugitive particulate matter (PM10) emissions and off-site residential exposure to diesel particulate matter (DPM) during Project construction. Our examination and reassessment of Project construction fugitive dust and DPM emissions concluded that the air quality impacts could exceed CEQA thresholds of significance and a revised DEIR is necessary to properly characterize environmental concerns associated with Project implementation.

Fugitive Dust

The climate of the Project's regional setting is highly conducive to generation of fugitive dust. As noted in the DEIR/EA, "the climate in the Blythe area is categorized as a high desert climate, with dry, hot summers and cool winters." The mean temperature for Blythe is 71.6°F, and the mean annual precipitation is 3.8 inches (p. 3-31). Desert climates are characterized by arid conditions and relatively low precipitation, and do not have tall vegetation to reduce the influence of winds on dust generation at surface level. These factors provide the most susceptible environment for dust to become airborne through ground disturbance and traffic activities associated with Project construction.

Table 7 on page 43 of the AQTR presents daily and annual estimates of criteria air pollutants ("CAPs") emissions associated with BMSP construction. Daily fugitive dust generation is estimated to be 41.82 pounds per day (lb/day), with the total PM emissions quantified at 50.47 lb/day including DPM. The AQTR concludes that there will be no significant air quality impact because this value is below the 82 lb/day Mojave Desert Air Quality Management District (MDAQMD) threshold for daily PM emissions. This assumption is unfounded based on an inaccurate application of control efficiency across all construction-related fugitive dust sources.

The 41.82 lb/day fugitive dust estimate hinges on a model that used an unprecedentedly high fugitive dust emission control efficiency estimate of 75% attributed solely to watering three times daily (Appendix B, AQTR, p. 41). SRA quantified emissions of fugitive dust associated with Project construction by universally applying the 75% control efficiency to all construction activity sites, access roads, and unpaved roads, as evidenced in Table A-11a of the AQTR. It is unclear how the daily estimate of 41.82 lb/day was derived in Table A-11a, considering that the total 41.82 lb/day of fugitive dust from all construction activity sites is not equal to the sum of daily emissions calculated for Access Roads, Grading, Excavation/Trenching, Material Unloading/Loading, and travel on Unpaved/Paved roads. A revised iteration of the AQTR should utilize CalEEMod to succinctly present the methodologies for estimating fugitive dust emissions.

The AQTR inappropriately asserted that the control efficiency could be applied to the entirety of the construction site for fugitive dust emission control. The 75% fugitive dust control efficiency estimate is taken from a 1999 document prepared by the Midwest Research Institute (MRI).[46] The 75% control efficiency value was estimated from a case study of a Clark County, NV Air Quality Implementation Plan for construction projects. In this case study, methodologies were used to estimate emissions from three types of emissions sources: construction activities, track-out, and wind erosion. Construction activities included grading, trenching, crushing, screening, on-site vehicle traffic, blasting, and demolition. The MRI report referenced a 1988 study, "Control of Open Fugitive Dust Sources," which documented that the default control efficiency for all three of these emission sources was 50%.[47] The 75% fugitive dust control efficiency specifically applied to the "track-out" emission source, referring to on-site vehicles toting dust off-site via paved roads. This specific activity represents only a small portion of the total fugitive dust emission sources at the BMSP construction site and should not be applied to all intended work.

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[46] Estimating Particulate Matter Emissions from Construction Operations, Final Report. Midwest Research Group. September 30, 1999. *nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100KK1W.TXT*
[47] *Ibid*, at 4-15.

The DEIR/EA identifies that preparation activities at the BMSP site will include "wrecking, excavation, grading, clearing of land, and solid waste disposal operations," as well as "scraping, backfilling, and compacting" prior to commencement of construction (p. 4-20). None of these activities were accounted for in the MRI-recommended control efficiency for vehicle track-out of fugitive dust. Based on our review, an estimate of fugitive dust control of 50% is a more appropriate for fugitive dust control for the Project construction site based on the evaluation provided in the MRI study.

The DEIR/EA and the AQTR estimated that approximately 41.82 pounds of fugitive PM10 would be generated each day during the construction period. This value reflects a 75% control efficiency based on the inappropriate assumptions discussed above. Applying the more reasonable site-wide estimate of 50% control efficiency, the daily anticipated fugitive emissions would double to 83.64 pounds per day, exceeding the MDAQMD threshold of 82 pounds/day would be exceeded.

A revised DEIR/EA should be prepared to provide for an estimate of air quality impacts from fugitive dust emissions that is based on a realistic estimate of dust control emissions. If the revised DEIR/EA confirms our findings, and shows an exceedance of MDAQMD the air quality threshold for PM10, mitigation should be identified that would reduce the impact to less than significant. A comprehensive Fugitive Dust Abatement Plan, as referenced in BMP-3, should be prepared for inclusion in the revised DEIR/EA to demonstrate how PM10 generation from construction activities can be mitigated to below the threshold.

Screening Health Risk Assessment for Diesel Particulate Matter

The AQTR failed to adequately address impacts to nearby sensitive receptors from DPM emissions associated with construction equipment and vehicle travel. The AQTR claims that a health risk assessment, prepared as a component of the report, provides a "worst case analysis of the potential for TAC impacts to sensitive receptors." (Appendix B, AQTR, p. 46) This statement is unfounded because the screening health risk assessment in the AQTR did not consider DPM exposures to children who inhabit nearby residences, and who are more susceptible to inhalation toxicity than adults. The Office of Environmental Health Hazard Assessment recommends the use of Age Sensitivity Factors (ASFs) to characterize the heightened susceptibility of children to air pollution in health risk assessments.[48] The guidance is implemented by multiplying the estimated carcinogenic exposure to air pollutants by ten for the first two years of life, and by three for the subsequent years until the age of sixteen. It is not evident that this methodology was utilized in the AQTR prepared by SRA for the BMSP.

We attempted to reconstruct the screening health risk assessment in accordance with the worst-case assumptions outlined by SRA. Alterations to the methodology were necessary based on improvements to the modeling software. The SCREEN3 model used by SRA was officially replaced by AERSCREEN in

[48] Technical Document for Exposure Assessment and Stochastic Analysis, FINAL, Chapter 11. Office of Environmental Health Hazard Assessment. August, 2012. http://oehha.ca.gov/air/hot_spots/tsd082712.html

2011, in accordance with EPA recommendations.[49] AERSCREEN is the screening level version of AERMOD, which has been federally promulgated as the preferred regulatory model since 2006 due to enhanced capabilities with regards to near field dispersion and simulated plume rise. In a revised AQTR, we suggest that SRA assess the off-site air quality impacts generated by BMSP construction using the most updated and applicable screening level dispersion model available.

Following the worse-case methodology set forth by SRA, we assumed that all DPM emissions would be released from within the BMSP construction site boundary and input the SRA emission rate of 0.32795 grams per second (g/s) over the course of the three year construction period into the AERSCREEN model. A volume source was selected based on the SRA modeling, as the shape of the BMSP construction site is geometrically complex. The AERSCREEN software outputs maximum single-hour concentrations of modeled air pollutants assuming worse-case scenario meteorology throughout one year. OEHHA guidance recommends that the single-hour concentration be multiplied by a scaling factor of 0.1 in AERSCREEN to represent an estimate of the maximum reasonable annualized concentration of the air pollutant.[50]

The DEIR identified that the nearest sensitive receptor - a residence - is approximately 260 feet (80 meters) from the project boundary. The maximum one-hour concentration predicted by AERSCREEN for a volume source with an average release height of three meters was 1.22 $\mu g/m^3$, which scales to an annualized concentration of 0.122 $\mu g/m^3$. Considering a three-year childhood exposure between the ages of one and four, we calculated an excess cancer risk during BMSP construction to be 17.1 in one million, as shown in the table below. Our evaluation demonstrates that when considering the worst-case exposure scenario, the potential exists for air quality impacts to exceed the applicable 10 in a million MDAQMD threshold. These results refute the cursory assessment prepared by SRA, and we recommend that the methodologies be revised in an updated iteration of the AQTR that more accurately addresses potential off-site air quality impacts from BMSP construction.

[49] Memorandum: AERSCREEN Released as the EPA Recommended Screening Model. United States Environmental Protection Agency Air Quality Modeling Group. April 11, 2011. http://www.epa.gov/ttn/scram/guidance/clarification/20110411_AERSCREEN_Release_Memo.pdf

[50] Technical Document for Exposure Assessment and Stochastic Analysis, FINAL, Chapter 2. Office of Environmental Health Hazard Assessment. August, 2012. http://oehha.ca.gov/air/hot_spots/tsd082712.html

Parameter	Description	Units	Child (1-2 yrs)	Child (2-4 yrs)
CPF	Cancer Potency Factor	1/(mg/kg-day)	1.1	1.1
Cair	Concentration	ug/m3	0.1222	0.122
DBR	Daily breathing rate	L/kg-day	581	581
EF	Exposure Frequency	days/year	350	350
ED	Exposure Duration	years	1	2
AT	Averaging Time	days	25550	25550
	Inhaled Dose		9.7E-07	1.9E-06
ASF	Age Sensitivity Factor	-	10	3
	Cancer Risk	**<u>1.71E-05</u>**	**1.07E-05**	**6.41E-06**

Sincerely,

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Geologic and Hydrogeologic Characterization
Industrial Stormwater Compliance
Investigation and Remediation Strategies
Litigation Support and Testifying Expert
CEQA Review

Education:

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.
B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

Professional Certification:

California Professional Geologist
California Certified Hydrogeologist
Qualified SSWPP Developer and Practitioner

Professional Experience:

Matt has 25 years of experience in environmental policy, assessment and remediation. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) while also working with permit holders to improve hydrogeologic characterization and water quality monitoring.

Matt has worked closely with U.S. EPA legal counsel and the technical staff of several states in the application and enforcement of RCRA, Safe Drinking Water Act and Clean Water Act regulations. Matt has trained the technical staff in the States of California, Hawaii, Nevada, Arizona and the Territory of Guam in the conduct of investigations, groundwater fundamentals, and sampling techniques.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – present;
- Senior Environmental Analyst, Komex H2O Science, Inc (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

<u>Senior Regulatory and Litigation Support Analyst:</u>

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of numerous environmental impact reports under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, greenhouse gas emissions and geologic hazards.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Stormwater analysis, sampling and best management practice evaluation at industrial facilities.
- Manager of a project to provide technical assistance to a comunity adjacent to a former Naval shipyard under a grant from the U.S. EPA.
- Technical assistance and litigation support for vapor intrusion concerns.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.
- Expert witness on two cases involving MTBE litigation.
- Expert witness and litigation support on the impact of air toxins and hazards at a school.
- Expert witness in litigation at a former plywood plant.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.
- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.

- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

Executive Director:

As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the dischrge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

Hydrogeology:

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

Policy:

Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

Geology:

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

Teaching:

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt currently teaches Physical Geology (lecture and lab) to students at Golden West College in Huntington Beach, California.

Invited Testimony, Reports, Papers and Presentations:

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

Hagemann, M.F., 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

Hagemann, M.F., 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

Hagemann, M.F., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

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<u>Other Experience:</u>

Selected as subject matter expert for the California Professional Geologist licensing examination, 2009-2011.

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EDUCATION

UNIVERSITY OF CALIFORNIA, LOS ANGELES **B.S. ATMOSPHERIC, OCEANIC, & ENVIRONMENTAL SCIENCES** ***JUNE 2010***

PROJECT EXPERIENCE

SOIL WATER AIR PROTECTION ENTERPRISE ***SANTA MONICA, CA***

AIR QUALITY SPECIALIST, PROJECT DEVELOPMENT STAFF *MARCH 2009 - JUNE 2013*

PROJECT MANAGER: VOC EMISSIONS AT UNCONVENTIONAL NATURAL GAS FACILITIES ***SEPT 2011 - JUNE 2013***

- Coordinated air dispersion modeling of VOC emissions from thirty-five natural gas processing facilities using AERMOD.
- Evaluated locally cumulative modeled concentrations with respect to regulatory thresholds and peer-reviewed literature.
- Reviewed and organized emissions inventory data and emission factor development studies to define model source terms.
- Composed text of affidavits and organized supporting materials for use as Expert testimony in environmental litigation.
- Participated in meetings with clients to discuss project strategy and identify solutions to achieve short and long term goals.

SENIOR ANALYST: VOCS AND SO_2 IN AMBIENT AIR SURROUNDING A PETROLEUM REFINERY ***NOV 2010 - JUNE 2013***

- Analyzed air monitoring data from numerous stations during facility emission events to examine effectiveness of network.
- Produced tables, charts, and graphs to exhibit the relative contribution of petroleum refinery emissions to local air quality.
- Combined analyses of air monitoring data, emissions modeling, and peer-reviewed literature in Expert Witness reports.
- Addressed time-dependent requests of client to conduct statistical analyses of air monitoring and emissions inventory data.
- Examined regulatory studies on the chemistry of ozone formation to characterize air quality impacts from industrial flares.

SENIOR ANALYST: BAAQMD LAND USE REDEVELOPMENTS SCREENING & MODELING ***JAN 2011 - DEC 2011***

- Calculated roadway, permitted source, and cumulative impacts for risk and hazard analyses at proposed land use projects.
- Prepared presentations containing figures and tables comparing results of particulate matter analyses to CEQA thresholds.
- Composed summary texts of Risk and Hazard Screening Analyses conducted for several land use redevelopment projects.
- Utilized BAAQMD methodologies for surface streets screening analyses to interpolate impacts between receptor distances.

SENIOR ANALYST: ODOROUS COMPOUNDS EMANATING FROM A SMOLDERING LANDFILL ***APRIL 2013 - JUNE 2013***

- Conducted ambient air and landfill gas sampling using sorbent tubes and SUMMA canisters for an array of analytes.
- Prepared portions of Quality Assurance Project Plan and Sampling and Analysis Plan submitted to the Missouri DNR.
- Calculated dioxin TCDD Toxic Equivalency Values from air monitoring data results obtained during field work activities.
- Reviewed previously conducted air sampling events to determine potential contaminants of concern and odor thresholds.

PUBLICATIONS

Contributing author: Feng, L., Wu, C., Tam, L., **Sutherland, A.J.**, Clark, J.J., Rosenfeld, P.E. Dioxin furan blood lipid and attic dust concentrations in populations living near four wood treatment facilities in the United States. *Journal of Environmental Health*. 2011 Jan-Feb; 73(6): 34-46.

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Contributing author: Chen, J.A., Zapata, A.R., **Sutherland, A.J.**, Molmen, D.R., Chow, B.S., Wu, L.E., Rosenfeld, P.E., Hesse, R.C. Sulfur dioxide and volatile organic compound exposure to a community in Texas City, Texas evaluated using AERMOD and empirical monitoring data. *American Journal of Environmental Science* 8(6) 2012: 622-632.

SWAPE Footnote #15

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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August 22, 2012

Rachael E. Koss
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Subject: Comments on the McCoy Solar Energy Project

Dear Ms. Koss:

We have reviewed the May 2012 Draft Environmental Impact Statement ("DEIS") for the McCoy Solar Energy Project ("Project"). The Project proposes to construct a 750-megawatt solar generation facility on approximately 8,000 acres of land 13 miles northwest of the City of Blythe in Riverside County, California. Project components include:

- A 230-kilovolt gen-tie line;
- A 230-kilovolt switchyard;
- Two telecommunications line;
- A distribution line; and
- An access road to the Project site (DEIS, p.2-4).

We have reviewed the DEIS for issues associated with hydrology and water quality and hazards and hazardous materials. We conclude that the DEIS does not adequately disclose and evaluate potentially significant impacts from Project construction on workers. A revised DEIS must be prepared to thoroughly disclose, analyze, and mitigate impacts from Project construction.

Hydrology and Water Quality

Impacts to Environment from Flooding of Project Site are not Adequately Disclosed

The DEIS states that following Project construction "erosion would occur in a manner consistent with existing conditions relating to wind and flash flooding" (DEIS, p. 4.7-8). The DEIS goes on to describe that "on-site inundation of the solar arrays during flood periods is anticipated as a matter of Project design" (DEIS, p. 4.20-9). Significantly, the DEIS does not consider that erosion from flooding may destabilize and topple PV panel arrays and may cause evaporation ponds to overtop and release wastewater. If PV panels are upended and broken, toxic compounds may be released and may cause impacts to waterways. The DEIS fails to disclose the potential for flood-caused contaminant releases and release of toxic compounds and wastewater.

PV panels containing cadmium telluride (CdTe) are being considered as a possible technology for the Project (DEIS, p. 4.9-6). The DEIS admits that CdTe is a hazardous substance but does not disclose the potential impacts of CdTe releases in the event of panel breakage. Instead, it simply states that "if the modules were damaged, CdTe would not mobilize from the glass into the environment in any plausible Project conditions" (*Ibid.*). This is in contrast with recent research that shows that cadmium from broken panels can leach into the environment. A 2012 study found that cadmium, from broken panels, can leach into groundwater at concentrations that exceed Environmental Screening Levels[1], which have been established for "protection against leaching and subsequent impacts to groundwater".[2]

The DEIS does not consider the possibility of panel breakage and subsequent CdTe releases due to flooding. Broken panels can expose the CdTe that is locked inside which can wash into adjacent waterways. A December 2011 report prepared for the Project site states that approximately 1% of the peak water flow from a 100-year flood event will flow to the McCoy Wash which eventually flows into the Colorado River via a system of man-made drains and canals.[3] Therefore, panels that break during flooding may release cadmium, at concentrations exceeding ESLs, into waters that will flow to the McCoy Wash and the Colorado River.

The potential for flooding was illustrated recently at the Genesis Solar Energy Project which is under construction approximately 12 miles to the west of the Project. The flood, which occurred over a 2-day period on July 30 and July 31, 2012 resulted from six inches of rain.[4] The rainfall, which was paired with high winds, damaged almost 200 parabolic trough mirrors resulting in damages of $3 million. The storm was characterized as a 100-year flood by company representatives.[5] Our review of this storm, using data from the Precipitation Frequency Data Server from the National Oceanic and Atmospheric Administration (NOAA) shows that 6 inches of rain over a 2-day period corresponds to a 500-year flood[6] (instead of a 100-year flood). Therefore, the DEIS's mitigation measures of providing evaporation ponds that can accommodate a 25-year storm event (DEIS, p. 4.20-18) and placing buildings 2 feet above the anticipated flood flows from a 100-year storm event (DEIS, p. 4.20-19) are inadequate.

If PV panels containing CdTe are used for the Project and flooding was to occur, there will be potentially significant releases of CdTe to adjacent waterways. Because the Applicant has not determined which

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[1] Fate and Transport Evaluations of Potential Leaching Risks from Cadmium Telluride Photovoltaics (2012). Environmental Toxicology and Chemistry, Vol. 31, No. 7

[2] Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. http://www.swrcb.ca.gov/sanfranciscobay/water_issues/available_documents/ESL_May_2008.pdf

[3] McCoy Project Site. Jurisdictional Delineation Report for Regulated Waters of the State of California, Riverside County, California. December 2011

[4] http://www.earthtechling.com/2012/08/big-desert-solar-project-hit-by-wind-flood/

[5] *Ibid.*

[6] http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca

type of panel will be used for the Project, impacts from panel breakage that may occur due to flooding and any subsequent releases of CdTe must be disclosed, evaluated, and mitigated.

The location of the Project on a broad alluvial fan surface in a piedmont[7] will place infrastructure in the path of distributary ephemeral stream channels which characteristically fill and overtop to accommodate infrequent rainfall events. Desert piedmonts are characterized by ephemeral flow networks that convey high-velocity flows through a complex array of unstable channels which shift positions during flooding. Predicting floods in these settings is difficult because of limited amounts of measured data on flow frequency and hydraulics.[8] According to recent research, "conventional concepts of floodplain management (i.e., as related to perennial streams) do not transfer" to alluvial fan settings and "flood-hazard management […] is a particularly challenging task."[9]

Erosion during flood events in this piedmont setting will potentially destabilize PV panels and cause them to topple, fall, and break. The flooding will also potentially inundate the evaporation ponds which could lead to erosion and failure of the pond's embankments.

The DEIS offers measures to mitigate flood hazards, stating:

> On-site inundation of the solar arrays during flood periods is anticipated as a matter of Project design. However, some of the proposed facilities on-site would require protection from flooding. For instance, unless suitably protected from flooding, the proposed on-site buildings could become inundated during a heavy storm event. Additionally, the proposed evaporation pond could become inundated. Implementation of Mitigation Measure WATER-4, which would require that all on-site buildings, maintenance areas, designated parking lots, and associated facilities be constructed at an elevation of at least 2 feet above the highest anticipated flood flows during a 100-year event, would reduce such risks. Implementation of Mitigation Measure WATER-5 would ensure that workers and employees are protected in the event of a flood (DEIS, p. 4.20-19)

Mitigation measure WATER-4 requires:

> The proposed evaporation pond shall include berms of levees that reach at least 2 feet above the highest anticipated flood flows during a 100-year storm event, or at least 2 feet above the highest adjacent ground, whichever is greater, in order to protect the evaporation pond from incident flooding events and ensure that the ponds are not inundated by flood flows (DEIS, p. 4.20-19).

Mitigation measure WATER-4 assumes that protection from a 100-year flood will suffice for buildings and the evaporation ponds. Mitigation Measure WATER-2 provides only that evaporation ponds shall be

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[7] A piedmont is a typically broad, generally low-relief area extending from the base of a mountain range toward the center or axis of a valley. The valley axis may host an axial stream, river, or wash; or a lake or playa.

[8] http://www.nbmg.unr.edu/pubs/r/r53/index.html

[9] http://www.nbmg.unr.edu/pubs/r/r53/index.html

sized to accommodate operational discharges plus a 25-year storm event, with no less than 1 foot of freeboard.

These measures would clearly not be adequate in the event a storm, of the magnitude that occurred at the Genesis Solar Power Project site, were to occur on the proposed Project site. The rainfall event at the Genesis Solar Power Project shows that flooding that is not anticipated can occur in the desert where estimating the likelihood of a flood events is notoriously difficult as discussed above.

Flooding of the magnitude observed on July 30-31, 2012 at the Genesis Solar Power Project site would have the potential to cause widespread damage to PV panel arrays and evaporation ponds, impacts not analyzed in the DEIS. A revised DEIS should be prepared to include a flood hazard assessment that recognizes the alluvial fan setting of the Project site location. It should also identify areas most prone to flooding so that placement of infrastructure, most importantly PV panels and evaporation ponds, are not placed in high-hazard areas. The revised DEIS should also evaluate the potential for panel breakage in the event of a flood and the potential for discharge of cadmium to adjacent waterways. A revised DEIS is also necessary to assess impacts from overtopping of evaporation ponds and resultant release of wastewater.

Project may Violate Water Quality Standards and Waste Discharge Requirements

The DEIS assumes the need for eight acres of evaporation ponds for discharge from the water treatment system. Discharge of wastewater to the evaporation ponds would require a Waste Discharge Requirement permit from the Regional Water Quality Control Board ("RWQCB"), a requirement not adequately addressed in the DEIS. A permit may also be required for any fill placement (during road construction, for example) or placement of PV panel supports across ephemeral drainages at the Project site, a condition that is unanticipated in the DEIS. Evaluation of the permit requirements is necessary to ensure full compliance with the requirements of the Porter-Cologne Water Quality Control Act and the California Water Code. Evaluation is also necessary to demonstrate that the Project will not cause or contribute to an exceedence of water quality standards established for surface water and groundwater under the Basin Plan.[10] A revised DEIS should be prepared to include permitting documents to show that compliance can be achieved and to show that wastewater discharge will not cause adverse impacts to wildlife and fill placement will not degrade Waters of the State.

Discharge of Wastewater

Treatment would be necessary to demineralize water used for panel washing. Operation of the two planned PV units would require use of up to 44 acre-feet per year of treated water for PV panel cleaning and dust control (DEIS, p. 2-20).

The DEIS states that solids produced from precipitation of minerals in wastewater (from reverse osmosis or demineralization systems) would likely to be classified as Class II non-hazardous industrial waste

[10] Water Quality Control Plan Colorado River Basin – Region 7. http://www.waterboards.ca.gov/coloradoriver/publications_forms/publications/docs/basinplan_2006.pdf

(DEIS, p. 2-22). According to the DEIS, the evaporation ponds would require permit approval from the Colorado RWQCB and/or the California Department of Public Health (DEIS, p. 3.20-21).

The DEIS goes on to say:

> If evaporation ponds are needed, a Water Discharge Requirement (WDR) permit would be obtained from the Colorado River RWQCB, which is expected to require the preparation of a Water Quality Monitoring and Response Plan that includes monitoring of the Project pond liner to detect leaks, as well as groundwater monitoring (DEIS, p. 2-22).

The DEIS makes conflicting statements about the need for evaporation ponds, stating on the one hand that the need for ponds is assumed in the DEIS, and then stating that Waste Discharge Requirement permit would be obtained "if" ponds are needed. Nevertheless, because the DEIS assumes the need for evaporation ponds, the DEIS should assume the need for approval of a Report of Waste Discharge (ROWD) from the Colorado River RWQCB. The approval process involves submittal of: (a) of a Notice of Intent (NOI) to comply with the terms and conditions of the General Waste Discharge Requirements or a Report of Waste Discharge (ROWD) pursuant to California Water Code §13260; (b) a fee; (c) a Project map; (d) evidence of CEQA compliance; and (e) a monitoring plan.

Other solar projects that required evaporation ponds have included draft ROWDs in the planning documents. For example, the applicant for the Beacon Solar project in Kern County prepared a ROWD and submitted it during the planning process for Regional Board Review in 2009.[11]

A ROWD is also necessary to evaluate flood impacts. The DEIS states that proposed evaporation ponds could become inundated (DEIS, p. 4.20-9) but does not describe if ponds could be overtopped and release wastewater thereby causing impacts to McCoy Wash and other receiving water bodies. Because of this oversight, no mitigation is provided in the event that ponds are breached. A ROWD should address the potential for flooding of the evaporation ponds and provide mitigation to ensure wastes are not discharged in the event of a flood.

A revised DEIS should be prepared to include a draft ROWD. A ROWD is essential for public review of potential impacts on water resources and biological resources which may include bird kills and attractive nuisance issues. The ROWD should include documentation about wastewater pond construction (including design specifications, sizing (including flood event considerations) and, evaluation of the need for leak detection), provisions for monitoring and reporting water quality and biological impacts (including bird mortality), and an evaluation of the need for groundwater monitoring.

<u>Construction in Ephemeral Drainages</u>

A ROWD is also necessary for the discharge of waste resulting from placement of fill or construction activities within numerous ephemeral drainages that are considered Waters of the State, according to the California Water Code. The DEIS does not address this requirement and provides no analysis of the need for a ROWD.

[11] Attachment 6, Report of Waste Discharge, Beacon Solar Energy Project. June 2009.

Preliminary jurisdictional evaluations of Waters of the State have been completed in support of the Project (DEIS, p. 3.20-20). The evaluation identified 185 acres of Waters of the State that will be impacted by Project construction, including desert dry wash woodlands, vegetated ephemeral streams and unvegetated ephemeral dry washes (DEIS, p. 4.3-6).

The placement of fill across ephemeral drainages considered Waters of the State has led to the preparation of ROWDs for other solar projects. For example, in San Luis Obispo County, the Central Coast RWQCB required a ROWD and issued Waste Discharge Requirements in 2012 for the California Valley Solar Ranch project.[12] The Waste Discharge Requirements for the California Valley Solar Ranch project were based on the finding that construction would impact 0.02 acres of ephemeral drainages. For comparison, the McCoy Project DEIS estimates that the project would impact 185 acres to State jurisdictional waters.

Pursuant to Section 13260(a) of the California Water Code, a revised DEIS should be prepared to include a ROWD that would identify the project's impacts to jurisdictional waters from construction of roads or placement of PV panel supports in waterways.

Hazards and Hazardous Materials

Hazards Associated with Former Military Site are not Evaluated Adequately

The Blythe Airport is four miles south the Project site. The Blythe Airport and its surroundings were occupied and used by the U.S. Army for bombing practice and gunnery ranges during World War II. The area of the airport and the practice ranges are known as the Blythe Army Airfield Formerly Used Defense Site (FUDs). The Blythe Army Airfield ("Blythe AAF") was used for heavy bomber pilot and crew training for the Second Air Force heavy bombardment crew from 1942 to 1944. In 1943, the base housed 7,500 personnel, 75 heavy bombers, and utilized 650 buildings.[13]

We have mapped the FUDs boundary and associated features including firing ranges and a practice bombing area (Figure 1, Attachment A). As shown in the figure, areas where bullets were scattered from target practice (known as "safety fans") are located approximately 4000 feet south of the Project site footprint. Tie lines for power transmission cut across both safety fans. The practice bombing range underlies a majority of the Project area.

Firing Ranges and Safety Fans

A Poorman gunnery range, skeet range, and jeep type target range, all with ammunition storage, were constructed and used by Army personnel.[14] Poorman ranges were used at bases across the U.S. for training in aerial gunnery. Turrets used for training generally utilized twin-mounted .50 caliber machine

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[12] California Regional Water Quality Control Board Central Coast Region. Individual Waste Discharge Requirements Order No. R3-2012-0006 for California Valley Solar Ranch Discharges of Fill Material for Waters of the State, San Luis Obispo County, California. February 2012.

[13] http://deserttrainingcenter.com/Blythe%20Army%20Airfield.htm

[14] Blythe Army Airfield, Findings and Determination of Eligibility, Site Summary Sheet, Project Summary Sheet and Risk Assessment Procedure, DERP-FUDS Site No. J09CA024500

guns. The safety fan associated with the Poorman Range at the Blythe AAF is shown in Figure 1 to extend more than five miles to underlie the eastern and western generator tie line alignments being considered for power transmission lines.

Jeep Ranges were used to simulate moving targets for trainees using .30 and .50 caliber machine guns. The Jeeps were guided on tracks behind an earthen bunker with the target extending above the berm.[15] Figure 1 shows the Jeep Range to underlie the eastern generator tie line alignment and an access road.

Firing and Bombing Area

A World War II vintage map identifies a "Firing and Bombing Area" northwest of the Blythe AAF and within the Project boundary. The area of the Firing and Bombing Area was annotated on the map with the notation "used during daylight hours, Blythe Air Base."[16] Although records about specific practice bombing activities are not available, practice bombing activities at similar ranges included the use of practice bombs fitted with black powder, spotting charges, or smoke charges.[17] The use of the spotting charges aided in the scoring of the accuracy of the bombardier trainees. This use is confirmed by a 1999 Archive Search Report for the Blythe AAF which found that "large quantities of black powder spotting charges (for practice bombs) and high explosive bombs were stored on the base."[18]

High explosive bombs at Blythe AAF were also identified in the Archive Search Report which suggests that these bombs were also used for practice bombing. Bomb fragments associated with high explosives were found at bombing ranges associated with Blythe AAF in Arizona.[19] Other evidence indicates use of 250-pound general purpose high explosive bombs.[20] Another related Archive Search Report identified the use of M38A2 practice bombs at Blythe AAF.[21] The M38A2 was a 100-pound sand-filled bomb fitted with an M1A1 spotting charge. The M1A1 spotting charge contains three pounds of black powder with an inertia-type fuse containing a shotgun primer.[22]

The Potential for Exposure to Hazardous Materials has not been Adequately Evaluated

The safety fans for the Poorman and Jeep Ranges that extend beneath the project transmission line routes may be areas where spent .30 and .50 caliber bullets are found during project construction. Bullets, upon striking soil, impart metal fragments to the soil matrix. The bullets and impacted soil may

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[15] http://www.bomberlegends.com/pdf/BL_Mag_v2-2-GunneryTrain.pdf

[16] U.S. Army Corps of Engineers. Defense Environmental Restoration Program for Formerly Used Defense Sites. Military Munitions Response Program. Final Archives Search Report for the former Laguna Area Northern Maneuver Area Northern Portion. La Paz, Maricopa, and Yavapai Counties, Arizona Project Number J09AZ043902. March 1999. p. 304 of 385.

[17] U.S. Army Corps of Engineers. Defense Environmental Restoration Program for Formerly Used Defense Sites. Ordnance and Explosives. Archive Search Report Findings for the former Borrego Hotel (Target Area and Emergency Landing Field). Borrego Springs, California. Project No. J09CA701104. March 1997.

[18] *Ibid.*, p. 29

[19] *Ibid.*, p. 35

[20] *Ibid.*, p. 20

[21] *Ibid.*, p. 15

[22] http://www.swf.usace.army.mil/pubdata/fuds/5points/specs/spotting.PDF

contain lead and other metals, including copper, zinc, tungsten, arsenic, antimony, and nickel, at concentrations that would pose a risk to workers excavating soil.[23] Lead has been found in association with .50 caliber rounds at a former jeep range at Nellis AFB in California.[24] Sampling for lead and other metals has been conducted at other former jeep ranges.[25]

The DEIS does not identify the presence of former ranges and does not recognize the potential for contamination to be associated with bullets that are likely to be found in the areas of the safety fans. No sampling for soil contamination associated with the safety fans has been conducted to date. Workers involved in excavation activities along the transmission line alignments may be exposed to soil and dust that would contain hazardous concentrations of lead.

Additionally, the potential for pyrotechnic, incendiary, or tracer ammunition use at the Poorman and Jeep Ranges was not evaluated in the DEIS. Pyrotechnic and incendiary magazines are identified in the map of Blythe AAF[26] and therefore pyrotechnic and incendiary devices were presumably used during training activities associated with the Poorman and Jeep ranges. Additionally, the Corps of Engineers, in a 1999 assessment of Blythe AAF, identified "munition (containers) containing White Phosphorus (WP) or other pyrophoric material (i.e. spontaneously flammable)" [27] providing further evidence of the use of pyrotechnics. Incendiaries are also classified as pyrotechnic munitions. Compounds of concern used in pyrotechnic munitions include perchlorates used as oxidizers.[28] Perchlorates are known to inhibit thyroid function[29] and are a risk to human health, primarily through ingestion of drinking water, although inhalation of soil dust is a known route of exposure.[30] Areas where pyrotechnic devices were detonated may present a health risk to construction workers in areas of transmission line construction.

Worker safety and public heath may be significantly at risk without soil sampling in the areas of the Project underlain by the former Poorman and Jeep Ranges. Soil sampling should be undertaken to include the metals associated with the projectiles used in the firing ranges and to include components of the pyrotechnics, including perchlorates.

Unexploded Ordnance may Pose Risks to Workers

The former Firing and Bombing Area, which underlies much of the Project footprint, represents an area where unexploded ordnance (UXO) may be present in the form of practice bombs and incendiary devices. In addition to the explosion hazard represented by UXO, toxic chemicals may be found in soil associated with the practice bombs and incendiary devices.

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[23] http://www.itrcweb.org/Documents/SMART-2.pdf, p. 3
[24] http://uxoinfo.com/blogcfc/client/enclosures/Nellis_SmallArmsCom_ASR.pdf
[25] See for example, http://www.azdeq.gov/environ/waste/sps/download/state/031010fs1.pdf, http://www.propfirst.com/BellaVista/PinecastleRange.pdf, and http://www.itrcweb.org/Documents/SMART-2.pdf
[26] Boundary Sketch, Blythe Army Airfield, September 1943
[27] Blythe Army Airfield, Findings and Determination of Eligibility, Site Summary Sheet, Project Summary Sheet and Risk Assessment Procedure, DERP-FUDS Site No. J09CA024500
[28] http://www.dtsc.ca.gov/LawsRegsPolicies/Regs/upload/HWMP_WS_dPerch-Sec9.pdf
[29] http://www.itrcweb.org/Documents/PERC-1.pdf
[30] http://oehha.ca.gov/risk/pdf/120409Perchlorate.pdf

UXO has been documented in association with the neighboring Blythe Solar Power Project (BSPP), located within less than 500 feet south of the Project site. During construction of the BSPP, seven separate UXO-related material findings have been reported. These incidents are documented in Monthly Compliance Reports and associated attachments, which were prepared by the applicant and submitted to the California Energy Commission. We obtained these reports and have created a map to show where UXO have been found (Figure 2, Attachment B). These findings are also described in the table below.

MEC/UXO Related Materials Findings at the Blythe Solar Power Project				
#	Date	Location (UTM, Zone 11S)	Findings	Area Surveyed
1	May 18, 2009	706674 E, 3728543 N	M1B1 Practice Landmine	400 x 400 foot grid
2	May 18, 2009	706976 E, 3728549 N	M1B1 Practice Landmine	400 x 400 foot grid
3	March 22, 2010	706678 E, 3725029 N	Pressure Plate for Practice Landmine	N/A*
4	April 6, 2010	708394 E, 3721881 N	Pressure Plate for Practice Landmine	N/A*
5	May 20, 2011	708475 E, 3722249 N	M1B1 Practice Landmine	200 x 200 foot grid
6	July 14, 2011	0706672 E, 3728568 N	M1B1 Practice Landmine	400 x 400 foot grid
7	July 20, 2011	0706918 E, 3728580 N	M1B1 Practice Landmine	400 x 400 foot grid

N/A: unable to obtain this data

UXO-related materials were found during site surveys performed by BSPP personnel. As the table shows, the surveys where the seven UXO-related materials were found only cover a tiny fraction of the entire BSPP site. If the entire BSPP site were thoroughly evaluated, numerous additional UXO-related materials and debris findings would likely be found.

The only mention of the potential for hazardous materials and UXO to be present on the Project site or associated transmission lines is as follows:

> Because of the area's former use for military training, there is potential for discarded military munitions, other explosives, and unexploded ordnance (collectively, UXO) to be encountered. The BLM has conducted investigations at several of the known camps, but has not completed a UXO survey of the entire training ground. As with most current or former military installations, there is a possibility of UXO. Reportedly, several UXO discoveries have been made in the immediate vicinity of the site. Information obtained from cultural resource studies in the area and construction efforts at the BSPP indicate that UXOs have been identified in the area with increasing frequency near the McCoy Wash (Tetra Tech, 2011) (DEIS, p. 3.22-4).

The DEIS omits any specific reference to the safety fans that underlie the transmission lines and the practice bombing area that underlies the Project footprint. The DEIS fails to document the findings of UXO made during field work for BSPP. Because of these omissions, the DEIS fails to convey that, almost assuredly, hazardous materials and unexploded ordinance will be found in areas where earthwork will take place, putting workers at risk, unless first evaluated.

Instead, the DEIS states

> The CERCLA requires that, before transferring lands from the military, the military service must search for and remove munitions and UXO to accommodate reasonably anticipated future land uses (DEIS, p. 3.22-4).

We know of no plans by the military, specifically, the Army Corps of Engineers, to assess these risks. Any plans by the military to assess UXO risks prior to ground disturbance should be disclosed in a revised DEIS.

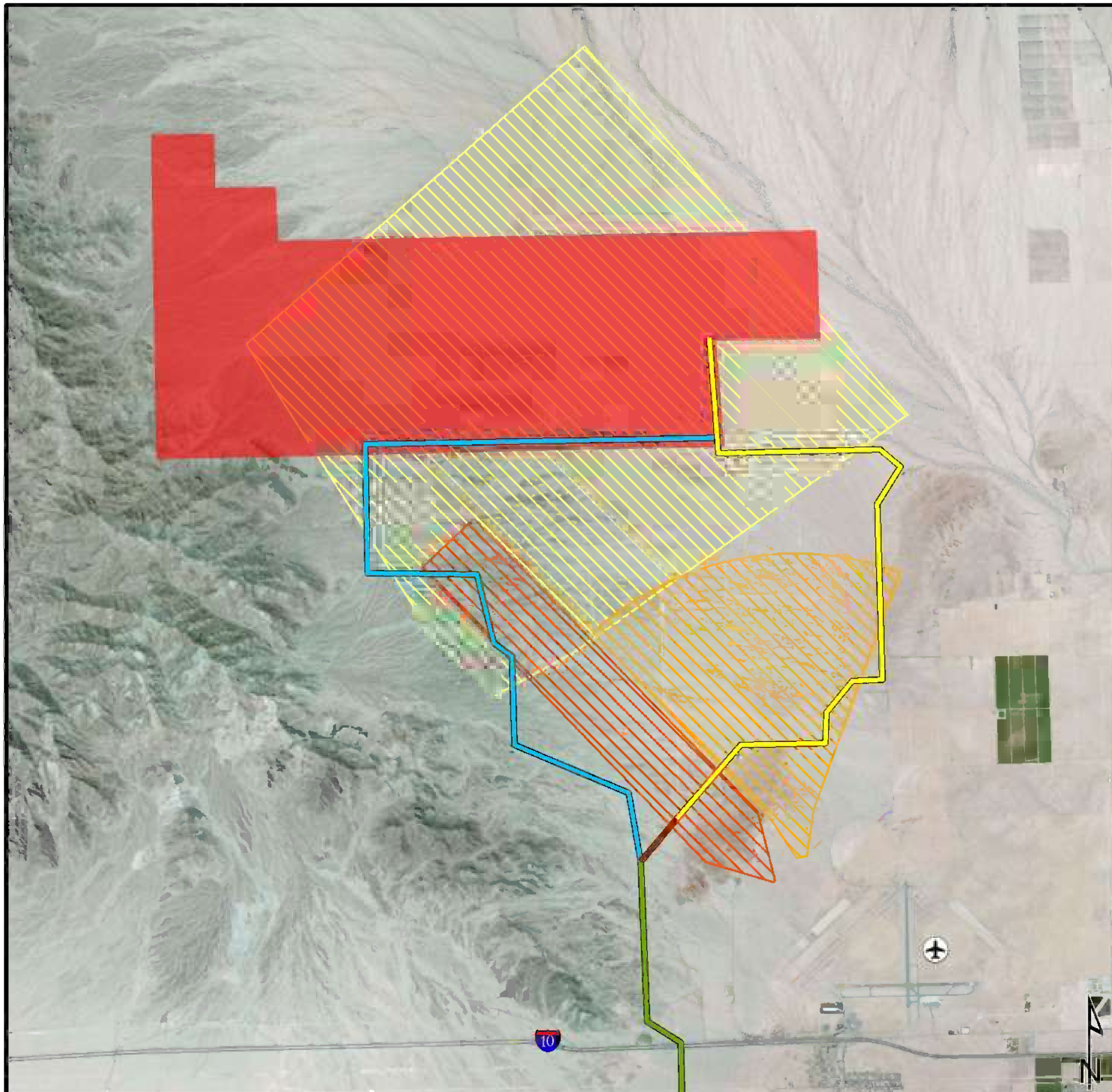
The DEIS should be revised to include full disclosure of the military uses of the Project are and the transmission lines, including target ranges and practice bombing ranges. Disclosure should include types of ammunition and ordnance that would likely have been used and the locations where the materials were expended, as well as contaminants and explosive hazards that would be associated with their use. The DEIS should also include plans for evaluation of UXO and soil contamination hazards prior to construction. The BLM has issued guidance for UXO evaluation[31] which should be used to prepare plans for UXO evaluation and findings, to be included in the revised DEIS. Plans implemented for the Solar Millennium project should also be considered, particularly the provisions for supervision by a UXO specialist and submittal of monthly reports of UXO findings.

Sincerely,

Matt Hagemann, P.G., C.Hg.

[31] U.S. Department of the Interior. Bureau of Land Management. Military Munitions and Explosives of Concern: A Handbook for Federal Land Managers, with Emphasis of Unexploded Ordnance. February 2006.

ATTACHMENT A



LEGEND

- McCoy Project Site[a]
- East Generator Tie Line Corridor and 24' Access Road[a]
- East Generator Tie Line Corridor[a]
- West Generator Tie Line Corridor (Alternate)[a]
- CRS Tie Line Corridor[a]
- Bombing Range: Used for Daylight Hours[b]
- Poor Man Small Arms Range[c]
- Jeep Small Arms Range[c]

NOTES

1. All locations are approximate.
2. Aerial imagery obtained from ESRI Aerials Map Service.

SOURCES

a. Tetra Tech, 2011. Site Vicinity Map. McCoy Solar Energy Project, Riverside County, California. January 19, 2011.
b. US Army Corps of Engineers, 1999. Defense Environmental Restoration Program for Formerly Used Defense Sites - Military Munitions Response Program - Final Archives Search Report for the Former Laguna Maneuver Area Northern Portion - La Paz, Maricopa, and Yavapai Counties Arizona. Project Number J09AZ043902. California/Arizona Maneuver Area, Third Edition - 29E 4. March 3, 1999.
c. Installation and CTT Maps, 2003. FUDs and Range Boundaries. Blythe Army Airfield, FUDs Property No. J09CA024502. Blythe, California, Riverside County.

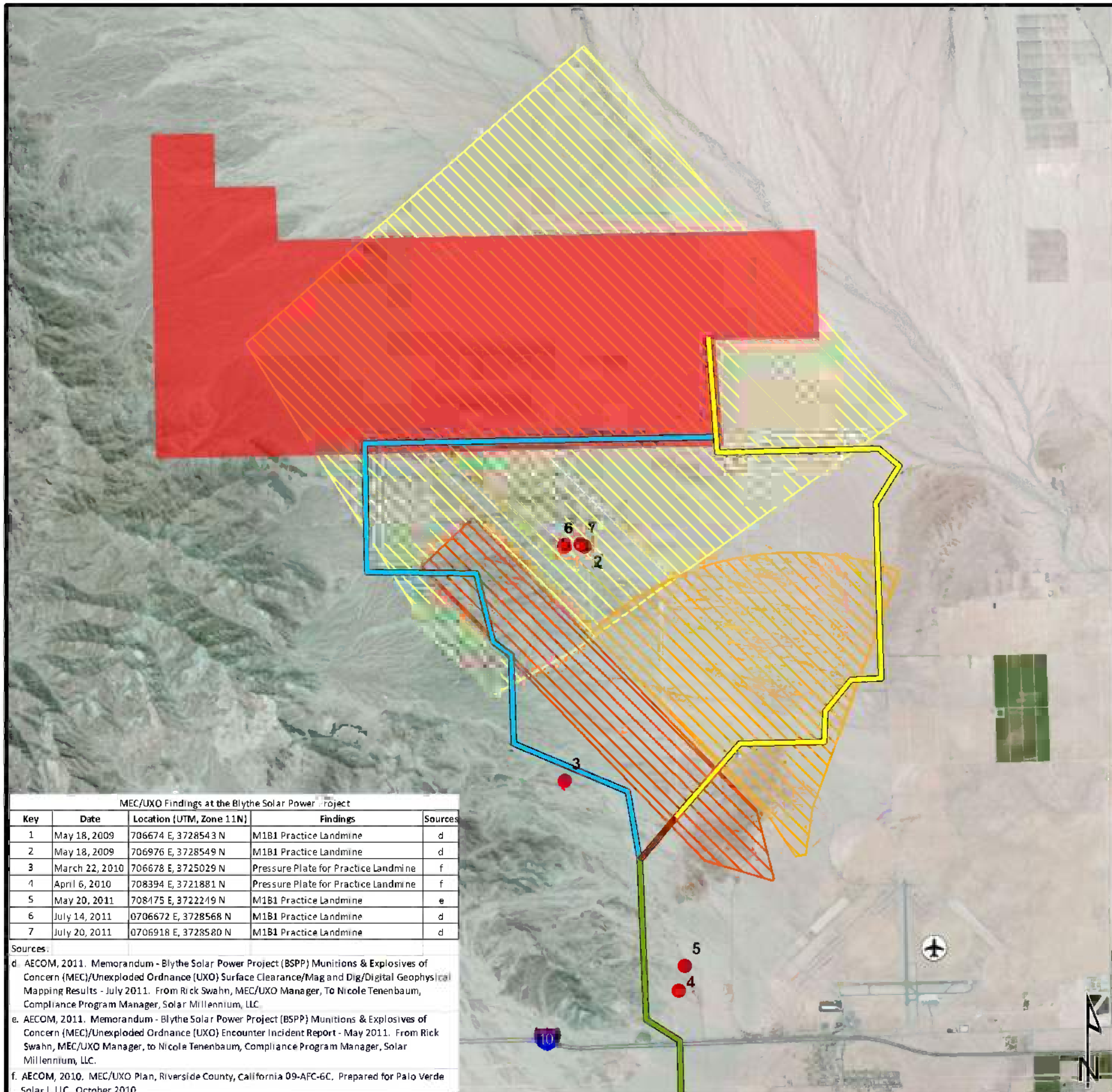
0 0.35 0.7 1.4 Miles

Project:
NextEra McCoy Solar Energy Project
Riverside County, California

Title:
Project Site Overview
Bombing Area and Small Arms Ranges

	Project No.: 523	Drawn By: JAC	Figure: 1
SWAPE	Approved: MFH	Date: 08.21.2012	

ATTACHMENT B



MEC/UXO Findings at the Blythe Solar Power Project

Key	Date	Location (UTM, Zone 11N)	Findings	Sources
1	May 18, 2009	706674 E, 3728543 N	M1B1 Practice Landmine	d
2	May 18, 2009	706976 E, 3728549 N	M1B1 Practice Landmine	d
3	March 22, 2010	706678 E, 3725029 N	Pressure Plate for Practice Landmine	f
4	April 6, 2010	708394 E, 3721881 N	Pressure Plate for Practice Landmine	f
5	May 20, 2011	708475 E, 3722249 N	M1B1 Practice Landmine	e
6	July 14, 2011	0706672 E, 3728568 N	M1B1 Practice Landmine	d
7	July 20, 2011	0706918 E, 3728580 N	M1B1 Practice Landmine	d

Sources:

d. AECOM, 2011. Memorandum - Blythe Solar Power Project (BSPP) Munitions & Explosives of Concern (MEC)/Unexploded Ordnance (UXO) Surface Clearance/Mag and Dig/Digital Geophysical Mapping Results - July 2011. From Rick Swahn, MEC/UXO Manager, To Nicole Tenenbaum, Compliance Program Manager, Solar Millennium, LLC.

e. AECOM, 2011. Memorandum - Blythe Solar Power Project (BSPP) Munitions & Explosives of Concern (MEC)/Unexploded Ordnance (UXO) Encounter Incident Report - May 2011. From Rick Swahn, MEC/UXO Manager, to Nicole Tenenbaum, Compliance Program Manager, Solar Millennium, LLC.

f. AECOM, 2010. MEC/UXO Plan, Riverside County, California 09-AFC-6C. Prepared for Palo Verde Solar I, LLC. October 2010.

LEGEND

- McCoy Project Site[a]
- East Generator Tie Line Corridor and 24' Access Road[a]
- East Generator Tie Line Corridor[a]
- West Generator Tie Line Corridor (Alternate)[a]
- CRS Tie Line Corridor[a]
- Bombing Range: Used for Daylight Hours[b]
- Poor Man Small Arms Range[c]
- Jeep Small Arms Range[c]
- MEC/UXO Findings

NOTES

1. All locations are approximate.
2. Aerial imagery obtained from ESRI Aerials Map Service.

SOURCES

a. Tetra Tech, 2011. Site Vicinity Map. McCoy Solar Energy Project, Riverside County, California. January 19, 2011.

b. US Army Corps of Engineers, 1999. Defense Environmental Restoration Program for Formerly Used Defense Sites - Military Munitions Response Program - Final Archives Search Report for the Former Laguna Maneuver Area Northern Portion - La Paz, Maricopa, and Yavapai Counties Arizona. Project Number J09AZ043902. California/Arizona Maneuver Area, Third Edition - 29E 4. March 3, 1999.

c. Installation and CTT Maps, 2003. FUDs and Range Boundaries. Blythe Army Airfield, FUDs Property No. J09CA024502. Blythe, California, Riverside County.

0 0.35 0.7 1.4 Miles

Project:
NextEra McCoy Solar Energy Project
Riverside County, California

Title:
Project Site Overview
Bombing Area and Small Arms Ranges
MEC/UXO Findings

	Project No.: 523	Drawn By: JAC	Figure: 2
SWAPE	Approved: MFH	Date: 08.21.2012	

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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Matthew F. Hagemann, P.G., C.Hg., QSD, QSP

Geologic and Hydrogeologic Characterization
Industrial Stormwater Compliance
CEQA Review
Investigation and Remediation Strategies
Litigation Support and Testifying Expert

Education:

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.
B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

Professional Certification:

California Professional Geologist
California Certified Hydrogeologist
Qualified SWPPP Developer and Practitioner

Professional Experience:

Matt has 25 years of experience in environmental policy, assessment and remediation. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) while also working with permit holders to improve hydrogeologic characterization and water quality monitoring.

Matt has worked closely with U.S. EPA legal counsel and the technical staff of several states in the application and enforcement of RCRA, Safe Drinking Water Act and Clean Water Act regulations. Matt has trained the technical staff in the States of California, Hawaii, Nevada, Arizona and the Territory of Guam in the conduct of investigations, groundwater fundamentals, and sampling techniques.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – present;
- Senior Environmental Analyst, Komex H2O Science, Inc (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

<u>Partner, SWAPE:</u>

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of numerous environmental impact reports under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, greenhouse gas emissions and geologic hazards.
- Stormwater analysis, sampling and best management practice evaluation at industrial facilities.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Technical assistance and litigation support for vapor intrusion concerns.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.
- Expert witness on two cases involving MTBE litigation.
- Expert witness and litigation support on the impact of air toxins and hazards at a school.
- Expert witness in litigation at a former plywood plant.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.
- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.
- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

Executive Director:

As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the dischrge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

Hydrogeology:

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

Policy:

Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

Geology:

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

Teaching:

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt currently teaches Physical Geology (lecture and lab) to students at Golden West College in Huntington Beach, California.

Invited Testimony, Reports, Papers and Presentations:

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

Hagemann, M.F., 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

Hagemann, M.F., 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

Hagemann, M.F., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

Hagemann, M.F., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

Hagemann, M.F., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

Hagemann, M.F., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

Hagemann, M.F., 2002. An Estimate of the Cost to Address MTBE Contamination in Groundwater (and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

Hagemann, M.F., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

Hagemann, M.F., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

Hagemann, M.F., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

Hagemann, M.F., and VanMouwerik, M., 1999. Potential Water Quality Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F**. 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

Hagemann, M.F., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

Hagemann, M.F., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

Hagemann, M.F., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

Hagemann, M.F., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

Hagemann, M. F., Fukanaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

Hagemann, M.F., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

Hagemann, M.F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

Hagemann, M.F., 1993. U.S. EPA Policy on the Technical Impracticability of the Cleanup of DNAPL-contaminated Groundwater. California Groundwater Resources Association Meeting.

Hagemann, M.F., 1992. Dense Nonaqueous Phase Liquid Contamination of Groundwater: An Ounce of Prevention... Proceedings, Association of Engineering Geologists Annual Meeting, v. 35.

<u>Other Experience:</u>

Selected as subject matter expert for the California Professional Geologist licensing examination, 2009-2011.

SWAPE Footnote #46

EPA Contract No. 68-D7-0068
Work Assignment No. 2-09
ERG No. 0101-01-009

ESTIMATING PARTICULATE MATTER EMISSIONS FROM CONSTRUCTION OPERATIONS

FINAL REPORT

Prepared for:

Emission Factor and Inventory Group
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Prepared by:

Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110

Under Subcontract to:

Eastern Research Group, Inc.
1600 Perimeter Park
P.O. Box 2010
Morrisville, North Carolina 27560

September 30, 1999

EASTERN RESEARCH GROUP, INC.

EPA Contract No. 68-D7-0068
Work Assignment No. 2-09
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P.O. Box 2010
Morrisville, North Carolina 27560

September 30, 1999

Preface

This report was prepared by Midwest Research Institute (MRI) for the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards under Purchase Order No. EFIG-0068 from Eastern Research Group (ERG). Mr. Garry Brooks was the Work Assignment Leader for ERG. This work was performed under EPA Prime Contract No. 68-D7-0068 with ERG.

The report summarizes the methods that have been used to develop inventories of fugitive dust and exhaust particulate matter (PM) emissions from construction activities, identifies surrogate data sources for PM emission calculations, and proposes a preferred methodology to estimate county level emissions. Mrs. Mary Ann Grelinger was the MRI Project Leader for this assignment. Dr. Chatten Cowherd and Dr. Greg Muleski served as technical consultants on this project. This report was prepared by Mrs. Grelinger, Ms. Courtney Kies, and Dr. Cowherd.

MIDWEST RESEARCH INSTITUTE

Chatten Cowherd for

Chatten Cowherd, Jr., Ph.D.
Principal Advisor

Approved:

Thomas J. Grant

for Roy Neulicht
Program Manager
Technical Support Contact

September 15, 1999

Contents

Figures

Tables

Section 1. Introduction

This report was prepared as part of a study to develop an improved method for estimating particulate matter (PM) emissions from construction operations.

A new methodology is needed to improve emission estimates on a national county-by-county basis for the National Emission Trends (NET) inventory. Construction operations can substantially impact local air quality from suspended dust, equipment exhaust, and burning emissions. The majority of PM emissions originates from sources that suspend dust from soil and construction materials, especially from equipment travel. PM emissions are released into ambient air from the following construction activities:

- Equipment movement on unpaved surfaces (suspended dust and exhaust emissions)
- Earthmoving (cut and fill operations, and excavation activities)
- Material transfer operations, including loading/unloading activities
- Material alterations, including drilling, crushing, screening, cutting, blasting, and surface cleaning activities
- Portable plant crushing and screening
- Track-out of dirt to nearby paved roads for subsequent dust resuspension by traffic
- Land clearing, including demolition/burning of existing structures and vegetative residues
- Wind erosion of soil exposed by construction activities

The activities performed in this study included:

- Identification of readily available national and regional information sources that can be used to prepare an inventory of PM emissions from construction activity
- Identification of categories of construction that can be expected to have different emission characteristics (e.g., highway, commercial, housing)
- Characterization of factors that impact construction emissions (e.g., meteorological parameters, regional differences in construction, soil types, economic conditions)
- Development of a methodology to estimate county-level emissions of fugitive dust from construction activities

This report is organized as follows. Section 2 provides information on the calculation of PM_{10} and $PM_{2.5}$ components of fugitive dust and exhaust emissions generated during construction operations. Section 3 identifies the categories of construction that are believed to have different dust emitting characteristics and levels of activity and in turn produce different amounts of PM emissions. Section 4 presents existing methodologies used to calculate PM_{10} emissions from construction activities. Section 5 presents an assessment of the California methodology and the NET methodology, recommended changes to the Trends procedure, an updated methodology for calculating emissions for the county-level on a national basis, and a review of the data sources needed to develop such an inventory.

Section 2.
PM Emissions from Construction Activities

Particulate matter emissions from construction activities are produced from equipment exhaust (primarily from diesel-fueled engines), equipment travel and activity on unpaved surfaces, on-site material handling operations (e.g., temporary on-site crushing/screening), and track-out of dirt onto adjacent paved roads with subsequent resuspension by traffic. Equipment exhaust emissions consist of finer, combustion aerosols, while fugitive dust emissions consist mostly of coarser crustal particles.

Conditions that influence construction PM emissions include equipment type, size, and travel speed; engine type, size, and load; soil type and moisture content; and wind conditions. For example, exhaust emissions are high when excavating soil and engines are under load; fugitive dust emissions are high when dry surface dust is disturbed and suspended by construction equipment travel.

A wide variety of equipment classes, sizes, and engine types are used in construction activities. Construction equipment includes motor graders, trucks, scrapers, and other equipment types. General construction equipment is outlined in Table 2-1.

Table 2-1. Types of Construction Equipment

Motor graders	Trucks	Scrapers
Loaders (track- and wheel-type)	Tractors (track- and wheel-type)	Excavators (track- and wheel-type)
Road wideners	Compactors (pneumatic and vibratory)	Road reclaimers/ Soil stabilizers
Windrow elevators	Cold planers	Power shovels

2.1 Information Sources—Construction Activity Levels

Many data sources are available that provide construction statistics for the national, regional, state, and county levels. This study identified information sources that can be used to develop a county-by-county inventory of PM emissions associated with construction activities. The available information sources determine the form of methodology that is used to develop the inventory.

Due to variations in the type of data that local governmental agencies can provide (construction permits and/or compiled local construction data), methods for determining construction activity levels differ by area. Many areas have high quality measures of construction activity levels resulting from local government requirements for construction permitting; however, only lower quality (less resolved) data may be available for other areas.

Two widely used references for national construction statistics are the F.W. Dodge Reports published by McGraw Hill, Inc. and the U.S. Bureau of Census, Construction Statistics Division. The F.W. Dodge Group publishes the monthly Dodge Construction Potentials Bulletin, and the Dodge Local Construction Potentials Bulletin providing the dollar value spent on various types of construction and also the number of buildings constructed. Annual reports and other supporting databases are also available from F.W. Dodge. All information is provided for a fee. The U.S. Bureau of Census publishes yearly the Statistical Abstract of the United States. This publication includes statistics on various aspects of construction. The Census of Construction Industries Division produces monthly statistics on construction activities including the number of housing starts. Most information from the F.W. Dodge group and the U.S. Census Bureau is available on a state basis.

Transportation statistics are published yearly by the Federal Highway Administration (FHWA) in *Highway Statistics*. The publication includes roadway characteristics and extent along with other roadway statistics. The data provided by the FHWA is useful in determining the new miles of roadway constructed on a yearly basis.

2.2 Information Sources—Construction Emission Factors

Two chapters of the U.S. EPA handbook, "Compilation of Air Emission Factors" [AP-42][1] apply to particulate matter emissions from construction activities. Chapter 7 relates to emissions from the mineral products industry, including construction aggregate processing and crushed stone processing. Chapter 13 contains relevant emission factors for prescribed burning, unpaved road traffic, aggregate handling and storage piles, industrial wind erosion, abrasive blasting, and explosives detonation. Section 13.2.3, "Heavy Construction Operations," contains PM emission factors specifically for emissions from heavy construction. Exhaust emissions contains emission factors from diesel-fueled construction equipment are separately estimated using EPA's NONROAD model.

2.3 Emission Calculations

Emissions from construction operations are related to three phases of a project. Demolition and debris removal includes removal of old structures or brush collection and transport/burning. Site preparation involves cut-and-fill, grading, and compaction activities (i.e., all earthmoving operations). General construction includes material handling operations for construction of structures and roads. Under some local PM estimation methodologies, construction equipment activity is allocated to road construction, building construction, and miscellaneous land-moving operations. Emissions are calculated for specific periods and time intervals. Inventories can be developed for annual, seasonal, monthly, and for worst-case, twenty-four hour periods.

Estimates of PM_{10} and $PM_{2.5}$[a] emissions from construction activities are developed using emission factors, activity level (source extent) data[b], and control efficiencies (if applicable). Historically, the primary emission factor for construction activities has been:

$$e = 1.2 \text{ tons/acre/month of activity}$$

This factor was based on early (i.e., 1970's) upwind/downwind tests of construction site impacts on ambient particulate levels. It refers to total suspended particulate (TSP) matter emissions represented by particles no greater than 30 μm in aerodynamic diameter.

Additional emission factors for earthmoving and other activities associated with construction operations can be borrowed from other AP-42 chapters, but certain differences exist between construction operation emissions and emissions from other fugitive dust sources. These additional factors were derived from field testing using the MRI exposure (plume) profiling method that determines the downwind transport of PM flux. Consequently, these emission factors combine exhaust with fugitive dust emissions. PM emission factors for fugitive dust are available in AP-42 Chapters 7 and 13 and are related to soil silt and moisture contents.

Emission factors for PM from construction equipment exhaust are available in the NONROAD model produced by EPA, Office of Mobile Sources (OMS), and are related to engine type, size, and load. The EPA OMS has developed a second draft of the NONROAD Emission Inventory Model. The NONROAD model calculates emissions of criteria and HAP pollutants, including PM emissions.

Control efficiency data for construction equipment engines is built into the NONROAD model for future diesel engine rules that will affect PM emissions. Control efficiencies for fugitive dust are published in AP-42 and are primarily related to watering or chemical suppression of surface soils at construction sites.

2.4 Factors Influencing Construction Emissions

The factors that influence construction emissions represent meteorological parameters, regional construction differences (e.g., basement/no basement for residential housing), soil types, and economic growth. Construction activity is related to climate, terrain, and economic conditions. For example, residential foundations differ between northern and southern states in the U.S. (e.g., fewer basements are excavated in southern states). Regional terrain and soil variations are also important (e.g., highway construction in mountains, or rocky vs. silty soils).

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[a] PM_{10} and $PM_{2.5}$ refer to particulate matter no greater than 10 μm and 2.5 μm in aerodynamic diameter, respectively.

[b] In most cases emissions are proportional to activity level.

Regional economic cycles in the construction industry impact construction PM emission inventories. The factors that will cause the highest activity levels for construction are low real interest rates, increasing economic growth, and some need for housing and commercial structures (population growth is a strong predictor of need). A prediction of future emissions must rely on economic and demographic forecasts for the inventoried area.

Construction activity also varies temporally according to meteorology (rainfall stops work), climate (unfavorable winter conditions impact work schedules), soil characterization (compacted, rocky areas slow construction), workforce availability (labor disputes halt construction), and economic conditions (effective demand).

Effective demand is defined as the combination of need for structures and roads, and affordable resources (capital). Several socioeconomic forces affect the need for construction, and are likely to impact regions and sub-regions unequally. Residential construction is driven by localized population growth, low interest rates, and the quality of current housing; on the other hand industrial construction is driven largely by economic growth. In turn, highway construction is frequently driven by new residential and commercial/industrial construction.

Section 3.
Categories of Construction

Construction activities can be distinguished by three classes: (1) road construction, (2) residential construction, and (3) nonresidential construction. Each is discussed below to show the variations in emission producing activities.

3.1 Road Construction

Road construction includes the building of new roadways from all the functional classes. The FHWA divides roads by purpose, lane width, number of lanes, surface type, location (including urban, rural, state), and other roadway characteristics. The characteristics of roadways vary depending on the type of roadway being constructed.

The road characteristics along with the new miles of roadway built on an annual basis are used to determine the land area that is affected by construction for the type of road being built. The three primary functional classes, arterials, collectors, and local roads, vary in width, lanes, and may have further variations depending on whether the road is located in an urban or rural area. Four divisions of roadways were made by functional class and demographic type in order to group the roads by similar characteristics.

3.2 Residential Construction

The construction of houses and apartment buildings is included as a separate category than other building construction primarily because of the statistics available for residential construction. Statistics are available for the number of housing units constructed and also the value of the construction.

Another variation is the level of activity that occurs at a residential construction site as compared to other forms of building construction. Housing construction does not normally require a large amount of earthmoving and occurs during a shorter time period, producing less emissions per unit area than would be seen at a nonresidential construction site. Apartment building construction lasts longer than housing construction.

3.3 Nonresidential Construction

Office buildings, warehouses, manufacturing facilities, schools, public works, and hospitals are all included in nonresidential construction. Construction on nonresidential sites is normally more involved and lasts longer than housing construction. It varies in the amount of earthmoving that takes place but most nonresidential construction impacts a similar amount of land on a per dollar basis.

3.4 Other Construction

Almost all construction activity can be included in either road, residential, or nonresidential construction. Public projects in which a large amount of earthmoving and building activity occurs (e.g., an expansive project such as a stadium or airport), should be considered separately and emissions should be estimated using detailed construction data from the engineering plans.

Section 4.
Existing Methodologies for Estimating Construction Emissions

Many methodologies have been developed to calculate PM emissions from construction activity. The basic limitations to developing a construction emissions methodology are how to estimate the level of activity that occurs at a construction site and what emission factor is appropriate to use to calculate PM emissions.

Two basic approaches are used in collecting data for the development of emission inventories: (a) "top down" methodology; and (b) "bottom up" methodology. The "top down" method uses national and state data resources to estimate activity levels that are multiplied by general emission factors to calculate emissions for a large region. The calculated emissions are then apportioned to more resolved areas, such as county and sub-county levels using surrogate activity level data, such as population or affected land area. The "top down" method for estimating construction operation emissions uses a single-valued, composite emission factor of 1.2 tons TSP/acre/month, multiplied by estimated acres of construction (derived from construction cost data) and an average duration for construction. The "top down" method is cost-effective, but does not usually provide an accurate reflection of emissions when broken down into the county and subcounty levels.

The "bottom up" methodology may use multiple emission factors (for specific construction phases and activities) and local activity data to calculate emissions. Local data includes equipment population levels, construction permit information, and specific factors that affect construction activity for that area, including construction equipment usage. "Bottom up" methods more accurately reflect the actual construction emissions than is represented using a "top down" method, but are labor-intensive and costly. A "bottom up" emission inventory is preferred for spatial and temporal allocation needed by modeling applications.

Existing methodologies for estimating PM emissions from construction activities are described below and are mostly "top down" methods. Their advantages and limitations are also explained.

4.1 Methodology 1: General "Top-Down" Emission Inventory

Most "top down" emission inventories of PM emissions from construction activities have utilized the current composite AP-42 emission factor as follows:

$$EF_{PM\text{-}k} = k \times EF_{TSP}$$

where: k = fraction of TSP that is PM-k
EF = emission factor, 1.2 tons TSP/acre/month

This emission factor requires only that the activity level (acres of construction and duration of the construction activity) be known for each type of construction. If construction activities are controlled, a fractional control efficiency is utilized:

$$\text{PM-k emissions} = EF_{PM\text{-}k} \text{ x acres of construction x months of activity x } (1 - CE)$$

where: CE = fractional control efficiency

The acres of construction are determined, usually from a published relationship of construction cost to acres disturbed. PM-k emissions are calculated by multiplying the TSP emission factor of 1.2 tons/acre/month by the PM-k/TSP ratio, the total acres disturbed by the construction activity and the months of activity. A control efficiency may be applied to reduce emissions.

For example, the PM_{10} emissions inventory for the Southern California Air Quality Management District's (SCAQMD) 1991 and subsequent 1994 Air Quality Management Plan used a PM_{10} emission factor of 0.31 tons/acre/month. This factor was based on the TSP emission factor of 1.2 tons/acre/month, a PM_{10} /TSP ratio of 0.52 (SCAQMD, 1991 and 1994), and a 50% emission reduction to account for watering as a dust control measure.[2]

The ratios of PM_{10} /TSP and $PM_{2.5}/PM_{10}$ are important because of their use to project PM_{10} and $PM_{2.5}$ emissions from TSP estimates. A typical ratio of 0.30 is used for PM_{10} /TSP. The *Criteria Document for Particulate Matter* (USEPA, 1996)[3] indicates a ratio for $PM_{2.5}/PM_{10}$ of approximately 0.15 for construction sites in Fresno, California. Other laboratory and field tests have indicated ratios of crustal $PM_{2.5}$ to PM_{10} in the range of 0.05 to 0.20, and are documented by Cowherd and Kuykendal.[4] They recommended a $PM_{2.5}/PM_{10}$ ratio of 0.15 for construction operations because of the typical dominance of unpaved road emissions.

The information on the acres of land disturbed by construction activity can be obtained from local government agencies and regional planning councils. Building permits usually specify the area of land and/or the cost of the construction. Permits are typically issued by city or county governments and require different levels of activity information.

The duration for an individual construction activity is likely to be identified in the building permit. An average duration can also be estimated using the MRI-developed values of 6 months for residential, 11 months for nonresidential, and 18 months for non-building construction.[5] Construction activity information can also be obtained from two major national sources, the U.S. Bureau of Census and from the McGraw-Hill Construction Information Group's *Dodge Construction Analysis System*, an on-line service that provides monthly-updated construction data for a fee.

The disturbed area can be determined by using the cost of the construction activity and published conversion factors for several construction types. This simple method uses the aggregated cost of construction in an area which is available from the U.S. Bureau of Census, Construction Statistics Division or from the U.S. Census Bureau's annual publication, *Privately Owned Construction Authorized by Building Permits*. The dollars-to-acres conversion factors are presented in Table 4-1 and are from the MRI report, *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites.*[5]

Table 4-1. Construction Dollars-To-Acres Conversion Factors (MRI, 1974)[5]

SIC code	SIC description	Factor (acres/$\$10^6$)
1521	General Contractors-Single-Family Houses	5
1522	General Contractors-Residential Buildings, Other Than Single-Family	5
1531	Commercial, Institutional, Manufacturing, and Industrial Buildings	5
1541	General Contractors- Industrial Buildings and Warehouses	5
1542	General Contractors- Nonresidential Buildings, Other than Industrial Buildings	5
1611	Highway and Street Construction, Except Elevated Highways	25
1622	Bridge, Tunnel, and Elevated Highway Construction	25
1623	Water, Sewer, Pipeline, and Communications and Power Line Construction	5
1629	Heavy Construction; Non-building Structures Construction	150

Reference: Cowherd, Chatten, Christine Guenther, and Dennis Wallace. *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites*. EPA-450/3-74-085, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1974.

Acres under construction, if obtained from construction cost data, are usually temporally resolvable only to a monthly level. It is possible to extrapolate to a daily emission estimate by dividing either annual or monthly emission estimates by the appropriate number of workdays in a month.

Table 4-2 identifies the original data resources used by MRI for the estimation of construction activity variables to support the methodology developed in 1974 for estimating county-by-county construction activity levels and emissions. Annual TSP emissions were estimated by MRI by determining the average construction duration (in months) for each type of construction and multiplying by the monthly emission estimate.

Table 4-2. Estimation of Construction Emissions—National Inventory by MRI

Variable	Data resource
Statewide dollars spent on construction	U.S. Bureau of Census, *Census of Construction 1972.*
Dollars-to-acres conversion factors	Developed by MRI using *Census of Construction 1972.*
County acres under construction	U.S. Bureau of Census, *Census of Construction 1972,* construction employment data.
Average duration of construction	Developed by MRI economists; 6 months for residential, 11 months for nonresidential, and 18 months for nonbuilding construction.

Reference: Cowherd, Chatten, Christine Guenther, and Dennis Wallace. *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites.* EPA-450/3-74-085, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1974.

Summary. Using a composite emission factor of 1.2 tons TSP/acre/month is believed to overestimate PM_{10} emissions from construction activities. The emission factor assumes all construction produces emissions at the same level on a per acre basis. The indicator for the level of activity that occurs at construction sites, dollar value of construction, is a good indicator of activity but conversion factors may not be accurate for converting dollar value to acres for all types of construction. The emission factor and the conversion factors were developed in 1974 and require changes to reflect current construction activity and economic factors.

4.2 Methodology 2: NET Inventory

E.H. Pechan and Associates based the National Emission Trends (NET) inventory methodology on the general methodology developed by MRI in 1974 for a national inventory to estimate construction PM_{10} emissions. The activity level is acres under construction and is estimated using construction expenditures by SIC code. The NET methodology is described below, and differences from the MRI method (described in Section 4.1) are identified.

Section 4.8.2.7.1, "Construction Activities," of the *National Air Pollution Emission Trends Procedures Document for 1900-1996*[6] gives the calculation methodologies for PM_{10} emissions from construction activities for the years 1985 through 1996 and includes $PM_{2.5}$ emissions for 1990 through 1996. In a manner patterned after Methodology 1, emissions were calculated from the AP-42 composite emission factor, an estimate of the acres of land under construction, and the average duration of construction activity. The acres of land under construction were estimated from the dollars spent on construction.

The 1985 through 1989 emission calculation procedure incorporated the general AP-42 emission factor for determining PM_{10} emissions for construction activities during that time period:

$$E = T \times \$ \times f \times m \times P$$

where	E	=	PM_{10} emissions
	T	=	TSP emission factor (1.2 tons/acre)
	\$	=	Dollars spent on construction (\$ million)
	F	=	Factor for converting dollars spent on construction to acres of construction (varies by types of construction, acres/\$ million)
	M	=	Months of activity (varies by type of construction)
	P	=	Dimensionless PM_{10}/TSP ratio (0.22)

The 1990 through 1995 emission calculation procedure used the same basic equation but also accounts for a control efficiency level and calculates both PM_{10} and $PM_{2.5}$ emissions:

$$E = P \times \$ \times f \times m \times (1\text{-}CE)$$

where	E	=	PM emissions
	P	=	PM emission factor (tons/acre of construction/month of activity) ($PM_{10} = 0.11$; $PM_{2.5} = 0.022$)
	\$	=	Dollars spent on construction (\$ million)
	F	=	Factor for converting dollars spent on construction to acres of construction (varies by type of construction, acres/\$ million)
	M	=	Months of activity (varies by type of construction)
	CE	=	Fractional control efficiency

Estimates for the dollars spent on various types of construction by EPA region for 1987 were obtained from the Census Bureau. The fraction of the total U.S. dollars spent in 1987 for each region for each construction type was calculated. Since the values from the Census Bureau are only available every five years, the Census dollars spent for the United States for construction were normalized using estimates of the dollars spent on construction for the United States as estimated by the F.W. Dodge Corporation for other years. This normalized Census value was distributed by region and construction type using the previously calculated fractions.

Construction acres were calculated using the proportionality developed by MRI between the number of acres and the dollars spent on that type of construction.[5] This information (proportioned to constant dollars using the method developed by Heisler)[7] was utilized along with total construction receipts to determine the total number of acres affected by each type of construction type. Estimates of the duration (in months) for each type construction were derived by MRI, from its 1974 report.[5]

The PM_{10}/TSP ratio for construction activities was derived from MRI research studies. Pechan used PM_{10}/TSP ratios for 19 test sites for three different construction activities presented in Table 9, "Net Particle Concentrations and Ratios" from the MRI Report "Gap Filling PM_{10} Emission Factors for Selected Open Area Dust Sources."[8] This report suggests averaging the ratios for the construction activity of interest. Since Pechan was looking at total construction emissions, the average PM_{10}/TSP ratios for all test sites were calculated and used for the

PM_{10}/TSP ratio. The PM_{10} emission factor 0.11 tons/acre/month is from the Best Available Control Method (BACM) Report, *Improvement of Specific Emission Factors.*[9] A particle size adjustment of 0.2 was used to convert PM_{10} to $PM_{2.5}$ emissions, after a review of $PM_{2.5}/PM_{10}$ ratios between EPA, Pechan, and MRI.[6] For the 1995 and 1996 NET inventories, the control efficiencies used for PM_{10} and $PM_{2.5}$ were 62.5 and 37.5 percent, respectively. No detail was provided on the rationale for the control efficiencies. [Note: MRI has reviewed past test data and found that the efficiency of watering, as a dust control method, is not related to the particle size fraction (i.e., the control efficiency should be the same for both PM_{10} and for $PM_{2.5}$).]

For the 1996 NET inventory, construction fugitive dust emissions were calculated from the composite TSP emission factor prepared by MRI for EPA, with default EPA correction parameters and 1996 Bureau of Census data. Controls were applied.[10] The total emissions are then allocated to the county level by county construction payrolls to develop a county-level inventory. Table 4-3 summarizes the Pechan methodology to develop NET emissions from construction activity.

Table 4-3. Estimation of Construction Emissions—EPA National Emission Trends Analysis by E.H. Pechan and Associates

Variable	Data resource
Statewide dollars spent on construction	U.S. Bureau of the Census, *Census of Construction Industries,* 1987, and F.W. Dodge/McGraw Hill, Inc. construction data (published annually).
Dollars-to-acres conversion factors	Midwest Research Institute, *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites,* November 1974.
Average duration of construction	Midwest Research Institute, *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites,* November 1974.

Reference: Barnard, William R., Allan Dean, and Patricia M. Carlson. *Evaluation of Fugitive Dust Emission Data, Draft Report,* E.H. Pechan & Associates, October 11, 1992.

Summary. The NET Inventory uses a "top-down" methodology and uses dollar value of construction as an indicator of activity level. The dollar value is found for nine EPA regions, and then emissions are allocated to the county level using county construction employment payrolls. The allocation does not give a good estimate for the actual county construction emissions because total emissions for the nine regions are divided among over 3,000 counties. The dollars-to-acres conversion factors based on 1972 dollars have been changed to reflect current dollar value and give a better estimate of acres disturbed. The 1996 NET Inventory uses an updated emission factor for construction activity and provides a better estimate of total PM_{10} emissions.

4.3 Methodology 3: California Emission Inventory Procedure

The methodology used in the *Emission Inventory Procedural Manual, Volume III, Methods for Assessing Area Source Emissions*[11] by the California Air Resources Board (CARB) is similar to the NET methodology, but calculates residential acreage by unit rather than cost and estimates for cost and number of units are from county sources.

The California manual's Section 7.7, "Building Construction Dust" presents a methodology for calculating construction emissions from fugitive dust using the same emission factor as used in the NET method plus a worst-case emission factor for heavy construction areas. The emission factors used are from a 1996 MRI report[9] in which an emission factor was developed using field test observations from eight construction sites in Las Vegas and California. The factors account for both exhaust emissions and fugitive dust emissions and do not account for any control measures, as is standard for all AP-42 construction emission factors.

Because acres under construction are not readily available for a geographic region, it must be estimated from either the value of construction or the units under construction. The CARB methodology uses an acreage per dollar conversion factor and an acreage per unit conversion factor to estimate total acres under construction. Residential construction acres are estimated on an acres/unit basis with single-unit residential construction having a factor of 1/5 acre/unit in rural areas and 1/7 acre/unit in urban areas. The factor for multi-unit residential construction is estimated at 1/20 acre/living unit. Commercial construction is estimated to affect 3.7 acres for every $1 million valuation. Likewise, industrial construction has a factor of 4.0 acres/$1 million valuation, and institutional construction a factor of 4.4 acres/$1 million valuation. The California methodology assumes that the emission factor includes the effects of typical control measures[11] even though the MRI report lists the factors as uncontrolled.[9] The procedure manual assumes a 50% control efficiency and recommends doubling the factor for areas in which watering is not used to control fugitive dust. Table 4-4 provides the estimates for the activity variables used in the California methodology.

Table 4-4. Estimation of Construction Emissions—California Methodology

Variable	Data resource
Residential construction acres	Uses default for acres/residential unit: 1/7 acre for single-unit residences in urban areas, 1/5 acre for single-unit residences in rural areas, and 1/20 acre/unit for multi-unit residences.
Nonresidential construction acres	Uses default values for acres/$1 million of construction. The factors for commercial, industrial, and institutional are 3.7, 4.0, and 4.4 acres/$1 million, respectively.
Construction duration	Uses default value of 6 months for single or multiple residential units and 11 months for commercial, industrial, and institutional construction.

Reference: Countess, Richard and Susan. PM_{10} Fugitive Dust Integration Project. South Coast AQMD Contract 96091, July 1996.

The California emission inventory includes a second section for calculating emissions from road construction. Section 7.8, "Road Construction Dust," uses the same emission factors from the BACM Report but uses different activity level indicators to find acreage disturbed. Road construction is divided into freeways, state highways, and city and county roads. The area affected is calculated from the miles of road built and the number of lanes, lane width, and shoulder width. The number of lanes, width per lane, and shoulder width are estimated for each type of roadway and from these estimates an area per mile factor is determined. The values determined in the California procedure are 12.1 acres per mile for freeways, 9.2 acres per mile for highways, and 7.8 acres per mile for city and county roads. All road construction is assumed to last 18 months.

The CARB uses a new computerized model, OFFROAD, to develop emission inventories of PM from construction equipment exhaust activities.

Summary. The CARB methodology uses housing units as an indicator of activity level for residential construction and dollar value for nonresidential construction. The dividing of the construction types and the conversion factors used in the California methodology give a higher level of accuracy to the estimate for the acres of land disturbed by construction. The CARB methodology indicates that the emissions calculated are for fugitive dust only and the OFFROAD model is used to estimate the construction equipment exhaust component. However, the emission factors used in the California methodology were derived from site testing, which includes both exhaust and fugitive dust. Thus the total PM emissions calculated by CARB for construction may be too high if both the Area Source Methodology and the OFFROAD model are used.

4.4 Methodology 4: National Particulate Inventory—Phase I

A national, county-level emission inventory of primary particulate (PM_{10} and $PM_{2.5}$) was prepared by E.H. Pechan and Associates under direction of EPA's Office of Policy, Planning, and Evaluation (OPPE). The National Particulate Inventory (NPI) projected emissions to the Year 2005 and utilized a methodology based largely on the methods used to develop the 1990 Interim Inventory, the NET inventory, and the 1985 NAPAP inventory.[12] Details of the methods were documented in a report to OPPE[13] and summarized in a paper presented at the 1997 A&WMA annual meeting.[12]

The methodology to estimate emissions from construction activities used the composite TSP factor of 1.2 tons/acre/month combined with ratios of PM_{10}/TSP and $PM_{2.5}$/PM_{10}. The ratios were stated to be derived from averages measured for three different construction activities at 19 sites.[12]

The activity level associated with the TSP factor is acres of land affected by the construction activities. Activity level data for development of the NPI, in acres, were obtained for states in each EPA Region from construction cost in the regional states. Construction cost date was used to find acres disturbed by using the same methodology as the NET Inventory.

State level emissions were allocated to county levels using construction payrolls from the *County Business Patterns* database, which provides county, state, and national level business data for 1977 to 1995. Statistics include number of establishments, payroll (annual and quarter), number of employees, and number of establishments by size class for 2-digit SIC industry groupings. The construction payroll data are collected annually by the Bureau of the Census.

Summary. The National Particulate Inventory follows the same methodology as the NET inventory and uses interim inventories to make future projections up to the Year 2005 for the emissions produced by construction activity.

4.5 Methodology 5: Regional Emission Inventories

The AP-42 Section 13.2.3, "Heavy Construction," provides emission factors for estimating site-specific construction emissions for specific construction phases (demolition, site preparation, etc.). This effort requires knowledge of the type and duration of construction phases that occur at each individual site. Examples of regional emission inventories of construction activities are presented below, as originally prepared for the MRI 1993 report, *Activity Levels of PM_{10} Area Source Categories Methodology Assessment and Improvement.*[14] These approaches demonstrate the use of local sources of construction activity level data.

4.5.1 San Joaquin Valley (SJV)

Activity levels could not be evaluated from the emission inventory report to the San Joaquin Valley Unified Air Pollution Control District PM_{10} Nonattainment Area Plan, prepared by Aerovironment, Inc., Monrovia, California, November 1991. The documentation of activity levels was not included in the report. Section 3 of the report presents results from a 1990 emission inventory, citing that calculations were performed by the CARB. Appendix A of that report presents the data from the CARB-developed emission inventory for the San Joaquin Valley. Appendix C of the report presents the only description of methodology, saying "the documentation of CARB methodology used for emissions inventory calculations was inadvertently omitted from the appendices attached to the 1991 PM_{10} Attainment Plan and accompanying this document. ARB has determined appropriate procedures for calculating each emissions inventory category." The SJV activity levels estimates are shown in Table 4-5.

Table 4-5. Estimation of Construction Emissions—SJV Methodology

Variable	Data resource
Areas under construction	CARB methodology was specified, but data sources not indicated.

Reference: San Joaquin Valley Unified Air Pollution Control District PM_{10} Nonattainment Area Plan, Aerovironment, Inc., Monrovia, CA, November 1991.

4.5.2 South Coast Air Quality Management District (SCAQMD)

The SCAQMD used the composite AP-42 TSP emission factor for construction activities in southern California. Activity data were presented in an MRI document[15] that determined total disturbed acres using the CARB methodology. Section 7-3, "Building Construction," presents ratios of construction units or valuation to acres of construction for residential, commercial, industrial, and institutional categories.

The number of construction units and value of construction were determined from the U.S. Census Bureau's annual publication, *Privately-Owned Construction Authorized by Building Permits*. It should be noted that U.S. Census Bureau data applies only to private construction. Public construction works such as a city convention center, airport, or similar public works are not included. The SCAQMD methodology is summarized in Table 4-6.

Table 4-6. Estimation of Construction Emissions—SCAQMD Methodology

Variable	Data resource
Units constructed and Value of construction	U.S. Census Bureau, *Privately Owned Construction Authorized by Building Permits* (an annual publication).
Acres under construction	CARB Area Source Methodology, Section 7-3 Building Construction; ratios of units or valuation to acres under construction.
Construction duration	Used CARB defaults for months of construction.

Reference: Phil J. Englehart and Gregory E. Muleski. *Open Fugitive Dust PM_{10} Control Strategies Study*, Midwest Research Institute: Kansas City, MO, October 12, 1990.

Data are available for SIC 47457-residential; 47365-commercial; 47373-industrial; and 54551-institutional construction.

A revised and more comprehensive emission inventory of SCAQMD construction sources was prepared by Richard and Susan Countess in their 1996 report, *PM-10 Fugitive Dust Integration Project*.[2] This report presented two useful tables for preparation of emission inventories. Table 4-7 shows a breakdown of construction activities and recommended that individual AP-42 emission factors be used when the required activity levels are known—rather than using the composite AP-42 TSP emission factor of 1.2 tons/acre/month. The recommended emission factors account for silt and moisture content, average wind speed, average vehicle speed, the number of vehicles, and climate.

Table 4-7. AP-42 Recommended PM_{10} Emission Factors for Construction Operations

Phase	Activity	AP-42 recommended emission factor reference	PM_{10} emission factor[1] (uncontrolled emissions)	Units
1. Demolition and debris removal	2. Demolition of buildings and natural obstacles			
	Mechanical dismemberment	NA	NA	
	Implosion of structure	NA	NA	
	Drilling/blasting soil	Drilling Factor in Table 11.9-4	1.3	lb/hole
	General land clearing	Dozer Equation (overburden) in Tables 11.9-1 and 11.9-2	$0.75\ (s)^{1.5}/(M)^{1.4}$	lb/hr
	3. Loading and unloading of debris into trucks	Material Handling Factor in Sec. 13.2.2	$0.0011(U/5)^{1.3}/(M/2)^{1.4}$	lb/ton
	4. Truck transport of debris			
	3a. Unpaved road travel	Unpaved Road emission factor in Sec. 13.2.2	$2.1(s/12)(S/30)(W/3)^{0.7}$ $(w/4)^{0.5}(365\text{-}p/365)$	lb/VMT
	3b. Paved road travel	Paved Road emission factor in Sec. 13.2.2	$0.016(sL/2)^{0.65}(W/3)^{1.5}$	lb/VMT
2. Site Preparation	1. Bulldozing	Dozer Equation in Tables 11.9-1 and 11.9-2	$0.75(s)^{1.5}/(M)^{1.4}$	lb/hr
	2. Scrapers unloading topsoil	Scraper unloading factor in Table 11.9-4	0.04	lb/ton
	3. Scrapers in travel	Scraper (travel mode) expression in Tables 11.9-1 and 11.9-2	$0.0000037(s)^{1.4}/(M)^{2.5}$	lb/VMT
	4. Scrapers removing topsoil	5.7 kg/vehicle kilometer traveled (VKT)	20.2	lb/VMT
	5. Loading/unloading trucks	Material Handling Factor in Sec. 13.2.2	$0.0011(U/5)^{1.3}/(M/2)^{1.4}$	lb/ton
	6. Compacting	Dozer Equation in Tables 11.9-1 and 11.9-2	$0.75(s)^{1.5}/(M)^{1.4}$	lb/hr
	7. Motor grading	Grading Equation in Tables 11.9-1 and 11.9-2	$0.031(S)^2$	lb/VMT
3. General Construction	1a. Travel on unpaved roads	Unpaved Road emission factor in Sec. 13.2.2	$2.1(s/12)(S/30)(W/3)^{0.7}(w/4)^{0.5}$ $(365\text{-}p/365)$	lb/VMT
	1b. Travel on paved roads	Paved Road emission factor in Sec. 13.2.2	$0.0126(sL/2)^{0.65}(W/3)^{1.5}$	lb/VMT

Table 4-7 (Continued)

Phase	Activity	AP-42 recommended emission factor reference	PM_{10} emission factor[1] (uncontrolled emissions)	Units
	2a. Portable plants crushing and screening	Factors for similar material/operations in Section 11 of AP-42	Factors for similar material/operations in Section 11 of AP-42	
	2b. Material transfers	Material Handling Factor in Sec. 13.2.2	$0.0011(U/5)^{1.3}/(M/2)^{1.4}$	lb/ton
	3. Other operations	Factors for similar material/operations in Section 11 of AP-42	Factors for similar material/operations in Section 11 of AP-42	

Note: s = silt content, %; M = moisture content, %; U = mean wind speed, mph; S = mean vehicle speed, mph; W = mean vehicle weight, tons; w = mean number of wheels/vehicle; sL = silt loading, g/m², and p = number of days with at least 0.01" of precipitation.

Because the composite AP-42 emission factor for TSP can provide only a rough estimate of PM_{10} emissions, MRI in their report to SCAQMD recommended alternative emission factors based on four different levels of construction activity knowledge, as seen in Table 4-8 from the report.

Table 4-8. Recommended PM_{10} Emission Factors for Construction Operations[c]

Basis for emission factor	Recommended PM_{10} emission factor
Level 1 Only area and duration known	0.11 ton/acre/month (average conditions) 0.42 ton/acre/month (worst-case conditions)[a]
Level 2 Amount of earth moving known, in addition to total project area and duration	0.011 ton/acre/month for general construction (for each month of construction activity) plus 0.059 ton/1,000 cubic yards for on-site cut/fill[b] 0.22 ton/1,000 cubic yards for off-site cut/fill[b]
Level 3 More detailed information available on duration of earth moving and other material movement	0.13 lb/acre-work hr for general construction plus 49 lb/scraper-hr for on-site haulage[c] 94 lb/hr for off-site haulage[d]
Level 4 Detailed information on number of units and travel distances available	0.13 lb/acre-work hr for general construction plus 0.21 lb/ton-mile for on-site haulage 0.62 lb/ton-mile for off-site haulage[c]

[a] Worst-case refers to construction sites with active large-scale earth moving operations.
[b] These values are based on assumptions that one scraper can move 70,000 cubic yards of earth in one month and one truck can move 35,000 cubic yards of material in one month. If the on-site/off-site fraction is not known, assume 100% on-site.
[c] If the number of scrapers in use is not knows, MRI recommends that a default value of 4 be used. In addition, if the actual capacity of earth moving units is known, the user is directed to use the following emission rates in units of lb/scraper-hour for different capacity scrapers: 19 for 10 yd³ scraper, 45 for 20 yd³ scraper, 49 for 30 yd³ scraper, and 84 for 45 yd³ scraper.
[d] Factor for use with over-the-road trucks. If "off-highway" or "haul" trucks are used, haulage should be considered "on-site".

[c] Some emission factors were revised by Countess based on median rather than mean values.

4.5.3 Phoenix

Construction activity levels for the Maricopa planning area were determined from the document, *PM_{10} Emissions Inventory Data for the Maricopa and Pima Planning Areas.*[16] The Maricopa County Air Pollution Bureau provided information on construction and earth moving permits, allowing location and area size to be tabulated. Information on permits is variable since each local governmental entity in the Phoenix metropolitan area establishes the information needed.

The Maricopa County Bureau of Air Pollution Control prepared a listing with addresses of approximately 1,500 earthmoving permits issued over a one-year period. Using a street atlas, each address for an earthmoving permit was manually located on a map of the inventoried area. Individual earthmoving permits listed the areas of disturbed earth and the lineal feet of trenching. A 20-ft width for each trench was assumed to allow calculation of area (acres for each disturbed site. All construction projects were assumed to have a 4-month duration so that a tons/acre/month inventory could be developed. An emission factor of 900 lb PM_{10}/acre was used, and appeared to be derived from the composite AP-42 TSP emission factor. The Phoenix methodology is summarized in Table 4-9.

Table 4-9. Estimation of Construction Emissions—Phoenix Methodology

Variable	Data resource
Acres under construction	Earthmoving permits from the Maricopa County Bureau of Air Pollution Control and the Pima County Air Quality Control District. Street addresses on permits were used to geographically map construction areas; approximately 1,500 permits had to be addressed. The permits listed acres of disturbed land and lineal feet of trenching; it was assumed that the disturbed width of trenches was 20 ft.
Construction duration	All construction projects were assumed to have a 4-month duration so that a tons/acre/month emission rate could be developed.

Reference: Donald R. Holtz. PM_{10} Emissions Inventory Data for the Maricopa and Pima Planning Areas, Engineering-Science; Pasadena, CA, January 1987.

4.5.4 Power/Bannock Counties

Construction-related emissions in an Idaho PM-10 nonattainment area were divided into (1) residential and commercial construction, and (2) road construction by Moore and Balakrishna.[17] They used AP-42 emission factors for construction activities, but devised unique ways to apportion emissions to smaller county areas (grid cells) for modeling purposes.

Residential and commercial construction activities were allocated to specific cells using U.S. Census tract data. Households were divided into low-, medium-, and high-growth areas, excluding urban areas. The numbers of households in each growth area were totaled and then divided by the total number in all three growth areas to obtain the percentage of households in each area. It was assumed that this percentage also applied to the number of construction events, and subsequently the percentage of emissions from construction. The calculated emissions for each growth area were divided equally among the total number of cells in each growth area.

Road construction activities were divided into (1) graveling, (2) rebuilding, (3) paving, and (4) sealing. Each activity was defined in terms of actual "road miles of construction" and "width" of the roads under construction. Road miles were multiplied by the road width that resulted in total acres of road being constructed. For road paving and sealing, the emission rate [factor] was reduced to half that of road graveling and rebuilding.

4.5.5 Las Vegas (Clark County, Nevada)

4.5.5.1 1991 Methodology

The 1991 emission inventory methodology began with the composite AP-42 TSP emission factor for construction activity. Activity levels for the Las Vegas, Nevada, nonattainment area were determined using the methodology presented in the document *Air Quality Implementation Plan for the Las Vegas Valley Particulate Matter PM_{10}*.[18] The primary piece of information was the total acres of construction, which was obtained from Topsoil Disturbance Permits from the Clark County Health District. Clark County requires Topsoil Disturbance Permits for land development activities affecting areas of 1/4 acre or more in size. These data are entered into the Clark County Geographic Information System (GIS) to calculate the total number of acres impacted by construction activities. There was no distinction between types of construction for the Las Vegas Valley.

PM_{10} emissions for Clark County were calculated using two components: (a) acres of construction, and (b) an emission factor of 654 lb PM_{10} per acre. A surrogate activity level factor was 1,000 gal diesel fuel/acre of construction, and resulted in a surrogate emission factor of 21.9 lb PM_{10} per 1,000 gal diesel fuel. These factors were "taken from research activities conducted in Arizona," and were not referenced or discussed further in the reviewed document. The 1991 Las Vegas methodology is summarized in Table 4-10.

Table 4-10. Estimation of Construction Emissions 1991 Las Vegas Methodology

Variable	Data resource
Gallons of diesel fuel	Estimate of 1,000 gallons of diesel fuel used in construction per acre of construction impacted land. This estimate was developed from a literature review that was referenced, but not discussed in the document.
Acres under construction	Clark County Health District Top Soil Disturbance Permits issued. Permits are required for any land development activity affecting more than one quarter of an acre. Permit data is entered into Clark County GIS for spatial distribution to each of 16 planning grids.

Reference: Clark County Department of Comprehensive Planning. Air Quality Implementation Plan for the Las Vegas Valley: Particulate Matter PM_{10}, Las Vegas, Nevada, November 5, 1991.

4.5.5.2 1998 Methodology[19]

The 1998 methodology to estimate annual PM_{10} emissions for the year 1995 was improved by staff from Clark County and considered three different sources of emissions during construction operations. "Construction activities" included grading, trenching, crushing, screening, on-site vehicle traffic, blasting, and demolition. A modified BACM[9] Level 1 methodology was used to estimate PM_{10} emissions, and required only the amount of land involved and the duration of the project, as separated into "large" and "remaining" projects. The average time to complete construction projects was defined as the number of months from initial ground breaking to final landscaping and paving.

A recommended BACM emission factor of 0.42 tons/acre/month was used for general construction sites that included cut and fill areas, large-scale earthmoving operations, or heavy traffic volumes. The BACM report also recommended an uncontrolled emission factor of 0.11 tons/acre/month for general construction sites that did not include any cut and fill areas, large-scale earthmoving operations, or heavy traffic volumes. Clark County judged that "remaining" projects (i.e., commercial, public parks, public buildings, residential homes, and miscellaneous) sometimes included cut and fill areas, large-scale earthmoving activities, and/or heavy traffic volumes.[19] Consequently, an average emission factor of 0.265 tons/acre/month [(0.42 + 0.11) / 2] was used for all construction projects other than "large" projects.

A control efficiency of 50 percent was applied because of local watering regulations, and using the control efficiency described in MRI's 1988 study for U.S. EPA OAQPS, "Control of Open Fugitive Dust Sources."[20] The control efficiency was then decreased by the percentage of construction sites implementing dust control, as estimated by air quality compliance officers.

"Track-out" dealt with *increased* paved road dust emissions due to dirt track-out from the construction site onto the adjacent paved street network. Track-out emissions were estimated for each type of construction using an estimated number of access points and vehicle traffic volumes on adjacent paved roadways. The number of access points ranged from 1 per 10 acres to 1 per 30 acres. Traffic that exited the access points was estimated at greater than 25 vehicles per day and corresponded to the associated emission factor. PM_{10} emissions from track-out were based on 13 grams/vehicle times the number of vehicle passes per day on the adjacent paved road, as recommended in the 1988 MRI report for EPA, "Control of Open Fugitive Dust Sources."[20] Traffic on adjacent paved roadways was estimated at 2,157 trips per day and was determined to match those from collector streets. This resulted in PM_{10} emissions of 0.0309 ton/day (except for public parks), from each track-out/access point. A control efficiency of 75 percent was stated to be determined from compliance rates for street sweeping and watering.

"Wind erosion" emissions from land exposed by construction activities were separately estimated. The methodology was based on geometric mean hourly emission rates from disturbed soils within the Las Vegas Valley, as reported in 1996 by David James, "Estimation of PM_{10} Emissions from Vacant Lands in the Las Vegas Valley." Wind speed dependent emission rates in tons/acre/hr were developed for nine wind speed classes (> 15 mph). These rates were adjusted for vegetative cover and for loss of loose surface material in an initial wind "spike." The annual number of hours of wind in each wind speed category for the year was then multiplied by the emission factor in tons/acre/hour of wind. This calculation produced a PM_{10} emission factor of 0.4472 tons/acre for 1995, and was applied to the permitted acres of construction in Las Vegas during that same year.

Summary. Regional emission inventories use more detailed information than is normally available at a national level for estimating county-level construction emissions. The methodologies do provide estimates that can be compared to estimates found using a composite emission factor to determine county-level emissions.

4.6 Methodology 6: Major Construction Project Inventory

A general conformity analysis of construction emissions associated with a major construction project provides a detailed and systematic procedure for inventorying fugitive dust PM_{10} emissions.[21] This large project [presumably for enlargement of an Arizona airport] consisted of seven construction phases: (1) first building; (2) second building; (3) parking lot; (4) fire station; (5) fuel storage facility; (6) maintenance hangar; and (7) large pavement project.

The inventory team used a spreadsheet to organize input data and calculate emission estimates. Data that were available to estimate PM_{10} emissions from the large construction project included:

- Project timelines and activity schedules
- Area and access points to the construction site
- Types of construction equipment
- Characterization of construction activities
- Quantities of material to be moved, crushed, and screened
- Precipitation and wind data
- Equipment speed and miles traveled
- Soil silt fraction and moisture content

The authors of the general conformity analysis stated that "Exhaust emissions associated with the construction activities have not been included." While this is true for generators and other stationary equipment, it is not true for AP-42 emission factors for PM from construction equipment activity. The emission factors for fugitive dust from construction equipment represent both exhaust and fugitive dust emissions because of the source profiling test method used by MRI to develop the AP-42 factors.

Direct PM emissions were estimated from demolition, site preparation, general construction, truck transport of debris, bulldozing, compacting, etc. Indirect emissions from transport and unloading of material to/from the construction site were also estimated. This included VMT estimates for paved road travel both on-site and off-site. Track-out emissions and wind erosion emissions from unpaved surfaces were also estimated. Wet suppression of fugitive dust sources was incorporated into the emission calculations using a control efficiency of 80 percent.

Summary. The detailed inventory done based on "unit-operation" emission factors is useful in determining the accuracy of emissions calculated for different types of construction activity using an emission factor for a specific type of construction and in determining which types of construction activity produce what amounts of emissions.

4.7 Methodology 7: U.S. EPA NONROAD Model

The U.S. EPA Office of Mobile Sources, Assessment and Modeling Division has developed a model for estimating non-road engine exhaust emissions. A second draft version of the NONROAD model was announced May 21, 1999 with the signing of the Tier 2/ Gasoline Sulfur Notice of Proposed Rulemaking. The model is available at http://www.epa.gov/oms/nonrdmdl.htm.

Construction equipment exhaust emissions are calculated using national or state engine population for each equipment/engine type. The engine populations are obtained from the PartsLink database available from Power Systems Research (a commercial source of data), and multiplied by the average power, activity, and emission factors to obtain pollutant emissions. The NONROAD model estimates exhaust emissions under "load" and "no load" conditions. Engine load is related to soil density, cycle time (distance/speed), and pull required (rolling resistance + grade resistance.) The following equation shows how NONROAD calculates emissions.

$$\text{Emissions} = (\text{Pop})(\text{Power})(\text{LF})(\text{UL})(\text{EF})$$

where:
- Pop = Engine population
- Power = Average power of equipment type (hp)
- LF = Load Factor (fraction of available power)
- UL = Usage level (hrs/yr)
- EF = Exhaust emission factor (g/hp-hr)

This equation shows that the NONROAD model uses a multi-parameter activity level combining engine population number with average power, load factor, and usage level. The primary element is the number of engines in an area, distributed by age, power, fuel type, and application. Each equipment/engine type is characterized for usage by horsepower-hours per year, and adjusted for a power load factor. Nationally-averaged horsepower-hours and the relative fraction of maximum available power are used.

The most important data for construction activity levels that are input to the NONROAD model originate from the 1996 PSR equipment population data (PartsLink), and revised population allocation data using the F.W. Dodge construction valuation data. Engine populations are divided into several discreet power levels rather than one average power level for each equipment application. Equipment populations are adjusted using the F.W. Dodge construction valuation data. An engine scrappage rate is assumed and the level of activity is a function of equipment age. The model is flexible and allows a "bottom up" approach with locally-derived estimates for all variables to estimate and allocate emissions from state to counties and sub-counties.

NONROAD input files are integral to the model and provide basic data by state and county that are required to calculate emissions: exhaust emission factors, base year equipment population, activity levels, load factor, average lifetimes, scrappage rates, growth estimates, and geographic and temporal allocation algorithms. Default values are provided in these input files, but the user can replace the default data with better information, either from EPA for national defaults or from local sources for locality-specific data. The input files can also be modified to test control strategies.

The NONROAD model can estimate current year emissions for a specified geographic area as well as project future year emissions and backcast past year emissions. Emissions can also be calculated for time periods—an entire year, one of the four seasons, or any particular month. The emissions are then temporally and geographically allocated using appropriate allocation factors.

One of the current shortfalls of the NONROAD model to predict emission estimates for construction activities is that the model accounts for only exhaust emissions from construction equipment. A simple correlation of fugitive dust emissions with exhaust emissions is not possible. For example, construction equipment will be under load at the earth cutting location and will emit high levels of exhaust emissions, but little fugitive dust will be generated because of typical sub-grade high moisture content. As the loaded equipment travels to the fill location, high levels of fugitive dust will be emitted from the exposed ground but the equipment may not emit high levels of exhaust emissions.

An EEA report of 1997 developed data on construction employees to scale equipment population as a function of construction employees, but this method did not include all types of construction activity. Sierra Research, SAI, ENVIRON, and the Texas Transportation Institute also have examined and used survey methods for obtaining information on construction equipment usage for input to the NONROAD model. Survey data of current construction projects were needed to provide location-specific data on a daily level.

The EPA model, PART5, was developed by the Office of Mobile Sources (OMS) to estimate PM emissions from only onroad vehicles, and is discussed here for background information and comparison of vehicle emission estimation methodologies. The name indicates consistency with the MOBILE5 model used to calculate emissions of other pollutants from onroad vehicles.

PART5 uses PM emission factors for direct and indirect sulfate, and carbon (soluble organic fraction and remaining carbon portion) to calculate exhaust emissions. Road dust, tire wear, and brake wear emissions are also calculated. The PART5 program uses VMT to calculate PM emissions in gram/mile. VMT data are obtained using onroad travel statistics available from local survey information maintained by state and local transportation agencies and assembled by the FHWA. VMT data are not collected for non-road sources, such as construction equipment.

Summary. The NONROAD model estimates PM emissions only from construction equipment exhaust. The model is useful to determine the exhaust emission component of the total emissions calculated using the AP-42 emission factor that includes both suspended dust and exhaust PM. The PART5 model does not apply to construction activities because it estimates vehicle exhaust emissions from onroad vehicles only.

Methodologies 1 through 6 are summarized in Table 4-11.

Table 4-11. Emission Inventory Methodologies

Inventory	Emission Calculation Parameters: Emission Factor	Activity Level Source	Notes
MRI National Inventory, 1974	1.2 tons/acre/month (TSP) AP-42	Construction Dollars and dollars to acres conversion factors(MRI developed factors,1972)	MRI durations of construction: 6 months residential, 11 months nonresidential, 18 months nonbuilding
National Emission Trends	1.2 tons/acre/month (TSP) AP-42 adjusted to PM_{10} and $PM_{2.5}$ PM_{10} = .26	Construction Dollars and dollars to acres conversion factors(MRI factors, adjusted using Heisler's method)	MRI durations: 6 months residential, 11 months nonresidential, 18 months nonbuilding
National Particulate Inventory	1.2 tons/acre/month(TSP), AP-42; used PM_{10}/TSP and $PM_{2.5}$/PM_{10} ratios derived from EPA "Gap Filling PM_{10} Emission Factors for Selected Area Dust Sources"	Emissions and methods derived from 1993 National Emission Trends Inventory	
California Air Resources Board (CARB)	1.2 tons/acre/month (TSP) AP-42 adjusted to PM_{10} and $PM_{2.5}$	Construction Dollars or Number of Units Constructed; CARB conversion factors for dollars to acres and units to acres	CARB Default Values: 6 months residential, 11 months commercial, industrial, and institutional
South Coast Air Quality Management District	0.31 tons PM_{10}/acre/month (based on AP-42 TSP emission factor)	CARB Methodology	CARB Defaults for Construction Duration
San Joaquin Valley	CARB Methodology	CARB Methodology	CARB Methodology
Las Vegas (Clark Co., NV) 1991	654 lb PM_{10}/acre (activity) plus 21.9 lb PM_{10}/1000 gal diesel fuel (equipment)	Top Soil Disturbance Permits for acres disturbed	Conversion of 1 acre of construction impacted land to 1000 gal. of diesel fuel
Las Vegas (Clark Co., NV) 1997	Heavy Construction—0.42 tons/acre/mo.; Other Construction—0.265 tons/acre/mo.; Track-Out—0.0309 ton/day/access pt. (based on traffic volume of 2,157 trips/day) Wind Erosion—0.4472 ton/acre, dependent on 1995 windspeeds	Topsoil Disturbance Permits for acres disturbed; other local data from air quality and metropolitan agencies	See text
Phoenix	900 lb PM_{10}/acre	Earth Moving Permits for acres disturbed	4 months for all construction projects
Power/ Bannock, 1996	1.2 tons/acre/month (TSP) AP-42 recommended emission factor		

Section 5.
Recommended Methodologies and Data Sources

This section presents an improved emission inventory procedure that calculates both exhaust and fugitive dust emissions from construction activities. The recommended procedure provides a balance between a "top-down" inventory and "bottom-up" inventory methodology. PM emissions at the county level are more accurately estimated for different types of construction operations using improved indicators of activity levels.

5.1 Assumptions and Limitations of Current Methodologies

The NET procedure and the CARB methodology both make assumptions and also use estimates that may no longer be applicable because of the date of their development. The NET methodology uses a single, composite emission factor for all types of construction based only on the dollar amount spent on construction. The first assumption is that all construction activity produces the same amount of dust on a per acre basis. The amount of dust produced is not dependent on the type of construction but merely on the area of land being disturbed by the construction. A second assumption is that land affected by construction activity is always affected the same amount, i.e., the methodologies do not account adequately for large scale cut and fill operations. Also, the methodologies are limited in that the conversion factors used to convert dollars spent on construction to acreage disturbed, along with the estimates for the duration of construction activity, were developed by MRI in 1974 and may result in a loss in reliability in calculating emissions.

5.2 Recommended Changes to the NET Methodology

MRI recommends the following changes to the current NET methodology. Following the California methodology, residential construction acreage should be based on the number of units constructed rather than the dollar value of construction. Accounting for the construction of foundations is also seen as a necessary change because of the difference in the amount of dirt moved when constructing a slab foundation as compared to a basement. Highway construction with significant cut and fill operations should be based on the new miles of highway constructed in each county. The control efficiency used in the 1996 Trends inventory for PM_{10} was 62.5% and was 37.5% for $PM_{2.5}$. MRI recommends using a control efficiency of 50% for both PM_{10} and $PM_{2.5}$ for areas in which dust control measures are used. The estimates for the duration of construction activity levels also need to be revised for each construction category.

increase factor to account for sig cut & fill

5.3 General Emission Factor for Construction

Construction emissions can be estimated when two basic construction parameters are known, the acres of land disturbed by the construction activity and the duration of the activity. As a general emission factor for all types of construction activity, MRI recommends using 0.11 tons PM_{10}/acre/month that is based on a 1996 BACM study by MRI prepared for the California South Coast Air Quality Management District (SCAQMD).[9] However, separate emission factors segregated by type of construction activity provide better estimates of PM_{10} emissions and give a more accurate estimate than could be obtained using a general emission factor. Specific emission factors and activity levels for residential, nonresidential, and road construction are described below.

5.4 Residential Construction Emissions

Residential construction emissions are calculated for three basic types of residential construction:

- Single-Family Houses
- Two-Family Houses
- Apartment Buildings

5.4.1 Emission Calculation Procedure

Emissions for housing construction activities are estimated using emission factors from the MRI BACM report.[9] Housing construction emissions are calculated using an emission factor of 0.032 tons PM_{10}/acre/month, (as recommended by the SCAQMD[2]), the number of housing units created, a units-to-acres conversion factor, and the duration of construction activity. The formula for calculating emissions from residential construction is:

$$\text{Emissions} = (0.032 \text{ tons } PM_{10}/\text{acre/month}) \times B \times f \times m$$

where: B = the number of houses constructed
f = buildings-to-acres conversion factor
m= the duration of construction activity in months

Figure 5-1 illustrates the calculation of residential construction emissions.

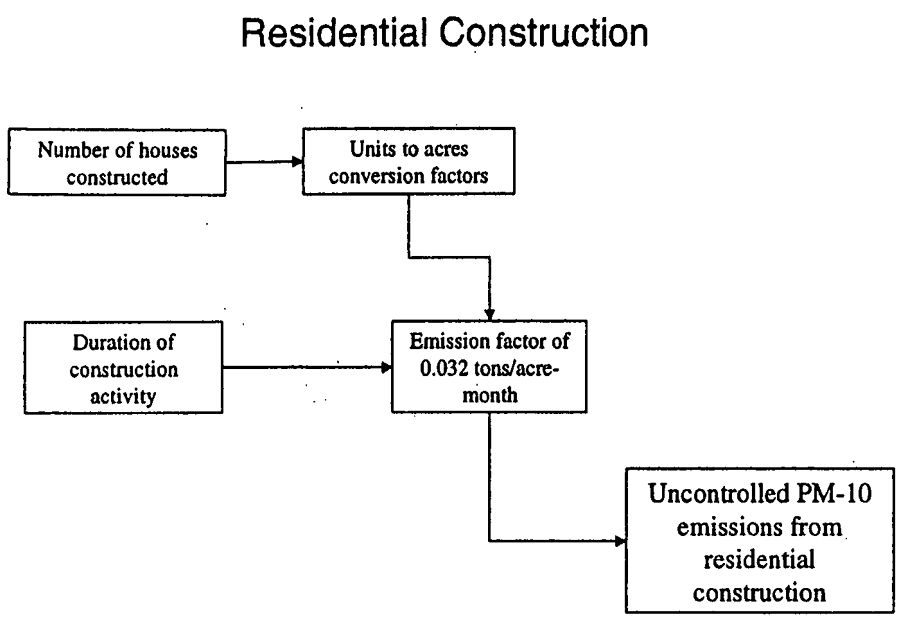

Figure 5-1. Residential Construction Emissions Flowchart

Apartment buildings vary in size, number of units, square footage per unit, floors, and many other characteristics. Since these variations exist and most apartment buildings occupy a variable amount of space, a dollars-to-acres conversion is recommended for apartment building construction rather than a building-to-acres factor. The estimate of 2.0 acres/$\$10^6$ (in 1992 constant dollar value) is recommended to determine the acres of land disturbed by the construction of apartments. The dollars-to-acres conversion factor was updated to a 1992 constant dollar value using the Construction Cost Index found in the annual edition of Statistical Abstract of the United States. A new estimate for the acres under construction per million dollars was developed using the difference in the 1992 index value and an estimated 1974 value. The approximately 40% difference led to an updated factor of 2 acres/$\$10^6$ derived from the original 5 acres/$\$10^6$ developed by MRI in 1974, The emission factor recommended for the construction of apartment buildings is 0.11 tons PM_{10}/acre/month because apartment construction does not normally involve a large amount of cut-and-fill operations.

An alternative formula is recommended for residential construction in areas in which basements are constructed or the amount of dirt moved at a residential construction site is known. The F.W. Dodge reports give the total square footage of homes for both single-family and two-family homes. This value can be used to estimate the cubic yards of dirt moved. Multiplying the total square feet by an average basement depth of 8 ft. and adding in 10% of the cubic feet calculated for peripheral dirt removed produces an estimate of the cubic yards of earth moved during residential construction. The added 10% accounts for the footings, space around the footings, and other backfilled areas adjacent to the basement. The cubic yards of earth moved along with the number of houses constructed can be used with the BACM Level 2 equation (emission factor of 0.011 tons PM_{10}/ acre/month plus 0.059 tons PM_{10}/1000 cubic yards of on-site cut/fill) to calculate emissions for regions in which basements are constructed or a large amount of dirt is moved during most residential construction. The Level 2 equation produces a slightly higher estimate of PM_{10} emissions than would be estimated using the residential construction emission equation.

5.4.2 Data Sources and Assumptions

The information available to determine activity level of residential construction is the dollar value of construction put in place and the number of units constructed. Construction costs vary throughout the United States and residential construction characteristics do not show as much variance as the cost does, so the number of units constructed is a better indicator of activity level. The amount of land impacted by residential construction is determined to be about the same on a per house basis rather than a per dollar basis. The average 2000 sq. ft. home can vary from the low to upper $100,000s depending on where the home is located in the United States. Incorporating a dollars-to-acres conversion factor would give a larger estimate for the acreage of land disturbed even though the construction affects the same amount of land as an area with a lower dollar value for residential construction and vice versa.

The number of housing units constructed by a county or state are available from the F.W. Dodge's "Dodge Local Construction Potentials Bulletin." Housing units are available for the three types of residential construction previously mentioned.

The conversion for single-family housing is estimated to be 1/4 acre per house. The conversion factor was determined by finding the area of the base of a home and estimating the area of land affected by grading and other construction activities beyond the "footprint" of the house. The average home is around 2000 sq. ft. Using a conversion factor of 1/4 acre/house indicates that five times the base of the house is affected by the construction of the home. This estimate is reasonable when considering the amount of grading, cut and fill, and transportion of materials on the property that occurs during residential construction.

The conversion for two-family housing was found to be 1/3 acre per building. The 1/3 acre was derived from the average square footage of a two-family home, around 3500 sq. ft., and the land affected beyond the base of the house, about 4 times the base for two-family residences.

5.4.3 Example Emission Calculation

Table 5-1 presents an example calculation of county-level emissions for residential construction.

Table 5-1. Example Annual PM_{10} Emissions from Residential Construction in a Hypothetical County

Residential type	No. of buildings	Acreage per building	Total Acres disturbed	Duration of construction	Emission factor (tonsPM_{10}/ acre/month)	Uncontrolled PM_{10} (tons)	PM_{10} control efficiency (%)	Controlled PM_{10} (tons)
Single-family	2422	1/4	606	6	0.032	116	0	116
Two-family	48	1/3	16	6	0.032	3.1	0	3.1
Apartment	59	1/2	30	12	~~0.032~~ 0.11	11.3	0	11.3
Total						130		130

A comparison of emission calculations using unit-operation emission factors, the residential construction emission equation, and the BACM Level 2 calculation shows that the Level 2 equation provides a higher estimate of emissions than using the general residential emission factor. The unit-operation emission calculation for bulldozing and grading produces an estimate similar to that from the Level 2 equation. The general residential emission factor calculates PM_{10} emissions from the construction of one single-family home to be 96 lbs/house. The Level 2 equation for a single-family home with a basement produces emissions of 109 lb PM_{10}/house. The emission calculation for bulldozing and grading estimates emissions to 112 lb/house PM_{10} (assuming 10 days of operation, 8% silt content, and 6% moisture content).

The comparison of residential construction emission methods for one single-family home were based on typical parameters for a single-family home:

- area of land disturbed — 1/4 acre
- area of home — 2000 sq. ft.
- duration — 6 months
- basement depth — 8 ft.
- moisture level — 6%
- silt content — 8%

Residential construction emission factor calculations are shown below. The general residential calculation is:

$$0.032 \text{ tons } PM_{10}\text{/acre/month} \times 1/4 \text{ acre} \times 6 \text{ months} = 0.048 \text{ tons or } 96 \text{ lb } PM_{10}$$

The BACM Level 2 emission calculation is:

Cubic yards of dirt moved: 2000 ft^2 x 8 ft. x 110% = 17600 ft^3 = 652 yd^3

(0.011 tons PM_{10}/acre/month x 1/4 acre x 6 months)+
(0.059 tons PM_{10}/1000 yd^3 dirt x 652 yd^3 dirt) =
0.016 +0.038 = 0.0545 tons or 109 lb PM_{10}
33 +76

The Unit Operation Emissions (Bulldozing) calculation from AP-42 is:

$$PM10 = 0.75\,(s)^{1.5}/(M)^{1.4} = 0.75\,(8)^{1.5}/(6)^{1.4}$$
$$= 1.4 \text{ lb } PM_{10}/\text{hr} \times 10 \text{ days} \times 8 \text{ hours} = 112 \text{ lb } PM_{10}$$

5.5 Nonresidential Construction Emissions

Nonresidential construction includes building construction (commercial, industrial, institutional, governmental) and also public works.

5.5.1 Emission Calculation Procedure

The emissions produced from the construction of nonresidential buildings are calculated using the value of the construction put in place. The formula for calculating the emissions from nonresidential construction is:

$$\text{Emissions} = (0.19 \text{ tons } PM_{10}/\text{acre/month}) \times \$ \times f \times m$$

where: \$ = dollars spent on nonresidential construction in millions
f = dollars-to-acres conversion factor
m = duration of construction activity in months

Figure 5-2 illustrates the calculation of PM_{10} emissions from non residential construction.

The emission factor of 0.19 tons PM_{10}/acre/month was developed using a method similar to a procedure originated by Clark County, NV (Las Vegas) and the emission factors recommended in the MRI BACM Report.[9] A quarter of all nonresidential construction is assumed to involve active earthmoving in which the recommended emission factor is 0.42 tons PM_{10}/acre/month. The 0.19 tons PM_{10}/acre/month was calculated by taking 1/4 of the heavy construction emission factor, 0.42, plus 3/4 of the general emission factor 0.11 tons/acre/month. The 1/4:3/4 apportionment is based on a detailed analysis of a Phoenix airport construction where specific unit operations had been investigated for PM_{10} emissions[21].

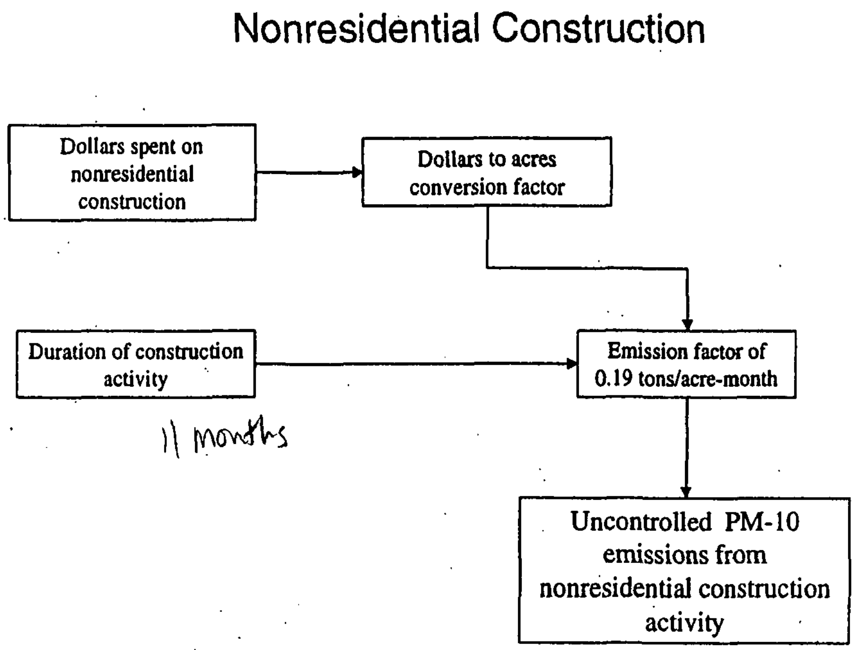

Figure 5-2. Nonresidential Construction Emissions Flowchart

Regions known to have extensive earthmoving activities will produce higher amounts of PM_{10} emissions. Since this larger amount would not be accounted for in building construction, the BACM "heavy construction emission factor" of 0.42 tons PM_{10}/acre/month may provide a better estimate for areas in which a significant amount of earth is disturbed.

An emission inventory for a 114-acre airport project[21] provides a comparison of detailed PM_{10} emissions as contrasted with the new recommended PM_{10} emission factor of 0.19 tons/acre/month. The results show total uncontrolled PM_{10} emissions using the detailed unit operation emission inventory methodology is 210 tons PM_{10} for the duration of the construction. The proposed emission factor results in total uncontrolled PM_{10} emissions of 260 tons PM_{10}. The new factor along with the acres under construction as an indicator of activity level provides an estimate of PM_{10} emissions from nonresidential construction within 25% of the emissions calculated using detailed engineering plans and "unit-operation" emission factors.

5.5.2 Data Sources and Assumptions

The dollar amount spent on nonresidential construction is available from the U.S. Census Bureau, Census of Construction Industries and the Dodge Construction Potentials Bulletin. Census data are divided by SIC Code whereas the Potentials Bulletin divides activity by the types of building being constructed rather than by SIC Code.

MRI has determined that the previous 1974 dollars-to-acres conversion factors can be updated to a single factor for nonresidential, nonroad construction. It is estimated that for every million dollars spent on construction, in 1992 constant dollars, 2 acres of land are impacted. The conversion factor reflects the current dollar value using the Price and Cost Indices for Construction that are available from the Statistical Abstract of the United States, published yearly. For example, the 1997 dollars-to-acres conversion factor would be 2/(118.7%) or 1.7 acres/ \$ 10^6. The estimate for the duration of nonresidential construction is 11 months.

5.5.3 Example Emission Calculation

Table 5-2 presents an example calculation of 1992 PM_{10} emissions from nonresidential, nonroad construction for a hypothetical county.

Table 5-2. Example 1992 PM_{10} Emissions for Nonresidential Construction in a Hypothetical County

Construction put in place (\$$10^6$)	1992 (\$ to acres)	Acres disturbed	Duration of activities	PM_{10} emissions factor (tons/acre/month)	Uncontrolled PM_{10} (tons)
57.7	2 acres/\$$10^6$	115	11	0.19	240

5.6 Roadway Construction Emissions

Roadway construction emissions are highly correlated with the amount of earthmoving that occurs at a site. Almost all roadway construction involves extensive earthmoving and equipment travel, causing emissions to be higher than found for other construction types.

5.6.1 Emission Calculation Procedure

The PM_{10} emissions produced by road construction are calculated using the BACM recommended emission factor for heavy construction and the miles of new roadway constructed. The formula used for calculating roadway construction emissions is:

$$\text{Emissions} = (0.42 \text{ tons } PM_{10}/\text{acre/month}) \times M \times f \times d$$

where: M = miles of new roadway constructed
f = miles-to-acres conversion factors
d = duration of roadway construction activity in months

The emission factor of 0.42 tons/acre/month is used to account for the large amount of dirt moved during the construction of roadways. Since most road construction consists of grading and leveling the land, the higher emission factor more accurately reflects the high level of cut and fill activity that occurs at road construction sites. Figure 5-3 illustrates the calculation of road construction emissions of PM_{10}.

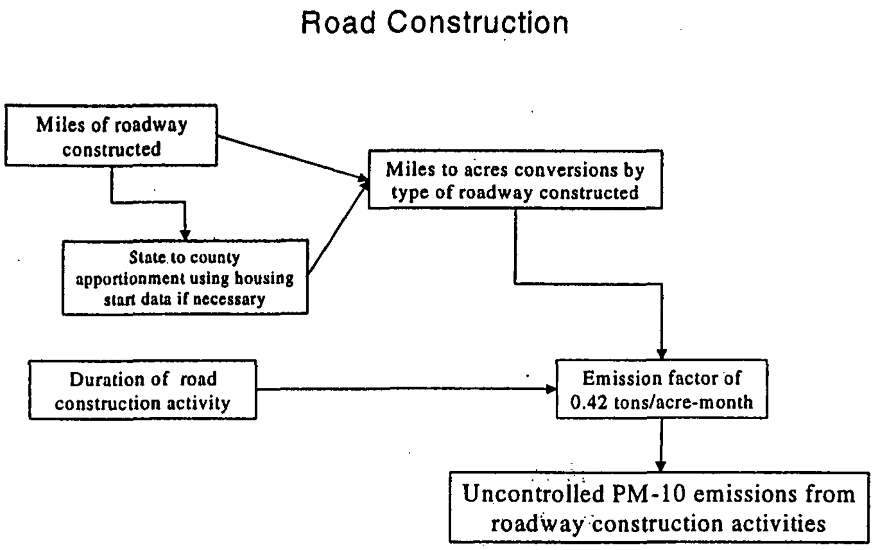

Figure 5-3. Road Construction Emissions Flowchart

5.6.2 Data Sources and Assumptions

The miles of new roadway constructed are available at the state level from the *Highway Statistics* book published yearly by the Federal Highway Administration and the Bureau of Census' Statistical Abstract of the United States. The miles of new roadway constructed can be found by determining the change in the miles of roadway from the previous year to the current year. The amount of roadway constructed is apportioned from the state to the county level using housing start data that is a good indicator of the need for new roads.

The conversion of miles of roadway constructed to the acres of land disturbed is based on a method developed by the California Air Resources Board. This calculation is done by estimating the roadway width, then multiplying by a mile to determine the acres affected by one mile of roadway construction. The California conversion factors are for freeway, highway and city/county roads. In the *Highway Statistics* book, roadways are divided into separate functional classes. MRI developed the miles-to-acres conversion according to the roadway types found in the "Public Road Length, Miles by Functional System" table of the annual *Highway Statistics*. The functional classes are divided into four groups. Group 1 includes Interstates and Other Principal Arterial roads and is estimated to have a conversion factor of 15.2 acres/mile. Group 2 includes Other Freeways and Expressways (Urban) and Minor Arterial Roads and is estimated at 12.7 acres/mile. Group 3 has Major Collectors (Rural) and Collectors (Urban) and a conversion factor of 9.8 acres/mile. Minor Collectors (Rural) and Local roads are included in Group 4 and converted at 7.9 acres/mile. Table 5-3 shows the data used to calculate the acres per mile of road constructed.

Table 5-3. Road Miles-to-Acres Conversion Calculation

	Group 1	Group 2	Group 3	Group 4
Lane Width (feet)	12	12	12	12
Number of Lanes	5	5	3	2
Average Shoulder Width (feet)	10	10	10	8
Number of Shoulders	4	2	2	2
Roadway Width* (feet)	100	80	56	40
Area affected beyond road width	25	25	25	25
Width Affected (feet)	125.0	105.0	81.0	65.0
Acres Affected per Mile of New Roadway	15.2	12.7	9.8	7.9

*Roadway Width= (Lane Width x # of Lanes) + (Shoulder Width x # of Shoulders)

Since the amount of new roadway constructed is available on a yearly basis, the duration of the construction activity is determined to be 12 months. The duration accounts for the amount of land affected during that time period and also reflects that construction of roads normally lasts longer than a year. The estimate for the duration of construction to find the total emissions produced by the construction over the length of the activity is 18 months.

5.6.3 Example Emission Calculation

Table 5-4 presents an example calculation of PM emissions from road construction. State miles are obtained from Table HM-50 in the annual report of the FHWA Report, *Highway Statistics*. State emissions are apportioned to the county level based on new housing statistics that are believed to be a good indicator for the construction of new road mileage.

Table 5-4 Example PM_{10} Emissions from Road Construction in a Hypothetical County

Road Type	State road mileage 1996	1997	New 1997 state road mileage	Miles to Acre factor	Affected state acres	Duration of construction (mo)	Emission factor (tons PM10/acre/month)	State uncontrolled PM_{10} emissions (tons)	County X uncontrolled PM_{10} emissions (tons)*
1	2980	3030	50	15.2	760	12	0.42	3830	192
2	3470	3530	60	12.7	762	12	0.42	3840	192
3	4200	4400	200	9.8	1960	12	0.42	9878	494
4	11100	11500	300	7.9	2370	12	0.42	11945	597

*Based on 0.05 fraction of state housing constructed in County "X".

5.7 Correction Parameters

The regional variances in construction activity, as previously mentioned, cause PM emissions to vary even though the same level of activity may occur at construction sites. These differences are accounted for using correction parameters.

5.7.1 Control Efficiency

The first correction parameter accounts for the emission reductions afforded by dust control measures used at construction sites. At most large construction sites watering is used to control dust suspended by construction equipment activity and vehicle travel on unpaved roads. The recommended emission factors are representative of uncontrolled sites which is consistent with the AP-42 manual. The recommended control efficiency for PM emissions, including PM-10 and PM-2.5, is 50% based on data presented in Reference 20 and recent MRI unpaved road tests.

5.7.2 Soil Moisture Level and Silt Content

The emission factors developed in the BACM report were developed from test sites in the southwestern United States which have different moisture levels and silt contents than other areas in the country. To account for the differences in moisture level and silt content, adjustments are applied to the controlled PM emissions.

Soil moistures for the areas from which the emission factors were developed are typically much lower than other regions. Thornthwaite's Precipitation-Evaporation Index ranges from 7 to 41 and is shown in Figure 5-4. The average value for the test sites is 24. The adjustment for moisture is:

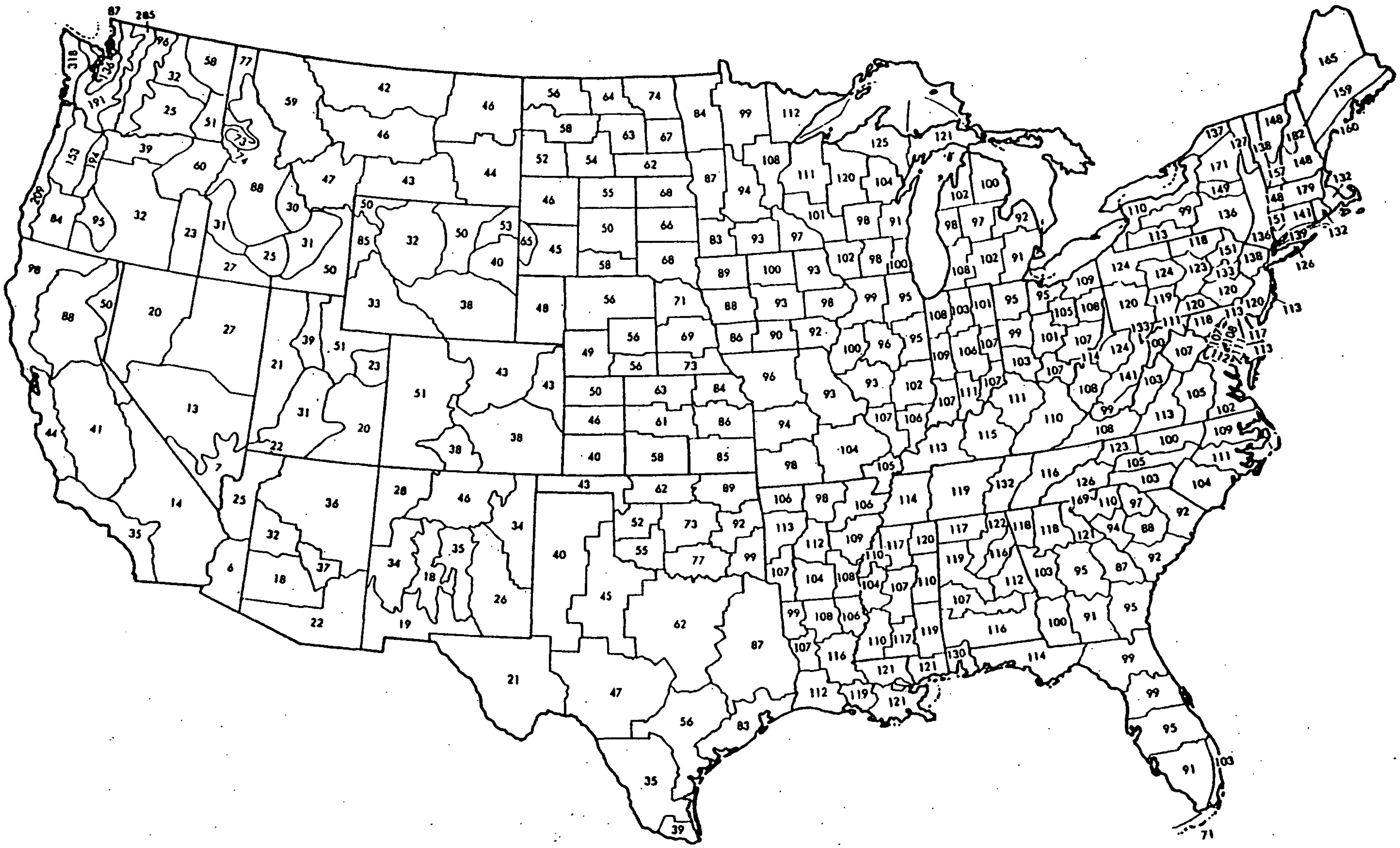

Figure 5-4. Map of PE Values for State Climatic Divisions

Moisture Level Corrected Emissions = Base Emissions x (24/PE)

where PE = the Precipitation-Evaporation value for the county being inventoried

The average dry silt content found for the test sites in the BACM report was 9%. To adjust for the level of silt content of surface soil in a particular county, a proportionality is used along with the base emissions. The equation to adjust for silt content is:

Silt Content Corrected Emissions = Base Emissions x (s / 9%)

where s = % dry silt content in soil for area being inventoried

The silt content of soil for a county can be found using the same procedure as in the NET Inventory. Section 4.8.2.2.1.1 in Reference 6 gives the methodology for determining the silt percentage of soils. The silt percentage is corrected using information from the California ARB which gives the conversion from a wet silt value to a dry silt value[23]. The dry silt percentage is used as a correction parameter for construction emissions. Typical silt contents for the various soil types are listed in Table 5-5, as reported in Reference 6.

Table 5-5. Dry Silt Content by Soil Type

Soil type	Silt content (%)
Silt Loam	52
Sandy Loam	33
Sand	12
Loamy Sand	12
Clay	29
Clay Loam	29
Organic Material	10-82
Loam	40

5.7.3 Emissions Adjustments

County level emissions of PM_{10} should be adjusted for dust control measures, precipitation/evaporation, and dry silt content of the soil. PM_{10} emissions can also be used to estimate $PM_{2.5}$ emissions using a $PM_{2.5}/PM_{10}$ ratio.

$PM_{2.5}$ Emissions = Uncontrolled PM_{10} Emissions x 50% x (24 / PE) x (s / 9%) x $PM_{2.5}/PM_{10}$

where: PE = PE value
s = % dry silt content
50% = 50% Control efficiency from periodic watering
$PM_{2.5}/PM_{10} = 0.15$

Table 5-6 presents the data sources, emission factors, and correction parameters for all three types of construction.

Table 5-6. Recommended Methodology

Construction activity type	Activity level data source	Emission factor	Control efficiency	Climatic factor	Soil factor
Residential	Houses: Number of housing units Apartments: Value of apartment construction (Statistical Abstract of the United States, published annually by the U.S. Census Bureau, or the F.W. Dodge Reports)	Houses: 0.032 tons PM_{10}/acre/month (Source: South Coast Air Quality Managment District $PM/_{10}$ Fugitive Dust Integration Project 1996) Apartments: 0.11 tons PM_{10}/acre/month	None	Precipitation/Evaporation Index	Dry Silt content as converted from wet silt
Nonresidential	Dollar Value of New Construction (Statistical Abstract of the United States or the F.W. Dodge Reports)	0.19 tons PM_{10}/acre/month (Source: SCAQMD, BACM Report No. 1, 1996, assumes 1/4 of all nonresidential construction activity is heavy construction	50%		
Road	New highway miles (Highway Statistics, FHWA annual publication)	0.42 tons PM_{10}/acre/month (Source: SCAQMD, BACM Report No. 1, 1996)			

5.8 PM_{10} Emissions from Combustion of Cleared Materials

Construction operations begin with general site preparation. This involves the clearing of trees, shrubs, and other vegetation that are usually burned. PM emissions are produced during the combustion of cleared materials.

The PM emissions from the combustion of cleared materials can be calculated using the emission factors from AP-42 Section 13.1, Wildfires and Prescribed Burning. The information needed to find PM emissions from burning are the acres affected by the construction activity and the tons of fuel per acre (available from Table 13.1- 1 of AP-42 by region). The total acres affected by construction can be found by using the conversion factors for units to acres, dollars to acres, and miles to acres for the three types of construction.

The emission factors used for the combustion of cleared materials come from Table 13.1-4 of AP-42 and are by region. Piled slash best represents vegetative residue cleared at a construction site and is typically 1/2 of the regional average emission factor for prescribed burning. The PM_{10} emission factor used for each region is 5 g PM_{10}/kg fuel for the Pacific Northwest, 6.5 g PM_{10}/kg fuel for the Pacific Southwest, 9.4 g PM_{10}/kg fuel for the Southeast, 6 g PM_{10}/kg fuel for the Rocky Mountain region, and 7 g PM_{10}/kg fuel for the North Central and Eastern Regions.

The equation for calculating PM_{10} emissions from the combustion of cleared materials is:

$$PM_{10} \text{ Emissions} = EF \times t \times a$$

where: EF = Regional emission factor for combustion in g/kg
t = conversion from acres to tons of available fuel (AP-42 Table 13.1-1)
a = total acres affected by construction

Table 5-7 gives the PM_{10} emission factors by region for the combustion of materials cleared from construction activities by region.

Table 5-7. Combustion of Cleared Materials Emission Factors by Region

Region	PM_{10} emission factor (g/kg of fuel)
Pacific Northwest	5.0
Pacific Southwest	6.5
Southeast	9.4
Rocky Mountain	6.0
North Central and Eastern	7.0

An example calculation of PM_{10}emissions from the burning of vegitative residues for a hypothetical county in the Rocky Mountain Region is shown in Table 5-8.

Table 5-8. Example Calculation of PM_{10} Emissions from the Burning of Vegetative Residues

Construction type	Acres affected	emission factor (g/kg)	Fuel loading per acre (ton/acre)	PM_{10} Emissions (tons)
Residential	652	6.0	60	234
Non-residential	115	6.0	60	41
Roads	293	6.0	60	105
Total				380

Section 6. References

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ATTACHMENT C

Palo Verde Irrigation District History

HISTORY OF THE PALO VERDE VALLEY

The history of the Palo Verde Valley is entwined in the history of the Colorado River. The former has always been dependent upon the latter. From 1852 to 1877, steamboats plied the Colorado from Port Isabel, at the mouth of the river, to Hardyville, near the present site of Davis Dam. A few trips were made to Calleville, a Mormon community at the mouth of the Virgin River, under what is now Lake Mead. This river traffic was supported by the mineral industry, with gold and silver mines in the mountains along both sides of the river from Yuma to Black Canyon, site of Hoover Dam. A wagon freight line, which crossed the river at Ehrenberg, Arizona, across the river from Blythe, delivered supplies to the mining areas of Quartzsite, Wickenburg and Prescott, Arizona. Another reason for river traffic was to supply the U.S. Army. Supplies were shipped from San Francisco to Port Isabel by ocean vessel and then transferred to river steamers which brought the goods to Ehrenberg. From here, goods went overland by wagon train to the Army posts in Arizona. When the Southern Pacific Railroad reached Yuma in 1877, the river traffic originated there and Port Isabel reverted to mud flats. With the advent of railroads in Arizona, traffic on the wagon freight line diminished. With the construction of Laguna Dam, near Yuma in 1909, river traffic ceased altogether.

Surveyors of the U.S. Government land office were also active in southeastern California in the period 1855 to 1884. These survey parties were supplied from the steamboats. One of the surveyors was Oliver P. Calloway, an engineer who had hacked out the first stage road from San Diego to Yuma, and had a hand in the development of San Diego Harbor. He saw the agricultural possibilities of the Palo Verde Valley. Lacking money he went looking for a financial angel and found one in the form of Thomas H. Blythe, a capitalist of San Francisco. (Blythe was born as Thomas Williams in Mold, England July 30, 1822). Blythe was making excellent returns on real estate investments in San Francisco and spending much of it on mining and agricultural promotion schemes. He acquired some 40,000 acres - all valley land east of what is now Defrain Boulevard, approximately one-mile westerly of the heart of the City of Blythe - from the State of California under provisions of the Swamp and Overflow Act. He hired George S. Irish as manager and Calloway as his engineer and told them to proceed. The first irrigation was from a swamp area - or slough - called Olive Lake in the north end of the valley, which irrigated some pasture lands and some small agricultural plots. A canal was built from the river at Black Point, a location about a mile north of the present Diversion Dam, to the slough, but it was very costly. Even with Indian labor at 50 cents a day, Blythe spent some $82,000 before any irrigation was accomplished. Thomas Blythe visited the valley only twice: once in December 1875, then again in November 1882.

Thomas Blythe made the first of subsequent filings on Colorado River water in California when he recorded a request for 95,000 miners inches (1,905 cubic feet per second) in the then county seat at San Diego on July 17, 1877. His total filings amounted to 190,000 miners inches. The water was requested for "agricultural, mining, manufacturing, domestic and commercial purposes".

In March 1880, a Chemehuevi Indian named "Big Bill" killed Calloway with a knife, after an argument about employment between Calloway and an Indian called "Up and Up". Calloway was buried in the north part of the valley in a casket made from mahogany fittings of an abandoned saloon in Ehrenberg. The Army caught "Big Bill" and sent him to Alcatraz, which was then a military prison. Calloway was replaced by C. C. Miller, of the family later affiliated with the famous Mission Inn at Riverside, California.

Thomas Blythe died of a heart attack in San Francisco in April 1883. His creditors immediately froze his assets and money for the Palo Verde Valley was cut off. Irish and Miller sold off the implements, turned the money over to the estate, and left the valley. Since Blythe was a bachelor and left no will, his estate was tied up in court for many years. There was no further agricultural development in the valley until after the turn of the century.

Frank Murphy and Ed Williams, cattlemen of southeastern Arizona, visited the valley in 1904 and became convinced of the valley's potential for beef production and irrigated agriculture. They were able to interest the Hobson brothers, of Ventura County, California, in the valley; and they formed the Palo Verde Land and Water Company and purchased the Blythe Estate, which became the parent company of the Mutual Water Company. The land company, in payment for the intake, headworks, etc., assumed the right to sell the water stock which was issued for the entire valley, at prices of their choosing.

C. K. Clarke was the first engineer of the water company and it was he who built the first intake structure and located the principal canals generally as they are today. The almost annual flood damage inflicted by the Colorado River necessitated the formation of the Palo Verde Joint Levee District, which was organized in 1917, and which sold bonds to build a levee to protect the valley. Later on the need for drainage became apparent, and the Palo Verde Drainage District was organized in 1921 and sold bonds for drain construction. About this time, it became apparent to the valley's water users that it was necessary to have one entity to administer the irrigation and drainage functions. They petitioned the state legislature to take appropriate action, and in 1923, the Palo Verde Irrigation District Act was passed. The District was then organized and began functioning in 1925, taking over the assets and obligations of the three predecessor organizations: the Palo Verde Mutual Water Company, the Palo Verde Joint Levee District and the Palo Verde Drainage District.

During the 1930's, the valley was hard hit and the District defaulted on its bonds. Later the bonds were refinanced with a RFC loan. Leaders of the valley worked hard for the Boulder Canyon Project and were influential in bringing about the construction of Boulder Dam (later designated as Hoover Dam) which was completed in 1935, and which regulated the flow of the river and virtually eliminated floods. Since that time, farming in the valley has been less of a gamble and the valley has generally prospered.

PALO VERDE IRRIGATION DISTRICT AS IT EXISTS TODAY

The Palo Verde Irrigation District occupies about 189 square miles of territory in Riverside and Imperial Counties, California. The District contains approximately 131,298 acres, 26,798 acres of which are on the Palo Verde Mesa. This Mesa lies just west of, and from 80 to 130 feet higher than, the valley. A portion of the Mesa area lies within boundaries of the Palo Verde Irrigation District. Colorado River water, supplied through Palo Verde Irrigation District canals, is lifted onto the Mesa by private pumps to irrigate a portion of the acreage in the District. The remaining mesa irrigated acreage is irrigated from deep wells developed by the landowners. The predominant crop on the Mesa is citrus.

The Colorado River, which is the boundary between Arizona and California, forms the eastern and southern boundaries of the District. The valley is relatively level; approximately 9 miles wide, 30 miles long and ranging in elevation above sea level from about 290 feet at the northern end to about 220 feet at the southern end. The soils are alluvial in nature, laid down in past years by Colorado River floods; and range in texture from fine grain clays to silty loams to light sandy soils, with the predominant soil being a sandy loam. The entire valley is underlain with permeable sand at shallow depths.

The Palo Verde Valley with its long, hot growing season is ideal for agriculture; crops are grown and harvested year round. Mild winters, with a minimum of frost, permit growing of many crops not suitable for production in other areas.

The Valley is served by a spur line of Arizona and California Railroad, a freeway and two State Highways. Interstate 10 Freeway is one of the major highways bringing traffic into California, and one of the most heavily traveled routes in the nation. State Highway 95 runs north from Blythe to Needles and Las Vegas. State Highway 78 traverses the desert southwest from Blythe to the Imperial Valley. Blythe Airport lies 7 miles west of Blythe and is leased by the City of Blythe.

The principal city in the area is Blythe, which with its urban fringe has a population of about 21,800, although more than 8,000 of these are inmates in 2 State prisons. Blythe serves a population of about 30,000 people, some of whom live in Arizona.

Developed valley farmland has a market value ranging from $2,500 to more than $5,000 per acre; mesa acreage has a wide range of values, based upon stage of development.

The 2003 net cultivated acreage in the District was 93,375 acres. Because of the year-round growing season and multi-cropping practices (the same acre of land producing two or more crops in one year) there were 106,582 acres of crops grown as shown below. The 2003 valuations (gross returns) as compiled by the Riverside County Agricultural Commissioner's Office for the Riverside County portion of the valley are also listed. No valuations were available for Imperial County.

2003 PVID CROP ACREAGES AND RIVERSIDE AGRICULTURAL COMMISSIONER VALUATIONS

Crop	PVID Acreage	% of Total Cropped Acreage	Riverside County* Gross Returns
Alfalfa	59,762	56.07%	$37,477,300.00
Sudan	3,213	3.02%	$759,800.00
Bermuda	2,422	2.27%	$1,345,000.00
Wheat & Barley	6,230	5.85%	$2,945,700.00
Palm Trees	10	0.01%	$635,300.00
Corn	932	0.87%	$108,600.00
Oats	945	0.89%	$134,400.00
Cotton	16,374	15.36%	$15,695,900.00
Misc. Field Crops**	4,396	4.12%	$3,907,200.00
Citrus & Orchard	2,434	2.28%	$4,745,300.00
Misc. Vegetables***	1,018	0.96%	$2,780,200.00
Broccoli	1,292	1.21%	$3,754,100.00
Lettuce	1,289	1.21%	$2,545,900.00
Cantaloupes	1,663	1.56%	$5,355,900.00
Honeydews	680	0.64%	$5,825,300.00
Mixed Melons & Water Melons	1,994	1.87%	$3,962,300.00
Idle/Diverted	1,854	1.74%	
Fish Ponds	74	0.07%	
Total	106,582	100.00%	$91,978,200.00

*Note: Riverside County Valuations are based on different acreages than PVID's acreage. Imperial County's Portion of Returns is not shown.

**Miscellaneous Field Crops: Klein Grass, Milo, Rye, Timothy Grass, Silage Corn, Peanuts and Irrigated Pasture.

***Miscellaneous Vegetables: Artichokes, Carrots, Cabbage, Onions, Garlic, Squash, Chile Peppers and Garden

In recent years, the annual value of crops produced within the District has ranged from $60 million to $158 million, excluding livestock. During recent years, 25 to 35 thousand head of sheep have been winter fed annually in the valley.

The District has a staff of about 71 people, including 7 Board members, office and clerical personnel, ditch riders (Zanjeros), construction and maintenance crews, and other employee classifications. Over the last 30 years, due to mechanization and to the lessened requirements of drain construction and maintenance, the District staff has been reduced from 125 to the present figure. This reduction was accomplished by not filling positions as they became vacant through retirement and resignation. For necessary construction, operation and maintenance, the District owns and operates considerable equipment. This equipment includes: A dragline, excavators, gradalls, dozers, a truck crane, motor graders, backhoes, a weed burner, spray rigs, dump trucks with pups, heavy-duty trailers, water trucks, and about 60 miscellaneous light and medium-duty pickup trucks.

The governing body of the District is the seven member Board of Trustees, elected by the landowners within the District on the basis of one vote for each 100 units of District-assessed valuation. Trustees serve three-year terms and are eligible for re-election.

The management of the District is handled by a general manager who serves at the pleasure of the Board, and is responsible for staffing and operating the District.

The prime functions of the District are: 1) to divert and distribute irrigation water from the Colorado River to the farmland, and 2) to provide agricultural drainage for said land. The greatest efforts of the District, in recent years, have been improving the efficiency of the water delivery system and the improvement of drainage (lowering the groundwater table) throughout the valley. In the 1960's, District forces carried out an extensive drainage improvement project, financed in 1964 by a $1,875,000 bond issue, and supplemented by finds from taxes and water tolls.

The financial condition of the District is extremely good and the total debt is quite low; the per acre bonded indebtedness of land within the District being among the lowest of irrigation districts in the country.

<u>WATER SUPPLY FOR PALO VERDE IRRIGATION DISTRICT</u>

An abundant supply of water for irrigation has been available for the Palo Verde Valley since the construction of Hoover Dam and the subsequent control of the river. Due to irrigation practices, the original saline condition of the valley soils, the flat slope of the valley, and other related factors, diversion per acre is high; however; considerable water, both operational spill and drainage flow, is returned to the river at the lower end of the valley. For the 1993 to 2002 period, (excluding 1992 thru 1994 Test Fallowing Program affects), the average diversion per net cropped acre has been approximately 10.28 acre feet with the return flow being equal to about 5.21 acre feet per net cropped acre, resulting in a diversion-less-return figure of about 5.08 acre feet per net cropped acre. From June 20 to December 20, 2003, fallowing of 17,109 acres resulted with the water savings going to the Coachella Valley Water District.

Irrigation water is delivered to the Palo Verde Valley user for a flat charge of $52.00 per acre per year. This charge, plus the average irrigation district assessment, results in a current total annual water cost of about $61.00 per acre. PVID receives no funding from State or Federal governments.

<u>DISTRICT FACILITIES</u>

The District canal system consists of approximately 244.23 miles of main and lateral canals with capacities from 2,100 cubic feet per second, at the upper or north end of the District, down to 25 cubic feet per second in various small laterals throughout the Valley. As a part of this canal system are the more than 2,550 structures necessary to operate the system. These structures are canal headings, checks, siphons, deliveries, bridges, flumes, pump plants, moss racks and miscellaneous structures.

While the District has 56.0 miles of lined canals, the installation of concrete-lined farm ditches has increased greatly during recent years. We estimate there are about 315 miles of concrete-lined farm ditches in the valley, about 72% of all private ditches.

The District drainage system is composed of approximately 141.4 miles of open drainage channels carrying groundwater drainage and canal operational spill water away from farmland and back to the river. This system of drains includes over 250 siphons, or submerged culverts.

The groundwater drainage conditions and "salt-balance" within the District continues to show improvement. The groundwater is hydraulically connected to the Colorado River. The valley average depth to groundwater below farmland, as shown by over 200 observation wells throughout the valley, is approximately 10 feet as compared to 5-1/2 feet in 1957.

<u>GENERAL PALO VERDE VALLEY CROP INFORMATION</u>:

Average yields of alfalfa are ten tons of hay per acre per year, with the average farm price during the recent years ranging from $60 to $140 per ton. The alfalfa hay is primarily used by dairies in central and southern California. Some alfalfa is specially baled for retail sales.

In recent years, wheat has replaced barley. This change occurred because of marketing problems and improved varieties of rust-resistant and high-yielding wheat that are less susceptible to lodging and easier to combine. Barley usually yields from 3,000 pounds to 5,000 pounds per acre, while wheat yields from 5,000 to 8,000 pounds per acre.

Cotton yields range from a low of two bales per acre up to a high of over four bales per acre. The average yield in recent years has been over 2 bales per acre. Genetically modified varieties have greatly increased yield potential in recent years.

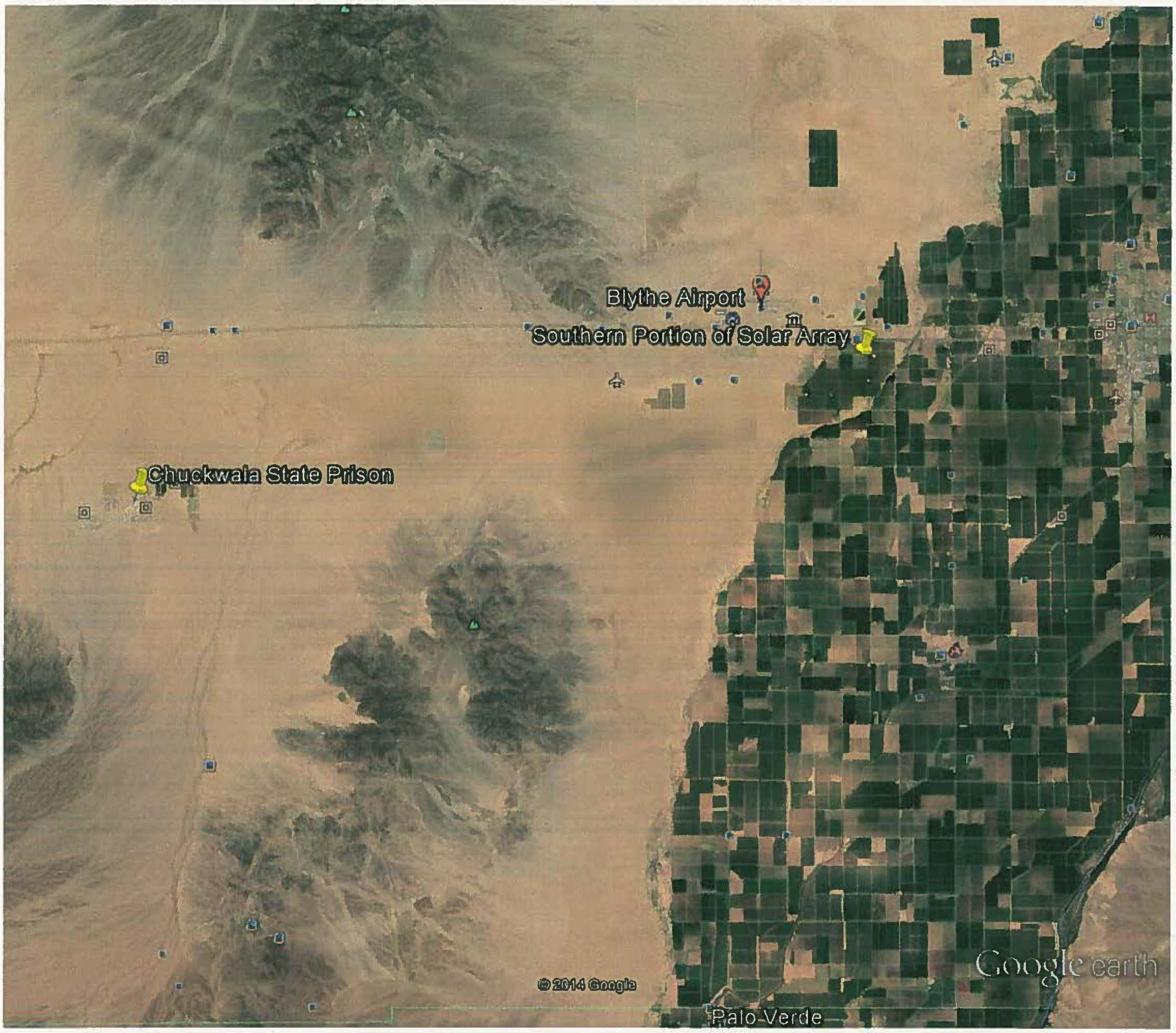
Many varieties of melons are grown in both spring and fall including watermelons, cantaloupes, honeydews, and mixed melons. Cantaloupes, the major type, produce average yields of 500 crates per acre. Honeydews have an average yield of 900 crates per acre.

Acreage of fall, winter, and spring lettuce (harvested from early November thru April) is generally over 2,000 acres. Yields are good, ranging from 500-1000 cartons per acre depending upon conditions and seasons.

Revised: July 2000
November 2001

November 2002
December 2003
January 2005

ATTACHMENT D



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Study: Valley fever has killed 3 prison workers, 103 sickened

By DON THOMPSON

Associated PressFebruary 6, 2014

Valley fever killed three employees at two central San Joaquin Valley prisons in recent years and sickened 103 others, according to a federal health care agency report made public Thursday.

Employees at Avenal and Pleasant Valley state prisons on the Valley's west side appear more likely to contract Valley fever than adults in the surrounding population, the report by the National Institute for Occupational Safety and Health said.

The institute found that the employee deaths and illnesses occurred between January 2009 and last June.

The state requested the report after nearly three-dozen inmate deaths and hundreds of hospitalizations at the prisons were blamed on the soil-borne fungus that causes Valley fever.

A federal judge ordered the state to move nearly 2,600 inmates to other prisons last fall because those inmates were deemed to be more susceptible to the fungus, which grows naturally in the soil in the San Joaquin Valley and other dry locations such as Arizona and Mexico.

The inmate deaths and illnesses are being separately reviewed by the federal Centers for Disease Control, which has yet to release its findings.

Blacks, Filipinos and inmates suffering from diabetes and HIV are among those thought to be most prone to valley fever and were ordered out of the prisons.

The report by the affiliated occupational safety institute focuses on employee illnesses. It makes recommendations that already have largely been adopted, including covering exposed soil or wetting it down to control dust; sealing doors and windows; replacing air filters; educating employees; and limiting their outdoor activities during dust storms or on windy days.

Officials with the California Department of Corrections and Rehabilitation, with the union that represents most prison guards and with the federal court-appointed official who runs prison medical care all said they were reviewing the report and had little immediate comment.

Pleasant Valley State Prison in Coalinga had 3,358 inmates and more than 1,300 guards and other employees last May. The institute confirmed 65 Valley fever cases among the prison's employees over the 3 1/2-year period of its study, including two employee deaths.

That equates to an average rate of 1,039 cases per 100,000 individuals, higher than the general rate of infection of 40 cases per 100,000 among the non-inmate adult population in Fresno County, the report says, though it cautions that there can be no direct comparison because of differences in the populations and the reporting of the illness.

Avenal State Prison in Kings County had 4,538 inmates and more than 1,500 employees last May. The institute confirmed 38 Valley fever cases there, with one death. It had an average rate of 511 cases per 100,000, higher than the average of 110 cases per 100,000 adults in Kings County.

Researchers couldn't determine if the prison employees contracted the disease at work or outside of work, and said most were likely exposed to the fungus on and off the job.

The state thwarted a previous study by the Centers for Disease Control in 2008 and decided against spending $750,000 for improvements at one of the prisons in 2007 because of the high cost. Yet three experts appointed by the federal judge found last year that the state spends more than $23 million annually to treat inmates hospitalized with Valley fever.

The fungus usually produces no symptoms, but in about 40% of cases it causes mild to severe flu-like symptoms or more serious infections. Valley fever can spread to the brain, bones, skin and eyes, leading to blindness, skin abscesses, lung failure and death.

In California, rates of reported fever cases increased more than six-fold over the past decade, from about 700 in 1998 to more than 5,500 cases reported in 2011, according to the CDC.

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Susceptible inmates at Pleasant Valley and Avenal, in California's Central Valley, will be removed in compliance with a court agreement

BY RICHARD K. De ATLEY and JANET ZIMMERMAN

Published: Aug. 6, 2013 8:36 p.m.

Eric Risberg, AP

Californiaâs prisons this week will start transferring inmates susceptible to Valley Fever from two Central Valley prisons, where infections from the airborne fungus sickened more than 1,800 prisoners between 2008 and 2012.

Valley Fever has been blamed for 62 deaths among California prison inmates statewide, most at the Avenal and Pleasant Valley facilities.

A report prepared by a court receiver looking into the illness in Californiaâs prisons said 200 prisoners yearly spend 5,000 days in hospital for treatment of their severe conditions, at an estimated care cost of about $23.4 million. African-American and Filipino inmates are particularly susceptible to Valley Fever, as are prisoners who have weakened immune systems.

Along with death, the disease can leave some with permanent disabilities.

The court-ordered transfer affects as many as 2,600 inmates at Avenal and Pleasant Valley.

At Pleasant Valley State Prison in Coalinga the rate of infection was 38 times that of residents in Coalinga, and 600 times the rate of the entire Fresno County. A court document that cited those figures did not detail outbreak numbers for the Avenal prison, which is in the city of the same name in Kings County.

While the disease is not contagio[...]tantly may develop immunities, and there m[...]o are vulnerable to the disease.

In the stateâs crowded correctior Powered by Sailthru n throughout California -- including prisons in Riverside and San Bernardino counties -- will have to take the places of those moved from Avenal and Pleasant Valley. Menâs state prison locations in Riverside and San Bernardino counties include Norco, Chino, and two prisons near Blythe.

The replacements will be chosen from prisons around the state, said Bill Sessa, a spokesman for the California Department of Corrections and Rehabilitation. âWe are taking a system-wide look at the candidates to go. They will not be people who have the susceptibilities described in the court action.â

âInmates, generally speaking, donât have any choice about where we assign them,â Sessa said. âWe move inmates around all the time for various reasons.â

The transfers were ordered after the Prison Law Office, a prisoner advocacy group, filed court papers citing high rates of Valley Fever infections in the prisons and alleging that the corrections department had not taken adequate action to protect inmates who might develop complications.

The exact number of inmates who will be transferred from Avenal and Pleasant Valley remains uncertain. Prisoners there can ask not to be transferred, even if they are considered susceptible to Valley Fever.

Some prisoners will be required to transfer, including âseriously immuno-suppressed inmates,â said Warren George of the Prison Law Office in Berkeley. âHow that shakes out between the number of inmates who cannot opt out, and those who can, is still ongoing,â he said in a telephone interview.

George said physicians and registered nurses were âtalking with the prisoners and informing them of their right to be transferred out, and walking them through the waiver process; some are choosing to waive their right to be transferred.â

Deaths caused by Valley Fever at individual prisons are difficult to track â" extremely ill prisoners are transferred to the systemâs medical facility at Vacaville, or to local hospitals, and their deaths are recorded there, George said.

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Jul 25, 8:06 PM EDT

APNewsBreak: Study recommends inmate immunity test


AP Photo

SACRAMENTO, Calif. (AP) -- Federal experts are recommending that California test inmates for immunity to a sometimes fatal soil-borne fungus before incarcerating them at two Central Valley state prisons where the disease has killed nearly three dozen inmates, according to a report obtained Friday by The Associated Press.

A federal judge last fall ordered the state to move nearly 2,600 susceptible inmates out of Avenal and Pleasant Valley state prisons because of the deaths and illnesses.

The Centers for Disease Control and Prevention recommended the state go further by using hypersensitivity skin tests that could identify inmates who already were exposed to valley fever. Those inmates could thus safely be housed at the two state prisons near Fresno because they largely are immune to repeat infections.

The experts said that is a better option than the current practice of screening out black and Filipino inmates and others who statistically are more susceptible to the fungus, which grows naturally in the soil in the Central Valley and other dry locations such as Arizona and Mexico.

They project that system-wide testing would find 13 percent of the prison population is immune because the inmates previously were exposed.

Joyce Hayhoe, a spokeswoman for the federal court-appointed receiver who controls prison medical care, said the office is reviewing the report.

Don Specter, director of the nonprofit Berkeley-based Prison Law Office, said the state should start testing inmates as soon as possible. His firm persuaded U.S. District Judge Thelton Henderson of San Francisco to order vulnerable inmates removed from the two

Skin tests would sharply reduce the number of infections, the experts said.

About 5 percent of inmates at the two prisons would be expected to be infected annually if no steps were taken, according to the 52-page report. Using the skin tests would reduce that to about 2 percent, preventing a projected 268 cases each year.

With the commercially available skin test, approved this month by the U.S. Food and Drug Administration, inmates would be injected with a noninfectious strain and evaluated 48 hours later.

Inmate would have the right to refuse to be tested, Hayhoe said.

The steps the state already has taken, including removing black and Filipino inmates, should reduce annual infections only slightly, preventing 44 infections annually, the experts projected.

At their peak in 2011, valley fever infections at the two prisons were up to 153 times higher than surrounding areas, researchers found. The two prisons combined to produce 83 percent of valley fever cases in the entire prison system, which includes about 135,500 inmates

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Local

Feds Recommend California Test Prison Inmates For Valley Fever

July 28, 2014 7:29 PM

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The same year, more than 20,000 cases were reported nationwide among the general population, most of them in Arizona and California.

Prison infections declined in 2012, but were still more than 20 times higher than among the general surrounding population. State officials say valley fever was killing six to nine inmates each year and costs the state more than $23 million annually to care for infected inmates and employees.

The fungus usually produces no symptoms, but in about 40 percent of cases it causes mild to severe flu-like symptoms or more serious infections. Valley fever can spread to the brain, bones, skin and eyes, leading to blindness, skin abscesses, lung failure and death.

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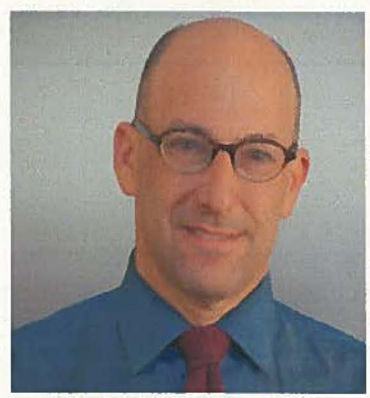

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A study released in February by the affiliated National Institute for Occupational Safety and Health found that valley fever killed three employees at the two prisons between January 2009 and June 2013 and sickened 103 other employees.

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Jul 25, 8:06 PM EDT

APNewsBreak: Study recommends inmate immunity test

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Calif. Inmates File Class Action Lawsuit Over Valley Fever Threat *(/class-action-blog/calif-inmates-file-class-action-lawsuit-over-valley-fever-threat)*

Friday, August 09, 2013

California inmates filed a federal class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)*, alleging that 40 people have died of valley fever in two San Joaquin Valley prisons in the last seven years.

Valley fever (Coccidioidomycosis) is a debilitating infectious lung disease that is caused by an airborne fungus. Currently, there is no cure for this disease.

According to a 1994 "Morbidity and Mortality Weekly Report" by the U.S. Centers for Disease Control and Prevention, 70 percent of the reported cases of valley fever in California were in the San Joaquin Valley from 1991-93.

The two San Joaquin Valley prisons named in the class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)* are the Avenal State Prison (ASP) and the Pleasant Valley State Prison (PVSP). These two prisons are located just 10 miles from each other.

Seven inmates and former inmates who contracted valley fever from either ASP or PVSP filed the class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)* against California Gov. Jerry Brown, the Department of Corrections and Rehabilitation, and prison officials. They allege that the state has done nothing to prevent high risk-prisoners from contracting the disease. According to their class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)*, African Americans and people aged 55 and older are more vulnerable to the disease.

According to the class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)*: "Coccidioidomycosis (commonly known as 'Valley Fever' or 'San Joaquin Valley Fever' or simply 'cocci') has long been known as a serious infectious disease which is contracted by the inhalation of an airborne fungus, 'Coccidioides Immitis.' Cocci is endemic in the soil of various areas of the Southwest. Nowhere is it more prevalent however, than in the San Joaquin Valley of California .... It is well known that disseminated Coccidioidomycosis is progressive, painful, and debilitating, and that it is uniformly fatal once it progresses to meningitis, if left untreated."

Currently there is no vaccine or cure for valley fever. According to the class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)*, the disease is treated by surgical removal of bone and tissue or by taking the medication Fluconazole for the rest of the victim's life. They claim that African Americans are more than 10 times more likely to contract valley fever than the rest of the population.

In their class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)*, the plaintiffs sued on behalf of three subclasses of former and current inmates who contracted valley fever, including African Americans, people aged 55 and older, and people who have a compromised immune system. To be eligible to join the class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)*, class members must have been incarcerated at ASP or PVSP after July 8, 2009.

The class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)* plaintiffs claim that, since at least 2006, the defendants have been aware that inmates in the above subclasses were more susceptible to valley fever. Despite knowing about the risks, the defendants have failed to take steps to protect inmates from the disease. As a result, approximately 40 inmates have died from valley fever complications in the last seven years.

Last month, U.S. District Judge Thelton Henderson ordered state corrections officials to relocate approximately 2,600 high-risk inmates out of ASP and PVSP. The state has 90 days to comply with the order.

In 2012, the U.S. government agreed to pay $425,000 to a former inmate of the Taft Correctional Institution who contracted the disease. The government did not admit any fault in the settlement.

The class action lawsuit *(http://www.aogllp.com/class-action-attorney-california)* seeks punitive damages and a court-supervised medical monitoring program for the members of the subclasses.

ATTACHMENT F

BOULDER CANYON PROJECT

AGREEMENT

REQUESTING APPORTIONMENT OF CALIFORNIA'S SHARE OF THE WATERS OF THE COLORADO RIVER AMONG THE APPLICANTS IN THE STATE

August 18, 1931

THIS AGREEMENT, made the 18th day of August, 1931, by and between Palo Verde Irrigation District, Imperial Irrigation District, Coachella Valley County Water District, Metropolitan Water District of Southern California, City of Los Angeles, City of San Diego and County of San Diego;

WITNESSETH:

WHEREAS the Secretary of the Interior did, on November 5, 1930, request of the Division of Water Resources of California, a recommendation of the proper apportionments of the water of and from the Colorado River to which California may be entitled under the provisions of the Colorado River Compact, the Boulder Canyon Project Act and other applicable legislation and regulations, to the end that the same could be carried into each and all of the contracts between the United States and applicants for water contracts in California as a uniform clause; and

WHEREAS the parties hereto have fully considered their respective rights and requirements in cooperation with the other water users and applicants and the Division of Water Resources aforesaid;

NOW, THEREFORE, the parties hereto do expressly agree to the apportionments and priorities of water of and from the Colorado River for use in California as hereinafter fully set out and respectfully request the Division of Water Resources to, in all respects, recognize said apportionments and priorites in all matters relating to State authority and to recommend the provisions of Article I hereof to the Secretary of the Interior of the United States for insertion in any and all contracts for water made by him pursuant to the terms of the Boulder Canyon Project Act, and agree that in every water contract which any party may hereafter enter into with the United States, provisions in accordance with Article I shall be included therein if agreeable to the United States.

ARTICLE I.

The waters of the Colorado River available for use within the State of California under the Colorado River Compact and the Boulder Canyon Project Act shall be apportioned to the respective interests below named and in amounts and with priorities therein named and set forth, as follows:

SECTION 1. A first priority to Palo Verde Irrigation District for beneficial use exclusively upon lands in said District as it now exists and upon lands between said District and the Colorado River, aggregating (within and without said District) a gross area of 104,500 acres, such waters as may be required by said lands.

SECTION 2. A second priority to Yuma Project of United States Bureau of Reclamation for beneficial use upon not exceeding a gross area of 25,000 acres of land located in said project in California, such waters as may be required by said lands.

SECTION 3. A third priority (a) to Imperial Irrigation District and other lands under or that will be served from the All American Canal in Imperial and Coachella Valleys, and (b) to Palo Verde Irrigation District for use exclusively on 16,000 acres in that area known as the "Lower Palo Verde Mesa", adjacent to Palo Verde Irrigation District, for beneficial consumptive use, 3,850,000 acre feet of water per annum less the beneficial consumptive use under the priorities designated in Sections 1 and 2 above. The rights designated (a) and (b) in this section are equal in priority. The total beneficial consumptive use under priorities stated in Sections 1, 2 and 3 of this article shall not exceed 3,850,000 acre feet of water per annum.

SECTION 4. A fourth priority to the Metropolitan Water District of Southern California and/or the City of Los Angeles, for beneficial consumptive use, by themselves and/or others, on the Coastal Plain of Southern California, 550,000 acre feet of water per annum.

SECTION 5. A fifth priority, (a) to The Metropolitan Water District of Southern California and/or the City of Los Angeles, for beneficial consumptive use, by themselves and/or others, on the Coastal Plain of Southern California, 550,000 acre feet of water per annum and (b) to the City of San Diego and/or County of San Diego, for beneficial consumptive use, 112,000 acre feet of water per annum. The rights designated (a) and (b) in this section are equal in priority.

SECTION 6. A sixth priority (a) to Imperial Irrigation District and other lands under or that will be served from the All American Canal in Imperial and Coachella Valleys, and (b) to Palo Verde Irrigation District for use exclusively on 16,000 acres in that area known as the "Lower Palo Verde Mesa," adjacent to Palo Verde Irrigation District, for beneficial consumptive use, 300,000 acre feet of water per annum. The rights designated (a) and (b) in this section are equal in priority.

SECTION 7. A seventh priority of all remaining water available for use within California, for agricultural use in the Colorado River Basin in California, as said basin is designated on Map No. 23000 of the Department of the Interior, Bureau of Reclamation.

SECTION 8. So far as the rights of the allottees named above are concerned, The Metropolitan Water District of Southern California and/or the City of Los Angeles shall have the exclusive right to withdraw and divert into its aqueduct any water in Boulder Canyon Reservoir accumulated to the individual credit of said District and/or said City (not exceeding at any one time 4,750,000 acre feet in the aggregate) by reason of reduced diversions by said District and/or said City; provided, that accumulations shall be subject to such conditions as to accumulation, retention, release and withdrawal as the Secretary of the Interior may from time to time prescribe in his discretion, and his determination thereof shall be final; provided further, that the United States of America reserves the right to make similar arrangements with users in other states without distinction in priority, and to determine the correlative relations between said District and/or said City and such users resulting therefrom.

SECTION 9. In addition, so far as the rights of the allottees named above are concerned, the City of San Diego and/or County of San Diego shall have the exclusive right to withdraw and divert into an aqueduct any water in Boulder Canyon Reservoir accumulated to the individual credit of said County and/or said County (not exceeding at any one time 250,000 acre feet in the aggregate) by reason of reduced diversions by said City and/or said County; provided, that accumulations shall be subject to such conditions as to accumulation, retention, release and withdrawal as the Secretary of the Interior may from time to time prescribe in his discretion, and his determination thereof shall be final; provided further, that the United States of America reserves the right to make similar arrangements with users in other states without distinction in priority, and to determine the correlative relations between the said City and/or said County and such users resulting therefrom.

SECTION 10. In no event shall the amounts allotted in this agreement to the Metropolitan Water District of Southern California and/or the City of Los Angeles be increased on account of inclusion of a supply for both said District and said City, and either or both may use said apportionments as may be agreed by and between said District and said City.

SECTION 11. In no event shall the amounts allotted in this agreement to the City of San Diego and/or to the County of San Diego be increased on account of inclusion of a supply for both said City and said County, and either or both may use said apportionments as may be agreed by and between said City and said County.

SECTION 12. The priorities hereinbefore set forth shall be in no wise affected by the relative dates of water contracts executed by the Secretary of the Interior with the various parties.

ARTICLE II.

That each and every party hereto who has heretofore filed an application or applications for a permit or permits to appropriate water from the Colorado River requests the Division of Water Resources to amend such application or applications as far as possible to bring it or them into conformity with the provisions of this agreement; and each and every party hereto who has heretofore filed a protest or protests against any such application or applications of other parties hereto does hereby request withdrawal of such protest or protests against such application or applications when so amended.

ARTICLE III.

That each and all of the parties to this agreement respectively request that the contract for delivery of water between The United States of America and The Metropolitan Water District of Southern California under date of April 24, 1930, be amended in conformity with Article I hereof.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed by their respective officers thereunto duly authorized, the day and year first above written. Executed in seven originals.

Recommended for Execution:

PALO VERDE IRRIGATION DISTRICT,
By ED J. WILLAMS,
ARVIN B. SHAW, JR.

IMPERIAL IRRIGATION DISTRICT,
By MARK ROSE,
CHAS. L. CHILDERS,
M. J. DOWD.

COACHELLA VALLEY COUNTY WATER DISTRICT,
By THOS. C. YAGER.

METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA,
By W. B. MATTHEWS,
C. C. ELDER.

CITY OF LOS ANGELES,
By W. W. HURLBUT,
C. A. DAVIS.

CITY OF SAN DIEGO,
By C. L. BYERS,
H. N. SAVAGE.

COUNTY OF SAN DIEGO,
By H. N. SAVAGE,
C. L. BYERS.

BOULDER CANYON PROJECT ACT

[PUBLIC-NO. 642-70TH CONGRESS)
[H. R. 5773]

AN ACT To provide for the construction of works for the protection and development of the Colorado River Basin, for the approval of the Colorado River compact, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That for the purpose of controlling the floods, improving navigation and regulating the flow of the Colorado River, providing for storage and for the delivery of the stored waters thereof for reclamation of public lands and other beneficial uses exclusively within the United States, and for the generation of electrical energy as a means of making the project herein authorized a self-supporting and financially solvent undertaking, the Secretary of the Interior, subject to the terms of the Colorado River compact hereinafter mentioned, is hereby authorized to construct, operate, and maintain a dam and incidental works in the main stream of the Colorado River at Black Canyon or Boulder Canyon adequate to create a storage reservoir of a capacity of not less than twenty million acre-feet of water and a main canal and appurtenant structures located entirely within the United States connecting the Laguna Dam, or other suitable diversion dam, which the Secretary of the Interior is hereby authorized to construct if deemed necessary or advisable by him upon engineering or economic considerations, with the Imperial and Coachella Valleys in California, the expenditures for said main canal and appurtenant structures to be reimbursable, as provided in the reclamation law, and shall not be paid out of revenues derived from the sale or disposal of water power or electric energy at the dam authorized to be constructed at said Black Canyon or Boulder Canyon, or for water for potable purposes outside of the Imperial and Coachella Valleys: *Provided, however,* That no charge shall be made for water or for the use, storage, or delivery of water for irrigation or water for potable purposes in the Imperial or Coachella Valleys; also to construct and equip, operate, and maintain at or near said dam, or cause to be constructed, a complete plant and incidental structures suitable for the fullest economic development of electrical energy from the water discharged from said reservoir; and to acquire by proceedings in eminent domain, or otherwise all lands, rights-of-way, and other property necessary for said purposes.

SEC. 2. (a) There is hereby established a special fund, to be known as the "Colorado River Dam fund" (hereinafter referred to as the "fund"), and to be available, as hereafter provided, only for carrying out the provisions of this Act. All revenues received in carrying out the provisions of this Act shall be paid into and expenditures shall be made out of the fund, under the direction of the Secretary of the Interior.

(b) The Secretary of the Treasury is authorized to advance to the fund, from time to time and within the appropriations therefor, such amounts as the Secretary of the Interior deems necessary for carrying out the provisions of this Act, except that the aggregate amount of such advances shall not exceed the sum of $165,000,000. Of this amount the sum of $25,000,000 shall be allocated to flood control and shall be repaid to the United States out of 62½ per centum of revenues, if any, in excess of the amount necessary to meet periodical payments during the period of amortization, as provided in section 4 of this Act. If said sum of $25,000,000 is not repaid in full during the period of amortization, then 62½ per centum of all net revenues shall be applied to payment of the remainder. Interest at the rate of 4 per centum per annum accruing during the year upon the amounts so advanced and remaining unpaid shall be paid annually out of the fund, except as herein otherwise provided.

(c) Moneys in the fund advanced under subdivision (b) shall be available only for expenditures for construction and the payment of interest, during construction, upon the amounts so advanced. No expenditures out of the fund shall be made for operation and maintenance except from appropriations therefor.

(d) The Secretary of the Treasury shall charge the fund as of June 30 in each year with such amount as may be necessary for the payment of interest on advances made under subdivision (b) at the rate of 4 per centum per annum accrued during the year upon the amounts so advanced and remaining unpaid, except that if the fund is insufficient to meet the payment of interest the Secretary of the Treasury may, in his discretion, defer any part of such payment, and the amount so deferred shall bear interest at the rate of 4 per centum per annum until paid.

(e) The Secretary of the Interior shall certify to the Secretary of the Treasury, at the close of each fiscal year, the amount of money in the fund in excess of the amount necessary for construction, operation, and maintenance, and payment of interest. Upon receipt of each such certificate the Secretary of the Treasury is authorized and directed to charge the fund with the amount so certified as repayment of the advances made under subdivision (b), which amount shall be covered into the Treasury to the credit of miscellaneous receipts.

SEC. 3. There is hereby authorized to be appropriated from time to time, out of any money in the Treasury not otherwise appropriated, such sums of money as may be necessary to carry out the purposes of this Act, not exceeding in the aggregate $165,000,000.

SEC. 4. (a) This Act shall not take effect and no authority shall be exercised hereunder and no work shall be begun and no moneys expended on or in connection with the works or structures provided for in this Act, and no water rights shall be claimed or initiated hereunder, and no steps shall be taken by the United States or by others to initiate or perfect any claims to the use of water pertinent to such works or structures unless and until (1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming shall have ratified the Colorado River compact, mentioned in section 13 hereof, and the President by public proclamation shall have so declared, or (2) if said States fail to ratify the said compact within six months from the date of the passage of this Act then, until six of said States, including the State of California, shall ratify said compact and shall consent to waive the provisions of the first paragraph of Article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven States signatory thereto, and shall have approved said compact without conditions, save that of such six-State approval, and the President by public proclamation shall have so declared, and, further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this Act, that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this Act and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin States by paragraph (a) of Article III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact.

The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of Article III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said State, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico but if, as provided in paragraph (c) of Article III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact, then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and (5) that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three States shall withhold water and none shall require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses, and (6) that all of the provisions of said tri-State agreement shall be subject in all particulars to the provisions of the Colorado River compact, and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada.

(b) Before any money is appropriated for the construction of said dam or power plant, or any construction work done or contracted for, the Secretary of the Interior shall make provision for revenues by contract, in accordance with the provisions of this Act, adequate in his judgment to insure payment of all expenses of operation and maintenance of said works incurred by the United States and the repayment, within fifty years from the date of the completion of said works, of all amounts advanced to the fund under subdivision (b) of section 2 for such works, together with interest thereon made reimbursable under this Act.

Before any money is appropriated for the construction of said main canal and appurtenant structures to connect the Laguna Dam with the Imperial and Coachella Valleys in California, or any construction work is done upon said canal or contracted for, the Secretary of the Interior shall make provision for revenues, by contract or otherwise, adequate in his judgment to insure payment of all expenses of construction, operation, and maintenance of said main canal and appurtenant structures in the manner provided in the reclamation law.

If during the period of amortization the Secretary of the Interior shall receive revenues in excess of the amount necessary to meet the periodical payments to the United States as provided in the contract, or contracts, executed under this Act, then, immediately after the settlement of such periodical payments, he shall pay to the State of Arizona 18¾ per centum of such excess revenues and to the State of Nevada 18¾ per centum of such excess revenues.

SEC. 5. That the Secretary of the Interior is hereby authorized, under such general regulations as he may prescribe, to contract for the storage of water in said reservoir and for the delivery thereof at such points on the river and on said canal as may be agreed upon, for irrigation and domestic uses, and generation of electrical energy and delivery at the switchboard to States, municipal corporations, political subdivisions, and private corporations of electrical energy generated at said dam, upon charges that will provide revenue which, in addition to other revenue accruing under the reclamation law and under this Act, will in his judgment cover all expenses of operation and maintenance incurred by the United States on account of works constructed under this Act and the payments to the United States under subdivision (b) of section 4. Contracts respecting water for irrigation and domestic uses shall be for permanent service and shall conform to paragraph (a) of section 4 of this Act. No person shall have or be entitled to have the use for any purpose of the water stored as aforesaid except by contract made as herein stated.

After the repayments to the United States of all money advanced with interest, charges shall be on such basis and the revenues derived therefrom shall be kept in a separate fund to be expended within the Colorado River Basin as may hereafter be prescribed by the Congress.

General and uniform regulations shall be prescribed by the said Secretary for the awarding of contracts for the sale and delivery of electrical energy, and for renewals under subdivision (b) of this section, and in making such contracts the following shall govern:

(a) No contract for electrical energy or for generation of electrical energy shall be of longer duration than fifty years from the date at which such energy is ready for delivery.

Contracts made pursuant to subdivision (a) of this section shall be made with a view to obtaining reasonable returns and shall contain provisions whereby at the end of fifteen years from-the date of their execution and every ten years thereafter, there shall be readjustment of the contract, upon the demand of either party thereto, either upward or downward as to price, as the Secretary of the Interior may find to be justified by competitive conditions at distributing points or competitive centers and with provisions under which disputes or disagreements as to interpretation or performance of such contract shall be determined either by arbitration or court proceedings, the Secretary of the Interior being authorized to act for the United States in such readjustments or proceedings.

(b) The holder of any contract for electrical energy not in default thereunder shall be entitled to a renewal thereof upon such terms and conditions as may be authorized or required under the then existing laws and regulations, unless the property of such holder dependent for its usefulness on a continuation of the contract be purchased or acquired and such holder be compensated for damages to its property, used and useful in the transmission and distribution of such electrical energy and not taken, resulting from the termination of the supply.

(c) Contracts for the use of water and necessary privileges for the generation and distribution of hydroelectric energy or for the sale and delivery of electrical energy shall be made with responsible applicants therefor who will pay the price fixed by the said Secretary with a view to meeting the revenue requirements herein provided for. In case of conflicting applications, if any, such conflicts shall be resolved by the said Secretary, after hearing, with due regard to the public interest, and in conformity with the policy expressed in the Federal Water Power Act as to conflicting applications for permits and licenses, except that preference to applicants for the use of water and appurtenant works and privileges necessary for the generation and distribution of hydroelectric energy, or for delivery at the switchboard of a hydroelectric plant, shall be given, first, to a State for the generation or purchase of electric energy for use in the State, and the States of Arizona, California, and Nevada shall be given equal opportunity as such applicants.

The rights covered by such preference shall be contracted for by such State within six months after notice by the Secretary of the Interior and to be paid for on the same terms and conditions as may be provided in other similar contracts made by said Secretary: *Provided, however,* That no application of a State or a political subdivision for an allocation of water for power purposes or of electrical energy shall be denied or another application in conflict therewith be granted on the ground that the bond issue of such State or political subdivision, necessary to enable the applicant to utilize such water and appurtenant works and privileges necessary for the generation and distribution of hydroelectric energy or the electrical energy applied for, has not been authorized or marketed, until after a reasonable time, to be determined by the said Secretary, has been given to such applicant to have such bond issue authorized and marketed.

(d) Any agency receiving a contract for electrical energy equivalent to one hundred thousand firm horsepower, or more, may, when deemed feasible by the said Secretary, from engineering and economic considerations and under general regulations prescribed by him, be required to permit any other agency having contracts hereunder for less than the equivalent of twenty-five thousand firm horsepower, upon application to the Secretary of the Interior made within sixty days from the execution of the contract of the agency the use of whose transmission line is applied for, to participate in the benefits and use of any main transmission line constructed or to be constructed by the former for carrying such energy (not exceeding, however, one-fourth the capacity of such line), upon payment by such other agencies of a reasonable share of the cost of construction, operation, and maintenance thereof.

The use is hereby authorized of such public and reserved lands of the United States as may be necessary or convenient for the construction, operation, and maintenance of main transmission lines to transmit said electrical energy.

SEC. 6. That the dam and reservoir provided for by section 1 hereof shall be used: First, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and satisfaction of present perfected rights in pursuance of Article VIII of said Colorado River compact; and third, for power. The title to said dam, reservoir, plant, and incidental works shall forever remain in the United States, and the United States shall, until otherwise provided by Congress, control, manage, and operate the same, except as herein otherwise provided: *Provided, however*, That the Secretary of the Interior may, in his discretion, enter into contracts of lease of a unit or units of any Government-built plant, with right to generate electrical energy, or, alternatively, to enter into contracts of lease for the use of water for the generation of electrical energy as herein provided, in either of which events the provisions of section 5 of this Act relating to revenue, term, renewals, determination of conflicting applications, and joint use of transmission lines under contracts for the sale of electrical energy, shall apply.

The Secretary of the Interior shall prescribe and enforce rules and regulations conforming with the requirements of the Federal Water Power Act, so far as applicable respecting maintenance of works in condition of repair adequate for their efficient operation, maintenance of a system of accounting, control of rates and service in the absence of State regulation or interstate agreement valuation for rate-making purposes, transfers of contracts, contracts extending beyond the lease period, expropriation of excessive profits, recapture and/or emergency use by the United States of property of lessees, and penalties for enforcing regulations made under this Act of penalizing failure to comply with such regulations or with the provisions of this Act. He shall also conform with other provisions of the Federal Water Power Act and of the rules and regulations of the Federal Power Commission, which have been devised or which may be hereafter devised, for the protection of the investor and consumer.

The Federal Power Commission is hereby directed not to issue or approve any permits or licenses under said Federal Water Power Act upon or affecting the Colorado River or any of its tributaries, except the Gila River, in the States of Colorado, Wyoming, Utah, New Mexico, Nevada, Arizona, and California until this Act shall become effective as provided in section 4 herein.

SEC. 7. That the Secretary of the Interior may, in his discretion, when repayments to the United States of all money advanced, with interest, reimbursable hereunder, shall have been made, transfer the title to said canal and appurtenant structures, except the Laguna Dam and the main canal and appurtenant structures down to and including Syphon Drop, to the districts or other agencies of the United States having a beneficial interest therein in proportion to their respective capital investments under such form of organization as may be acceptable to him. The said districts or other agencies shall have the privilege at any time of utilizing by contract or otherwise such power possibilities as may exist upon said canal, in proportion to their respective contributions or obligations toward the capital cost of said canal and appurtenant structures from and including the diversion works to the point where each respective power plant may be located. The net proceeds from any power development on said canal shall be paid into the fund and credited to said districts or other agencies on their said contracts, in proportion to their rights to develop power, until the districts or other agencies using said canal shall have paid thereby and under any contract or otherwise an amount of money equivalent to the operation and maintenance expense and cost of construction thereof.

SEC. 8. (a) The United States, its permittees, licensees, and contractees, and all users and appropriators of water stored, diverted, carried, and/or distributed by the reservoir, canals, and other works herein authorized, shall observe and be subject to and controlled by said Colorado River compact in the construction, management, and operation of said reservoir, canals, and other works and the storage, diversion, delivery, and use of water for the generation of power, irrigation, and other purposes, anything in this Act to the contrary notwithstanding, and all permits, licenses, and contracts shall so provide.

(b) Also the United States, in constructing, managing, and operating the dam, reservoir, canals, and other works herein authorized, including the appropriation, delivery, and use of water for the generation of power, irrigation, or other uses, and all users of water thus delivered and all users and appropriators of waters stored by said reservoir and/or carried by said canal, including all permittees and licensees of the United States or any of its agencies, shall observe and be subject to and controlled, anything to the contrary herein notwithstanding, by the terms of such compact, if any, between the States of Arizona, California, and Nevada, or any two thereof, for the equitable division of the benefits, including power, arising from the use of water accruing to said States, subsidiary to and consistent with said Colorado River compact, which may be negotiated and approved by said States and to which Congress shall give its consent and approval on or before January 1, 1929; and the terms of any such compact concluded between said States and approved and consented to by Congress after said date: *Provided*, That in the latter case such compact shall be subject to all contracts, if any, made by the Secretary of the Interior under section 5 hereof prior to the date of such approval and consent by Congress.

SEC. 9. All lands of the United States found by the Secretary of the Interior to be practicable of irrigation and reclamation by the irrigation works authorized herein shall be withdrawn from public entry. Thereafter, at the direction of the Secretary of the Interior, such lands shall be opened for entry, in tracts varying in size but not exceeding one hundred and sixty acres, as may be determined by the Secretary of the Interior, in accordance with the provisions of the reclamation law, and any such entryman shall pay an equitable share in accordance with the benefits received, as determined by the said Secretary, of the construction cost of said canal and appurtenant structures; said payments to be made in such installments and at such times as may be specified by the Secretary of the Interior, in accordance with the provisions of the said reclamation law, and shall constitute revenue from said project and be covered into the fund herein provided for: *Provided*, That all persons who served in the United States Army, Navy, Marine Corps, or Coast Guard during World War II, the War with Germany, the War with Spain, or in the suppression of the insurrection in the Philippines, and who have been honorably separated or discharged therefrom or placed in the Regular Army or Naval Reserve, shall have the exclusive preference right for a period of three months to enter said lands, subject, however, to the provisions of subsection (c) of section 4 of the Act of December 5, 1924 (43 Stat. 672, 702; 43 U.S.C., sec. 433); and also, so far as practicable, preference shall be given to said persons in all construction work authorized by this chapter: *Provided further*, That the above exclusive preference rights shall apply to veteran settlers on lands watered from the Gila canal in Arizona the same as to veteran settlers on lands watered from the All-American canal in California: *Provided further*, That in the event such entry shall be relinquished at any time prior to actual residence upon the land by the entryman for not less than one year, lands so relinquished shall not be subject to entry for a period of sixty days after the filing and notation of the relinquishment in the local land office, and after the expiration of said sixty-day period such lands shall be open to entry, subject to the preference in the section provided.[1]

SEC. 10. That nothing in this Act shall be construed as modifying in any manner the existing contract, dated October 23, 1918, between the United States and the Imperial Irrigation District, providing for a connection with Laguna Dam; but the Secretary of the Interior is authorized to enter into contract or contracts with the said district or other districts, persons, or agencies for the construction, in accordance with this Act, of said canal and appurtenant structures, and also for the operation and maintenance thereof, with the consent of the other users.

SEC. 11. That the Secretary of the Interior is hereby authorized to make such studies, surveys, investigations, and do such engineering as may be necessary to determine the lands in the State of Arizona that should be embraced within the boundaries of a reclamation project, heretofore commonly known and hereafter to be known as the Parker-Gila Valley reclamation project, and to recommend the most practicable and feasible method of irrigating lands within said project, or units thereof, and the cost of the same; and the appropriation of such sums of money as may be necessary for the aforesaid purposes from time to time is hereby authorized. The Secretary shall report to Congress as soon as practicable, and not later than December 10, 1931, his findings, conclusions, and recommendations regarding such project.

SEC. 12. "Political subdivision" or "political subdivisions" as used in this Act shall be understood to include any State, irrigation or other district, municipality, or other governmental organization.

"Reclamation law" as used in this Act shall be understood to mean that certain Act of the Congress of the United States approved June 17, 1902, entitled "An Act appropriating the receipts from the sale and disposal of public land in certain States and Territories to the construction of irrigation works for the reclamation of arid lands," and the Acts amendatory thereof and supplemental thereto.

"Maintenance" as used herein shall be deemed to include in each instance provision for keeping the works in good operating condition.

"The Federal Water Power Act," as used in this Act, shall be understood to mean that certain Act of Congress of the United States approved June 10, 1920, entitled "An Act to create a Federal Power Commission; to provide for the improvement of navigation; the development of water power; the use of the public lands in relation thereto; and to repeal section 18 of the River and Harbor Appropriation Act, approved August 8, 1917, and for other purposes," and the Acts amendatory thereof and supplemental thereto.

"Domestic" whenever employed in this Act shall include water uses defined as 'domestic" in said Colorado River compact.

SEC. 13. (a) The Colorado River compact signed at Santa Fe, New Mexico, November 24, 1922, pursuant to Act of Congress approved August 19, 1921, entitled "An Act to permit a compact or agreement between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming respecting the disposition and apportionment of the waters of the Colorado River, and for other purposes," is hereby approved by the Congress of the United States, and the provisions of the first paragraph of article II of the said Colorado River compact, making said compact binding and obligatory when it shall have been approved by the legislature of each of the signatory States, are hereby waived, and this approval shall become effective when the State of California and at least five of the other States mentioned, shall have approved or may hereafter approve said compact as aforesaid and shall consent to

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[1] As amended by act of March 6, 1946 (60 Stat. 36)

such waiver, as herein provided.

(b) The rights of the United States in or to waters of the Colorado River and its tributaries howsoever claimed or acquired, as well as the rights of those claiming under the United States, shall be subject to and controlled by said Colorado River compact.

(c) Also all patents, grants, contracts, concessions, leases, permits, licenses, rights-of-way, or other privileges from the United States or under its authority, necessary or convenient for the use of waters of the Colorado River or its tributaries, or for the generation or transmission of electrical energy generated by means of the waters of said river or its tributaries, whether under this Act, the Federal Water Power Act, or otherwise, shall be upon the express condition and with the express covenant that the rights of the recipients or holders thereof to waters of the river or its tributaries, for the use of which the same are necessary, convenient, or incidental, and the use of the same shall likewise be subject to and controlled by said Colorado River compact.

(d) The conditions and covenants referred to herein shall be deemed to run with the land and the right, interest, or privilege therein and water right, and shall attach as a matter of law, whether set out or referred to in the instrument evidencing any such patent, grant, contract, concession, lease, permit, license, right-of-way, or other privilege from the United States or under its authority, or not, and shall be deemed to be for the benefit of and be available to the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, and the users of water therein or thereunder, by way of suit, defense, or otherwise, in any litigation respecting the waters of the Colorado River or its tributaries.

SEC. 14. This Act shall be deemed a supplement to the reclamation law, which said reclamation law shall govern the construction, operation, and management of the works herein authorized, except as otherwise herein provided.

SEC. 15. The Secretary of the Interior is authorized and directed to make investigation and public reports of the feasibility of projects for irrigation, generation of electric power, and other purposes in the States of Arizona, Nevada, Colorado, New Mexico, Utah, and Wyoming for the purpose of making such information available to said States and to the Congress, and of formulating a comprehensive scheme of control and the improvement and utilization of the water of the Colorado River and its tributaries. The sum of $250,000 is hereby authorized to be appropriated from said Colorado River Dam fund, created by section 2 of this Act, for such purposes.

SEC. 16. In furtherance of any comprehensive plan formulated hereafter for the control, improvement, and utilization of the resources of the Colorado River system and to the end that the project authorized by this Act may constitute and be administered as a unit in such control, improvement, and utilization, any commission or commissioner duly authorized under the laws of any ratifying State in that behalf shall have the right to act in an advisory capacity to and in cooperation with the Secretary of the Interior in the exercise of any authority under the provisions of sections 4, 5, and 14 of this Act, and shall have at all times access to records of all Federal agencies empowered to act under said sections, and shall be entitled to have copies of said records on request.

SEC. 17. Claims of the United States arising out of any contract authorized by this Act shall have priority over all others, secured or unsecured.

SEC. 18. Nothing herein shall be construed as interfering with such rights as the States now have either to the waters within their borders or to adopt such policies and enact such laws as they may deem necessary with respect to the appropriation, control, and use of waters within their borders, except as modified by the Colorado River compact or other interstate agreement.

SEC. 19. That the consent of Congress is hereby given to the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming to negotiate and enter into compacts or agreements, supplemental to and in conformity with the Colorado River compact and consistent with this Act for a comprehensive plan for the development of the Colorado River and providing for the storage, diversion, and use of the waters of said river. Any such compact or agreement may provide for the construction of dams, headworks, and other diversion works or structures for flood control, reclamation, improvement of navigation, division of water, or other purposes and/or the construction of power houses or other structures for the purpose of the development of water power and the financing of the same; and for such purposes may authorize the creation of interstate commissions and/or the creation of corporations, authorities, or other instrumentalities.

(a) Such consent is given upon condition that a representative of the United States, to be appointed by the President, shall participate in the negotiations and shall make report to Congress of the proceedings and of any compact or agreement entered into.

(b) No such compact or agreement shall be binding or obligatory upon any of such States unless and until it has been approved by the legislature of each of such States and by the Congress of the United States.

SEC. 20. Nothing in this Act shall be construed as a denial or recognition of any rights, if any, in Mexico to the use of the waters of the Colorado River system.

SEC. 21. That the short title of this Act shall be "Boulder Canyon Project Act."

Approved, December 21, 1928.

ATTACHMENT G

Renewable Energy Development in the California Desert:
Common Raven Predation on the Desert Tortoise
November 2010

Summary

Over the past few decades, common raven (*Corvus corax*; raven) populations have increased substantially and its distribution has expanded in the California desert, primarily in response to human-provided subsidies of food, water, and nest sites associated with a variety of land uses. Ravens are a known predator of the desert tortoise (*Gopherus agassizii*), a species listed as threatened under the federal Endangered Species Act (ESA) and the California ESA (CESA). A large number of renewable energy projects are currently proposed in the California deserts within the range of the desert tortoise. Due to the locations of these projects, associated infrastructure, and the increase in human activities that will occur if these projects are approved, a corresponding increase in raven presence and predation on desert tortoises is anticipated throughout the region. The direct, indirect, and cumulative impacts from renewable energy and other development projects throughout the range of the desert tortoise have been and will continue to be substantial. As discussed below, conservation efforts at both the project and regional level will be required to address impacts from renewable energy projects and infrastructure.

Offsetting Direct Impacts from Development Projects:

The Bureau of Land Management (BLM) addresses the increase of ravens and associated issues in each of the amendments to the California Desert Conservation Area Plan (CDCA). The CDCA plan amendments established that all new projects with the potential to increase raven populations would be required to implement mitigation measures to reduce or eliminate the opportunity for proliferation of ravens. The BLM's biological assessments and the U.S. Fish and Wildlife Service's (USFWS) biological opinions for the CDCA plan amendments reiterate the need to address this species and its potential impacts on desert tortoise populations.

Pursuant to CESA, the California Department of Fish and Game (CDFG) issues incidental take permits for projects that may affect desert tortoises and their habitats. Permit conditions include mitigation measures designed to offset project impacts and typically require the development of a raven control plan and implementation of off-site measures to reduce the indirect and cumulative environmental effects of increased raven predation.

To address project-specific impacts on desert tortoises from ravens that may be attracted to renewable energy project sites and associated transmission, project proponents should design their projects to exclude ravens to the extent practicable and implement measures to reduce raven predation on the desert tortoises at the local level. Each project proponent should develop an on-site raven management plan to eliminate and/or minimize the availability of subsidies and the potential for ravens to occupy the project site during all phases of development and use, including construction, operation and maintenance, and decommissioning. The USFWS developed a project-specific raven management plan template, which is provided in Appendix A.

However, because it is not possible to completely exclude ravens from using project infrastructure (i.e., solar structures, transmission lines and towers, buildings, fences, etc.) as nesting, perching, and roosting substrates (during breeding as well as non-breeding seasons), a regional raven management plan was developed. Contributions to and implementation of the regional plan are intended to address the indirect and cumulative impacts associated with development projects and other land uses in the desert that facilitate the expansion of raven populations into desert tortoise habitats.

Offsetting Indirect and Cumulative Impacts from Development Projects:

To address the impacts from ravens on desert tortoises and their habitats, the USFWS together with several cooperating agencies, including the BLM, National Park Service, Department of Defense, and the Department of Agriculture completed an environmental assessment for the implementation of a regional plan to reduce predation by the common raven on the federally threatened desert tortoise in the California desert (Raven EA; USFWS et al. 2008). This document was prepared because the raven is a known predator of the desert tortoise and the Desert Tortoise (Mojave population) Recovery Plan identifies reducing predation on the species as an important recovery task.

The Raven EA outlines a large scale, adaptively managed program that is expected to be implemented in a phased approach in collaboration with the cooperating agencies and local partners. The plan includes five primary actions:

1) Reduction of human provided subsidies (i.e., food, water, sheltering and nesting sites, etc.)
2) Education and outreach
3) Raven nest removal
4) Raven removal
5) Evaluation of effectiveness and adaptive management

The latter three activities are accomplished first through the identification of offending ravens by surveyors (whom also can remove nests) and then reporting those birds to the Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services (WS) who are contracted to remove the offending individuals. Offending ravens are birds that are known to prey on desert tortoises as determined by survey results. Effectiveness monitoring is incorporated into subsequent years of the survey effort; therefore, the survey effort should remain consistent or increase but should not decrease. After the first 3 years of implementation, removal may increase to include additional (i.e., non-breeding) ravens depending on the results of monitoring.

The Raven EA identifies three levels of effort pertaining to lethal removal of ravens, which can be increased or decreased following the third and sixth year of implementation based on monitoring results. Thus the level of effort for this component will/could change every 3 years and reach a maximum level at year 6 (these are represented by levels 1-3 below). In addition, there is an understanding among agencies (e.g., BLM, CDFG, and USFWS) that every component of the plan may not be implemented each year. For example, an education and outreach program from one year may not need to be repeated annually.

To assess the potential cost to implement the regional raven management plan, the USFWS evaluated three primary aspects of the plan identified in the Raven EA [removal (conducted by WS), outreach and education, and monitoring surveys]. The following outlines the assumptions and cost estimates used to develop the budget outline:

- Removal: In 2010, a single year-round WS employee costs approximately $92,000. For the first 3 years of the plan, if seasonal workers are utilized only during raven breeding season, this cost would be reduced. In 2009, $30,000 covered one WS staff for approximately 2.5 months, including training. We anticipate that survey and removal efforts would be divided amongst the three desert tortoise recovery units in the California Desert. Assuming that the optimum use of a WS employee would be one per recovery unit, a minimum of three people is needed at the lowest level of effort (approximately $40,000/WS personnel during the breeding season). After 3 years, removal efforts would no longer be limited to raven breeding season, necessitating year-round personnel. We estimated that maximum effort would require no more than two WS staff per recovery unit.

- Outreach and education position: Outreach and education is an important component of the plan. Currently, the assumption is that two people can effectively implement the education and outreach program for the Raven EA. A base annual salary for a GS-11 position within the region is approximately $64,000. Education and outreach would also benefit from media support including pamphlets and radio and television broadcasts, which would increase the costs to administer this component of the plan.
- Monitoring survey team: The effort, and therefore cost, of the monitoring survey team is dependent on the level of implementation of the plan. Effectiveness monitoring is essential in determining the success of the plan, and whether additional efforts will be needed. The three levels of survey effort considered below are compatible with the three increasing levels of raven removal effort.

The table below estimates the annual cost of these activities at each of the three levels of implementation described in the Raven EA, beginning with level 1.

Table 1. Annual budget estimates for implementation of the Raven EA.

Primary Activities in the Raven EA	**Level 1**	**Level 2**	**Level 3**
Removal staff	120,000	276,000	552,000
Outreach	128,000	128,000	128,000
Monitoring survey team	820,000	1,000,000	4,381,745
TOTAL	**$1,068,000**	**$1,404,000**	**$5,061,754**

In addition, there are a multitude of additional activities identified in the Raven EA that could be conducted in the desert to facilitate the reduction of raven subsidies. These include: identification and cleanup of illegal dump sites, surveys of communities to identify business that do not adequately control their waste, and surveys of landfills and transfer stations. Depending on the required level of implementation necessary for effectiveness, funds to conduct these other activities may be available.

Calculating Project-Specific Contributions to the Regional Raven Management Plan:

As stated above, implementation of the regional raven management plan is necessary to address the indirect and cumulative impacts of development projects. Given the potential for ravens to use a variety of human-provided structures and sites for foraging, nesting, and shelter and because it is not possible to completely exclude ravens from using project infrastructure, which can extend across thousands of acres for each project; it is appropriate to calculate the contribution of each project to the regional raven management plan based on the total area required for the development of the facility and associated components. These funds would be used to carry out the primary actions described above.

With the assistance of the National Fish and Wildlife Foundation (NFWF), who will be holding and managing the funds to implement the regional raven management plan, the USFWS and CDFG calculated the equitable contribution for development projects that are expected to increase raven presence and predation on the desert tortoise. This was accomplished by utilizing modeling tools to determine a per acre contribution for projects with permit terms of 20 or 30 years.

First, we estimated the developable (contributing) acreage within the implementation area of the Raven EA by reviewing state, federal, and county planning documents. Lands allocated for conservation or with otherwise "protected status", such as Department of Defense installations, congressionally designated Wilderness Areas, National Park Service units, State Parks, and lands managed by CDFG were excluded from developable acreage. For determining developable acreage on BLM lands, we included all of the current right-of-way applications for solar and wind projects, and assumed that no more than 1% of the Desert Wildlife Management Areas (DWMAs) would be developed pursuant to the CDCA plan and associated amendments (Table 2).

Table 2. Total estimated acres of potential development within the range of the desert tortoise in California.

Land Use Category	Acreage
Potentially developable acres in CDCA (desert tortoise habitat modeled .2-1, Nussear 2009)	2,453,600
1% of DWMAs	42,232
Solar project applications	450,000
Wind project applications	569,000
TOTAL	**3,514,832**

Since not all of these acres will actually be developed, we assumed that 35% of the total acreage in Table 2, or 1,230,191 acres, would be developed over the next 30 years.

Then, based on the figures in Table 1, NFWF performed the following calculations:

- Calculated the year-by-year costs of raven removal, outreach, and survey activities;
- inflated those costs over the 20- or 30-year period for inflation, which was assumed at 3%;
- discounted the inflated cost stream to a "net present value" using an expected rate of return net of administrative/financial fees and expenses (analyzed discount rates of 2%, 3%, 4%, and 5%); and
- divided the net present value by the developable/contributing acreage of 1,230,191.

The resulting "per acre" charge is what a developer would pay up-front in a single lump sum for its contribution to the regional raven management plan, with this charge being multiplied by the number of acres used or impacted by a project to arrive at the total payment amount for that project.

The various discount rates (2%, 3%, 4%, and 5%) are intended to reflect what net investment return might be earned on the mitigation funds as they await disbursement. The term "net" here refers to investment return after assessing the NFWF's administrative fees and financial institution investment advisory fees (likely to be roughly 3% in the aggregate). The USFWS, in consultation with the CDFG, determined a 3% discount rate would be appropriate for this type of program, based on an estimated 20 to 30 year implementation period. Table 3 below provides the resulting cost per acre contribution for development projects with a permit terms of 20 and 30 years. If approvals are granted to extend the term of a renewable energy project past the initial permit term (i.e., 20 or 30 years), the applicable state and/or federal agencies will re-evaluate the level of implementation of the regional raven management plan and assess whether the project is responsible for contributing additional funds to the account.

Table 3. Per acre contribution for the implementation of the regional raven management plan.

Permitted Duration of Project	**Per Acre Contribution**
20 years	$64.00
30 years	$105.00

For associated transmission lines, towers, and substations that are expected to remain in place after the initial term of a given renewable energy project, the contribution to the regional raven management plan will be $105 per acre impacted. The total contribution for a transmission line and its associated components will be determined according to the following acreages and formula:

Total contribution for transmission line and components = (1 + 2) x $105.00

1= # acres impacted by all associated substations

2= # acres impacted by the transmission line (determined by multiplying the width of the widest tower pad (acres) by the length of the transmission line)

Therefore, projects within and near currently occupied desert tortoise habitat or suitable desert tortoise habitat would contribute to the implementation of the regional raven management plan at the amounts specified above. Based on the methodology used for calculating the contribution, the total amount would be paid in full as part of the overall mitigation for the project. However, for projects that will be built in phases, the per-acre contribution may be paid as each phase is approved for construction pending agency agreement. For projects being mitigated through the NFWF program, the schedule of payments would be dictated by the terms of that program.

The total contributions for development projects within the California deserts will facilitate the ability for the resource and land management agencies to fully implement the actions identified in the regional raven management plan. Managing raven populations will play an important role in furthering the recovery of the desert tortoise.

Literature Cited

U.S. Fish and Wildlife Service, U.S. Department of Agriculture, U.S. Department of Defense, Bureau of Land Management. 2008. Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise. Ventura Fish and Wildlife Office. Ventura, California.

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Appendix A

Common Raven (*Corvus corax*) Management Plan Template
(for all development projects within the range of the Mojave population of the desert tortoise)

Introduction

The purpose of the project-specific management plan is to address direct impacts to desert tortoises by eliminating and minimizing subsidies to the maximum extent practicable that are known to attract and be exploited by common ravens (ravens) during project construction, operation and maintenance, and decommissioning (i.e., removal of project facilities and infrastructure, reclamation of access roads, restoration of native vegetation). To address the indirect and cumulative effects of the project, the proponent would participate in the regional raven management plan either through monetary or in-kind contributions coordinated by the Raven Management Work Group, and working group formed by the Desert Managers Group.

The project-specific management plan should be implemented throughout the life of the project and include management strategies to control and limit raven abundance in and around the project area. In situations where subsides such as structures for perching cannot be eliminated (i.e., power lines and towers) the proponent will implement best management practices (BMPs) such as, reduction of available subsidies, raven monitoring, and raven nest removal. The project-specific plan is designed to avoid and minimize direct impacts resulting from the proposed project.

Potential subsidies to be considered for each project include but are not limited to:

- Availability of water from dust abatement activities, equipment cleaning and maintenance, evaporation and retention ponds, drainage areas or landscaping;
- Potential perching, roosting, or nesting sites;
- Food sources from soil disturbance and road kill (e.g., small mammals, insects, etc.); and
- Food sources and attractants from human and animal food and waste.

Plan Development

The project-specific raven management plan should address each of the following elements for each phase of project implementation:

- Identification of project design features and other measures to manage potential introduction of subsidies that may attract ravens to the area, including repellant devices to discourage nesting, perching, and roosting on project facilities such as transmission poles and towers; a refuse management system; a monitoring program; and a list of adaptive management options that would be applied if necessary, including the removal of all raven nests;

- Documentation of the effectiveness of project design features and BMPs;
- Identification of triggers that will prompt implementation of adaptive management procedures; and
- Regular reporting to document raven management measures that have been implemented and results of raven abundance and effectiveness monitoring throughout the life of the project.

The following are examples of elements that should be addressed at each stage of project implementation. This should not be considered a complete list, as there may be other elements that should be considered depending on the project.

Construction
Surface disturbance unearthing food sources
Ponding water
Human and animal food and waste management
Temporary nesting, perching, and roosting sites
Revegetation

Operation and Maintenance
Surface disturbance unearthing food sources
Ponding water
Human and animal food and waste management
Temporary and permanent nesting, perching, and roosting sites
Evaporation ponds
Landscaping

Decommissioning
Surface disturbance unearthing food sources
Ponding water
Human and animal food and waste management
Temporary and permanent nesting, perching, and roosting sites
Landscaping
Restoration, revegetation, and/or reclamation activities

Plan Implementation/Monitoring

Implementation and effectiveness monitoring of on-site efforts are critical to the understanding of the success and value of raven management activities. At a minimum, the plan should identify, address, and implement the following activities:

Construction
The project site should be monitored to ensure BMP compliance and document any raven use. The monitoring protocol should be rigorous enough to detect raven use. If a component of construction is identified as providing subsidies or attracting ravens, immediate steps should be taken to address the subsidies through an adaptive management program.

Operation

Raven nest removal should be conducted on all property structures for the life of the project. In the event that a nest is located with eggs, the nest will be removed following the completion of the nesting cycle unless, current implementation standards of the regional raven management plan allow for immediate removal. A raven abundance monitoring plan should be developed to verify the effectiveness of the BMPs and evaluate the need for adaptive management. The frequency and intensity of the monitoring plan will be related to the number of potential subsidies and the size of the proposed project. Monitoring stations will in most cases be associated with structures or elements where BMPs have been utilized or potential raven attractants are expected.

Decommissioning

The project site should be monitored to ensure BMP compliance and document any raven use. The monitoring protocol should be rigorous enough to detect raven use. If a component of decommissioning is identified as providing subsidies or attracting ravens, immediate steps should be taken to address the subsidies through an adaptive management program.

Adaptive Management

The project proponent should identify and describe adaptive management practices as they will be used to ensure effectiveness of accomplishing the purpose of the raven management plan. Project specific triggers will be established through coordination with the agencies. Lethal removal of ravens will only be utilized under special circumstance and will be commensurate with the level of implementation of the regional raven management plan.

Education

This component should outline worker education, at all phases of development, as it pertains to avoiding and reducing subsidies for ravens and to promoting desert tortoise awareness. It should address continued education for long-term employees and users of the site (i.e., customers, etc.).

Response to Letter 12

Response 12-1

The commenter notes that the Project is located in the Bureau of Land Management's Riverside East Solar Energy Zone (SEZ) and notes that this area is governed by the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO Plan) and the California Desert Conservation Area (CDCA).

Only a portion of the Project site is located within an area subject to the NECO Plan and the CDCA. The proposed Project (up to 485 MW PV solar energy generation facility and 8.4-mile gen-tie line) would occupy a total of 3,660 acres. The Project would be located on lands under the jurisdiction of the County of Riverside, the BLM, and the City of Blythe. A majority of the Project would be located within the County of Riverside and within the area governed by the County of Riverside's General Plan and the Palo Verde Valley Area Plan. A portion of the solar facility site would be within the area of the City of Blythe, within the area governed by the City's General Plan. A portion of the 230 kV gen-tie line would traverse BLM-managed lands, and that area would be governed by the CDCA Plan. The portion of the gen-tie line that would traverse BLM-managed lands that are within the area governed by the CDCA Plan, designated Multiple-Use Class M (Moderate). Of the 8.4-mile gen-tie line, approximately 4.8 miles would extend outside of the solar facility and would be placed within a 125-foot-wide ROW and occupy 73 acres. Of this, 3.8 miles would traverse BLM-managed lands with 53 acres within the (SEZ). The comment does not address specific issues or concerns related to the adequacy of the environmental impact analysis in the Final EIR/EA. General policy concerns regarding the overall impact of development governed by the plans within the SEZ is noted and will be provided to the Riverside County Board of Supervisors for their review and consideration.

The commenter further states that there are several approved and pending solar power projects located within the SEZ. The commenter states that there is lack of sufficient mitigation measures associated with each of these projects and each project will result in cumulative impacts to natural resources. While this comment reflects the commenter's opinion regarding cumulative impacts and the merits of the mitigation measures associated with the approved and pending projects located within the SEZ, this comment does not raise specific issues related to the sufficiency of the analysis of environmental impacts and/or their avoidance or mitigation, as recommended in CEQA Guidelines Section 15204. Nonetheless, this comment is hereby noted and it will be provided to the Riverside County Board of Supervisors for their review and consideration.

Response 12-2

The commenter states that the County and BLM should analyze the Project's foreseeable direct, indirect, and cumulative impacts and provide all feasible mitigation.

This comment does not address specific issues or concerns related to the adequacy of the environmental analysis. However; it should be noted that the Final EIR/EA was prepared to comply with the requirements of both CEQA and NEPA. CEQA requires an EIR to identify the significant environmental effects of a project. An EIR presents criteria that are used to determine whether or not an adverse impact is significant under CEQA. An EIR must also describe potentially feasible mitigation measures that could minimize each significant adverse impact. Potentially feasible mitigation measures that could minimize impacts determined significant under CEQA are specifically identified in specific resources sections in the Final EIR/EA as "mitigation measures" (Sections 4.2.1 through 4.2.15). The NEPA process is to be used to identify and assess reasonable alternatives to proposed actions that would avoid or minimize adverse effects of an action upon the quality of the human environment (40 CFR Part 1500.2 [e]). Environmental effects include direct, indirect, and cumulative impacts. Cumulative effects of Project implementation are discussed under each resource area. The Final EIR/EA provides an environmental analysis to determine the direct, indirect, and cumulative effects on that resource (refer to Sections 4.2.1 through 4.2.15).

Response 12-3

The commenter contends that the Draft EIR/EA fails to properly analyze the Project's impacts.

The Final EIR/EA analyzed the environmental impacts of the proposed Project. The Final EIR/EA was prepared and reviewed by County Staff and technical experts and is consistent with State CEQA Guidelines and NEPA requirements. The document includes analysis relative to Aesthetics/Visual Resources, Agriculture and Forestry Resource, Air Quality, Biological Resources, Cultural Resources, Geology Soils and Mineral Resources, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, Paleontological Resources, Population and Housing, Public Services, Utilities, and Socioeconomics, Recreation, and Traffic and Transportation. The Final EIR/EA adequately set forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project based on technical reports and studies prepared by qualified individuals, and proposed feasible mitigation measures to reduce those impacts as required under CEQA and NEPA. Furthermore, the Final EIR/EA supplies the public and decision-makers with adequate information concerning the potential environmental effects of the proposed Project and describes, as necessary, feasible mitigation measures to reduce impacts to less than significant.

Refer to Response 12-22, below, regarding Colorado River water entitlement.

Response 12-4

The commenter states that the Draft EIR/EA will not mitigate impacts to the extent claimed, and in some instances, may generate additional impacts. The commenter provides an example asserting that the Draft EIR/EA does not evaluate potentially significant impacts associated with burrowing owl translocation.

The avoidance steps outlined in Mitigation Measure Biology-4 of the Final EIR/EA will be implemented first and only if avoidance is unavoidable and in consultation with CDFW, BLM, and the County should passive relocation be considered. As outlined in Mitigation Measure Biology-4 of the Final EIR/EA occupied burrows will not be disturbed during the breeding season (February 1 through August 31) unless an approved biologist verifies, through non-invasive methods, that both 1) the birds have not begun egg-laying and incubation and 2) that juveniles from the occupied burrow are foraging independently and are capable of independent survival. Occupied burrows will be protected with a buffer.

Passive relocation is considered the preferred option to trapping (CBOC 1993), and the CDFW will not authorize the capture and relocation of burrowing owls except in the context of scientific research (CDFW 2012). Should passive relocation be considered, the steps within the Burrowing Owl Mitigation and Monitoring Plan will be implemented. This will include monitoring of the mitigation site to ensure the appropriate maintenance for the mitigation site and that persistence of the burrowing owls on site is successful and long-term (CDFW 2012). Monitoring of the site will occur four times per year for a two-year program. Two visits will be conducted during the breeding season, and the other two visits will be conducted during the non-breeding season to evaluate the burrowing owl use of the artificial burrows or other natural burrows. Maintenance of artificial burrows shall occur three to four times during the two years following relocation, as necessary.

Based on the CDFW guidance for passive relocation and implementation of a monitoring program the Project would not have potentially significant impacts to the burrowing owl.

Response 12-5

The commenter suggests that the Draft EIR/EA should be recirculated to resolve inadequacies.

Generally, an EIR must be recirculated for additional public review if "significant new information" is added to the EIR following notice of the initial public review period but prior to final certification (CEQA Guidelines §15088.5(a)). Not all new information added to an EIR is significant, and "new information added to the EIR that merely clarifies or amplifies or makes insignificant modifications" does not trigger recirculation (CEQA Guidelines §15088.5(b)).

Section 15088.5(a) of the CEQA Guidelines states:

> A lead agency is required to recirculate an EIR when significant new information is added to the EIR after public notice is given of the availability of the draft EIR for public review under Section 15087 but before certification. As used in this section, the term "information" can include changes in the project or environmental setting as well as additional data or other information. New information added to an EIR is not "significant" unless the EIR is changed in a way that deprives the public of a meaningful opportunity to comment upon a substantial adverse environmental effect of the project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that the project's proponents have declined to implement. "Significant new information" requiring recirculation include, for example, a disclosure showing that:
>
> (1) A new significant environmental impact would result from the project or from a new mitigation measure proposed to be implemented.
> (2) A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.
> (3) A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the environmental impacts of the project, but the project's proponents decline to adopt it.
> (4) The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

The fourth example is based on the court's decision in a specific lawsuit and is intended to capture circumstances in which fundamental information is omitted in the Draft EIR and then added after the public comment period has closed. In *Mountain Lion Coalition v. Fish & Game Commission* (1989) 214 Cal.App.3d 1043, an environmental organization challenged the Fish and Game Commission's adoption of regulations that would have allowed sport hunting of mountain lions to resume within the state based on an environmental analysis that failed to adequately consider cumulative impacts: the analysis inadequately addressed or completely ignored important environmental issues that had been drawn to the agency's attention by the superior court, ignored input from scientists, and failed to support conclusions with references to specific scientific and empirical evidence. In reaching its decision, the court stated: "While technical perfection in a cumulative impact analysis is not required, courts have looked for 'adequacy, completeness, and a good faith effort at full disclosure.' 'A good faith effort to comply with a statute resulting in the production of information is not the same, however, as an absolute failure to comply resulting in the omission of relevant information.'" *Id.* at 1052 (citations omitted).

The BMSP Draft EIR/EA was circulated to responsible agencies, trustee agencies with resources that would be affected by the Project, and interested agencies and individuals. Per CEQA Section 15125, baseline conditions for each topical resource area are described in Chapter 3, *Affected Environment*, Sections 3.2.1 through 3.2.15. Chapter 4, *Environmental Consequences*, Sections 4.21 through 4.2.15 provides an adequate and complete disclosure of direct, indirect and cumulative impacts associated with the proposed Project. Chapter 4 also contains mitigation measures, where appropriate, to avoid, minimize, and compensate adverse impacts. The significant unavoidable, irreversible and irretrievable commitments of resources, short-term uses and long-term productivity and growth-inducing impacts are analyzed in Chapter 5, *Other NEPA/CEQA Considerations*.

As discussed in this Final EIR/EA, no "significant new information" needs to be added to the Final EIR/EA, thereby triggering the need for recirculation. There is also neither a new significant environmental impact nor a substantial increase in the severity of an existing significant environmental impact. Finally, there is no new feasible alternative or mitigation measure that clearly would lessen the environmental impact(s) of the Project which the Applicant has declined to adopt. The Final EIR/EA is in compliance with applicable CEQA Guidelines and other requirements.

Response 12-6

The commenter contends that the Draft EIR/EA does not comply with CEQA requirements and is therefore inadequate because it failed to provide 1) a stable and finite project description, 2) baseline conditions, 3) mitigation to the extent feasible, and 4) defers mitigation.

Please see response to comment 12-10 below. The Project description provided in Chapter 2, *Alternatives Including the Proposed Project,* is accurate, stable, and finite. Integral Project components are described in Section 2.2.1, *Project Facilities* (refer to pages 2-5 through 2-12).

It is atypical for detailed final project design features to be well-established for energy infrastructure projects prior to certification of an EIR/EA. In order to adequately address impacts of all potential design specifications, the impact analyses presented in the Final EIR/EA assumed a worst-case scenario of development anywhere within the proposed Project site for each topical issue area (Sections 4.21 through 4.2.15 of the Final EIR/EA). In this way, the Final EIR/EA conservatively estimated the potential environmental impacts associated with Project development. CEQA, by design, is initiated during the very early planning phases of a project; therefore, a project development plan may change due to facets that are either not anticipated or not foreseen until the time the project is under full and deliberate development. New information or changes in the project scope and/or design will frequently occur during further project refinement and during project development. These differences or changes of the scope and parameters of the project development plan by the proponent frequently do not render further scrutiny under CEQA. CEQA requires a general description of the "main features" of the project, and does not require "all of the details or particulars." A project description is adequate if it provides information sufficient to inform the public and the decision-makers of the full scope of the project.

As described in Response 12-5 above, the Final EIR/EA adequately sets forth an accurate and complete environmental baseline and analyses of the required CEQA topical issue areas. In addition, the Final EIR/EA supplies the public and decision makers with adequate information concerning the potential environmental effects of the proposed Project and describes as necessary feasible mitigations to reduce impacts to less than significant.

The Final EIR/EA reflects a good faith effort to investigate and disclose environmental impacts of the project (see CEQA Guidelines §§ 15003(i), 15151), and the mitigation measures are legally adequate. CEQA states that formulation of mitigation measures may specify performance standards which would mitigate the significant effects of the project and which may be accomplished in more than one specified way (see CEQA Guidelines § 15126.4(a)(1)(B)). The Final EIR/EA identified mitigation measures that require the preparation of a more precise mitigation plan after certification of the EIR/EA, which is acceptable under CEQA provided that the agency "commits itself to eventually devising measures that will satisfy specific performance criteria articulated at the time of approval." *Sacramento Old City Association v. City Council* (1991) 229 Cal.App.3d 1011, 1028-1029.

Response 12-7

Comment noted. Scott Cashen's comments are addressed in Response to Letter 12a and Matt Hagemann's and Anders Sutherland's comments are addressed in Response to Letter 12b.

Response 12-8

The commenter states that the Draft EIR/EA does not meet the requirements of CEQA and NEPA because it fails to include an accurate and complete project description.

Comments regarding the accuracy and completeness of the project description relative to CEQA are addressed above in Response 12-6.

Pursuant to NEPA, the intent of the environmental impact analysis is to ensure that environmental information is available to public officials and the public before decisions are made and actions are taken (40 CFR Part 1500.1 [b]). In addition, the NEPA process is to be used to identify and assess reasonable alternatives to proposed actions that will avoid or minimize adverse effects of the action upon the quality of the human environment (40 CFR Part 1500.2 [e]). As stated above, the Final EIR/EA supplies the public and decision makers with adequate information concerning the potential environmental effects of the proposed Project and describes as necessary feasible mitigations to reduce impacts to less than significant.

Response 12-9

The commenter states that the Draft EIR/EA fails to provide a sufficient level of detail related to the Project grading and contends that the "vague description" is incorrect and insufficient to provide adequate evaluation of the Project impacts.

The level of detail provided in the Final EIR/EA is sufficient to adequately assess Project impacts. Section 2.2.2, *Construction*, on page 2-12 of the Final EIR/EA provides information relative to site preparation.

> Since most of the site has nearly level to gently sloping topography, no mass grading would be required. Some of the parcels where facilities and arrays would be located would require light grubbing for leveling and trenching. Access roads would require minimal grading. After grubbing and light grading, construction of staging areas would occur. On-site pre-assembly of trackers would take place in the assembly area.
>
> The PV system proposed for the site can operate on slopes up to nine percent in all directions. Fine grading would only be required for the development of site access. During construction, it is anticipated that a total of up to approximately 1,354 ac-ft of water (451 ac-ft/yr) would be utilized for soil moisture conditioning and dust control (final use numbers will be further refined pre-construction).
>
> Minor demolition of existing site structures (e.g., storage buildings in citrus grove, three on-site residences) would be required.
>
> Installation of the electrical collection system would require excavations to a depth of about three feet for underground electrical circuits, inverter and switchgear enclosure

foundations, and transformer foundations. The O&M building foundations would also be excavated to a depth of about three feet.

Response 12-10

The commenter states the Project description does not include a sufficient level of detail relative to installations (electrical equipment and support piles for gas-powered generators) involving trenching and grading nor locations, numbers and lengths of the two O&M buildings and proposed access roads.

The Final EIR/EA studied the parameters of the proposed Project and action alternatives as they have been developed to this point. As is typical, the project is generally designed at the time of application, and final engineering details will not be developed until the final planning stage (Section 15124 of the CEQA Guidelines).

As detailed in Chapter 1 and Chapter 2 the proposed locations of the O&M buildings are mapped on Figures 1-1, 1-3, 2-1, 2-12, 2-13, 2-14 and also in Chapter 3, Figure 3.2.1-1. A more detailed layout of the conceptual O&M building is provided in Figure 2-9 and Figure 2-10. The general site plan (Figure 2-1) shows the location of the solar modules across the solar facility site with a solar module inset of the typical 1.5 MW solar module blocks. Within these blocks, the figure maps the proposed locations of the maintenance and access roads equipment pads and parking areas. This information is further detailed in Figure 2-2. Within the internal substation arrangements, Figure 2-7 shows the typical location and length of the driveways planned around the switchrack, transformer yard and control building. Relative to the areas of concern on the Project site, Figure 3.2.4-1 maps the location of vegetation communities within the confines of the Project boundary, Figure 3.2.4-2 maps inventory results of special status plans in the project area, Figure 3.2.4-3 maps the results of the wildlife inventory in the Project area, Figure 3.2.4-4 maps the inventory results of the Mojave Fringed-Toed Lizard. Regarding hazardous sites, Figure 3.2.8-1 maps the hazardous sites within a 1-mile search boundary of the Project boundary. Relative to hydrological resources, Figure 3.2.9-1 details the limits of the 100-year floodplain in relation to the project boundary as well as the solar facility blocks. Figure 3.2.9-2 maps the jurisdictional waters within the Project boundary limits in addition to the general project area. Figure 3.2.9-3 goes into further details mapping the estimated OHWM of an ephemeral channel that crosses the Project boundary and shows detail of where this ephemeral channel falls in relation to the solar panel blocks and transmission line corridor.

The EIR/EA accordingly addresses, as the “proposed Project,” the maximum envelope of development. That maximum envelope includes any location where any of these project facilities could be installed or developed, thus ensuring that all impacts of any potential location are studied. For example, for biological resources, an impact assessment was conducted to define the various levels of potential impacts likely to occur for each Project component. The impact assessment combines several facets that collectively define the value of natural biotic communities and subjects those facets to various impact features to predict impact magnitude. Both the direct and indirect impacts of development of the proposed Project and action alternatives are associated with ground disturbances caused by construction of road networks for access, installation of towers, conductors, substations, and other associated infrastructure, and ongoing maintenance. All the biological data collected within the study area were mapped and an impact assessment and mitigation planning procedure was developed.

To assess potential effects of the proposed Project and Alternatives related to hydrology and water quality, water resources on the proposed solar facility site and within the area were inventoried to allow a location-specific analysis of temporary and permanent effects of the proposed Project. Potential effects to hydrology and water quality include temporary (i.e., construction-related and those related to decommissioning) effects and long term (i.e., operational) effects. Furthermore, when evaluating potential effects of the proposed Project resulting from construction, operation and maintenance, and decommissioning of the Project, it was assumed that the Project would comply with all applicable federal, State, and local regulatory requirements and permits that protect surface water and groundwater.

The impacts analyses covered the entire footprint of potential development. For example, the EIR/EA addresses the impacts of grading and trenching that could occur anywhere within the solar array, access road, and gen-tie line areas (refer to Sections 4.2.3, 4.2.4, 4.2.5, 4.2.6, 4.2.8, 4.2.9, and 4.2.12 in the Final EIR/EA). The Final EIR/EA studied gas-powered generators and the support piles used to stabilize them, in a way that captures all impacts no matter what precise onsite location of the generators is later determined (refer to Sections 4.2.3, 4.2.4, 4.2.5, 4.2.6, 4.2.8, 4.2.9, 4.2.11, and 4.2.12 in the Final EIR/EA). Similarly, the construction and operation of the O&M buildings are studied throughout the EIR/EA, as are the construction and operation of access roads (refer to Sections 4.2.3, 4.2.4, 4.2.5, 4.2.6, 4.2.8, 4.2.9, 4.2.11, 4.2.12, 4.2.15 in the Final EIR/EA). The impacts of the construction activities themselves were addressed by projecting that the proposed Project would use similar equipment operating for a similar number of hours as other similar solar projects (refer to Section 4.2.3, *Air Quality*, in the Final EIR/EA and Appendix B of the Final EIR/EA).

Through such standard practices as plan checking and permit application review, the County and BLM would ensure that only the project (or action alternative) studied in the Final EIR/EA and approved by that agency could be built. Accordingly, only the impacts and potential impacts identified in this Final EIR/EA would occur.

The commenter expresses concern that because the project components have not been precisely located within the project site, it is not possible to know whether each such component will avoid hazardous materials, ephemeral streams, special status plants, burrowing owls or Mojave fringe-toed lizards, and other biological and hydrological resources. The Final EIR/EA addresses this concern by specifying BMPs and Mitigation Measures that will ensure the components will be located and constructed in a manner that ensures no significant impacts (refer to 4.2.4, *Biological Resources*, and 4.2.9, *Hydrology and Water Quality*).

Response 12-11

The commenter states that the Draft EIR/EA did not identify a source of water for the Project's non-potable water use, and assumes the existence of an entitlement in existence, nor the quantity available, for overall construction and project operations.

The commenter is directed to the *Water Supply Assessment for the Blythe Mesa Solar Project* provided in Appendix G of the Final EIR/EA which provides an in-depth analysis of water requirements for the Project and sources of water supply. Please also refer to page 24 of the Errata in Response to Comments section, Chapter 3 of this Final EIR/EA which clarifies and expands the discussion relative to the source of water (potable and non-potable) and the quantity available for overall construction and project operations.

Response 12-12

The commenter states that the Draft EIR/EA contains conflicting information relative to the Project's water supply.

This comment is acknowledged. Section 2.2.3 of the Final EIR/EA (page 2-19) states, "Riverside County Community Service Area #122 (CSA #122) has issued a will-serve letter for the Project's limited potable water needs. Less than one ac-ft of groundwater per year would be required for potable use in the two O&M buildings. The water supply from PVID sources and CSA #122 is sufficient to meet requirements of the proposed Project, including the minor potable groundwater demand under average-year, single-dry year, and multiple-dry year conditions over a 20-year future projection (refer to Appendix G, Water Supply Assessment).” Whereas Section 4.2.9 (page 4-247) states; “Water for the Project would be taken from existing PVID water entitlements that support the agricultural operations currently on the proposed solar facility site; current operations are not supported by groundwater wells.”

During the 36-month (3-year) construction period for the proposed Project, approximately 1,354 ac-ft of water (or about 451 ac-ft/yr) would be required. Construction water (non-potable) would be used for dust suppression, concrete manufacturing, and fire safety. During operations, non-potable water would be used for solar array washing, fire water supply, and on-site maintenance activities (such as may be required for landscape maintenance to support dust control). Two O&M buildings would require a total of up to 150 gallons per day of potable water. Operation and maintenance activities could include daily operations and routine maintenance activities, such as PV panel washing, which are anticipated to occur up to two times per year, if necessary, to optimize output. Cleaning of the panels would require up to 345 ac-ft/yr of untreated non-potable water to maintain panel efficiency. Panel washing crews would clean the panels up to twice a year with a lightweight to medium-duty truck. The truck would be fitted with a water tank and air compressor to operate a high-pressure sprayer and cleaning brush system. The operational needs would be further refined pre-construction. It is emphasized that operational needs would be well below the existing (pre-Project) irrigation use of approximately 12,000 ac-ft/yr. Water for the Project would be taken from existing PVID water entitlements that support the agricultural operations currently on the proposed solar facility site rather than evaporation ponds common to other solar developments in this region; current operations are not supported by groundwater wells. Riverside County Community Service Area #122 (CSA #122) has issued a will-serve letter for the Project’s limited potable water needs. Less than one ac-ft of groundwater per year would be required for potable use in the two O&M buildings. The water supply from PVID sources and CSA #122 is sufficient to meet requirements of the proposed Project, including the minor potable groundwater demand under average-year, single-dry year, and multiple-dry year conditions over a 20-year future projection (refer to Appendix G, Water Supply Assessment).

The commenter is directed to the *Water Supply Assessment for the Blythe Mesa Solar Project* provided in Appendix G of the Final EIR/EA which provides an in-depth analysis of water requirements for the Project and sources of water supply. Please also refer to page 25 of the Errata in Response to Comments section, Chapter 3 of this Final EIR/EA which clarifies and expands the discussion relative to the source of water (potable and non-potable) and the quantity available for overall construction and project operations.

Response 12-13

The commenter contends that the Draft EIR/EA does not provide information to substantiate the Project’s claim to PVID water and that the water used for construction and operation is not a permissible use of the Colorado River.

Water supplies required for construction, operation, and maintenance of the Project would be provided by PVID water entitlements that currently support the agricultural operations on-site; these operations are not currently supported by groundwater wells. The Watershed Supply Assessment conducted for the Project determined that adequate water supplies exist to serve the Project over the life of the Project (construction, operation and maintenance, and decommissioning). The great majority of water for the proposed Project (i.e., all of the non-potable water) would not be delivered by a public water system or using public water system connections. The proposed Project would use existing water infrastructure that currently delivers irrigation water from the PVID. Riverside County Community Service Area #122 (CSA #122) has substantiated its intention to provide this potable supply by issuing a will-serve letter for the

Project's limited potable water needs. CSA #122 has provided a will-serve letter for the small amount (up to 150 gallons per day) of potable water for the two O&M buildings. The Project would result in a beneficial increase in available PVID water supply due to the reduction in water demand for the Project compared to existing agricultural use.

Response 12-14

The commenter contends that the environmental setting in the Final EIR/EA is inadequate because it fails to include relevant information regarding biological resources, hazardous materials, and water resources.

The County of Riverside respectfully disagrees with this assertion. The Final EIR/EA adequately set forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project based on technical reports and studies prepared by qualified individuals, and proposed feasible mitigation measures to reduce those impacts as required under CEQA and NEPA. Furthermore, the Final EIR/EA supplies the public and decision-makers with adequate information concerning existing conditions and the potential environmental effects of the proposed Project. Issues regarding revising and recirculating the Final EIR/EA are addressed above in Response to 12-6.

Response 12-15

The commenter contends that the Draft EIR/EA failed to accurately establish the existing environmental setting because a Phase I Environmental Site Assessment (ESA) was not prepared. The commenter further states that the Draft EIR/EA includes a misleading account of hazards based on the Data Map Area Study, which includes "a summary environmentally affected sites."

The environmental setting relating to hazards and hazardous materials described in Final EIR/EA Section 3.2.8 (pages 3-102 through 3-107) contains a summary of environmentally affected sites and other sites that are within a one-mile radius surrounding the Project area. The Environmental Data Resources, Inc. (EDR) report was included in its entirety in Appendix F of the Final EIR/EA and includes descriptions of each agency database, site names and addresses, and status, with some repetition existing among the different databases including Federal Database Records and State and Local Database Records. These databases do identify recognized environmental conditions on a property and within a given radius of the property. Chapter 3, Section 1.2.5 of the Final EIR/EA gives a detailed description of the World War II Desert Training Center/California-Arizona Maneuver Area, as well as the BAAB. Potential existing hazards were assessed based on information contained in the EDR DataMap Area Study as part of the Phase I Environmental Site Assessment prepared for the parcels comprising the Project area. An updated EDR DataMap Area Study map is included with the Phase I ESA in Appendix T of this Final EIR/EA document. The identified hazardous sites are identified on Figure 3.2.8-1 on page 3-103 of the Final EIR/EA. Therefore, the Final EIR/EA adequately sets forth an accurate and complete environmental baseline and analyses of hazards and hazardous materials as required by CEQA. Section 3.2.8 and Section 4.2.8 of the Final EIR/EA supplies the public and decision makers with adequate information concerning the potential environmental effects related to hazards and hazardous materials of the proposed Project and describes as necessary feasible mitigations to reduce impacts to less than significant (refer to Mitigation Measures Hazards-1 and Hazards-2 on page 4-239 of the Final EIR/EA).

Response 12-16

The commenter notes that the Data Map Area Study fails to adequately set forth the existing environmental setting because it is inconsistent with industry standards for determining existing hazards at a project site. The commenter further notes that other solar projects in the vicinity have all used a Phase I ESA to determine the hazards on site.

Refer to Response 12-15.

A hazardous materials review was conducted to determine the existing conditions of the project site and vicinity. This review focused on possible locations of contamination by hazardous materials or waste and included a review of a federal, state, and local database searches (within one mile of the Project area) by Environmental Data Resources, Inc. (refer to Appendix F of the Final EIR/EA). An updated EDR DataMap Area Study map is included with the Phase I ESA in Appendix T of this Final EIR/EA document (please refer to page 25 of the Errata in Response to Comments section of this Final EIR/EA).

The EDR was reviewed to identify hazardous material sites in the Project site vicinity pursuant to Government Code Section 65962.5. Two sites were identified within the Project boundaries during hazardous materials database search (refer to Figure 3.2.8-1 on page 3-103 in the Final EIR/EA). Five sites are within a mile of the Project site. The EDR database search revealed that one sites identified within the Project boundaries had documented leaking underground storage tanks that one site contains an aboveground storage tank. The aboveground storage tank will be removed in compliance with all rules, laws, and regulations.

As stated on page 4-217 of the Final EIR/EA, "The construction of the proposed Project would require minimal grading for the foundations of the substations and O&M buildings; therefore, it is anticipated that workers' exposure to impacted soils would be at low-level concentrations." Furthermore, page 4-219 in the Final EIR/EA states, "If any underground storage tanks are discovered during construction and require removal, the Project will comply with the Underground Storage Tank Guidelines to Closure by Removal procedures published by the Hazardous Materials Management Division of Riverside County Department of Environmental Health."

The Final EIR/EA includes mitigation measures (Hazards-1 and Hazards-2 on page 4-239 of the Final EIR/EA) to ensure compliance with existing agency regulations that address the handling of hazardous materials to ensure that the proposed Project would not create a significant hazard to the public or the environment related to the handling or accidental release of hazardous materials.

While the Final EIR/EA did not identify a significant, adverse impact related to the potential to encounter contaminated soil, the Applicant will commit to including a WEAP to be implemented to ensure worker safety and minimize worker hazards during construction and operation, and this requirement will be included as a Condition of Approval of the Conditional Use Permit. See Response 2-6 for a discussion of that program.

The fact that inhalation of dust could adversely affect human health is discussed in Section 4.2.8 of the Final EIR/EA. However, in light of the Applicant-proposed dust control measures (dust abatement plan, BMP-2) and Mitigation Measures Hazards-1 through Hazards-3, the risk of potential dust-related health impacts to construction workers, including the risk of contracting Valley Fever, would be less than significant.

Response 12-17

The commenter states that the Draft EIR/EA fails to identify the Project site as a Formerly Used Defense Site ("FUDS") and disclose the extent of military operations that have occurred on site.

Chapter 3, Section 1.2.5 of the Final EIR/EA gives a detailed description of the World War II Desert Training Center/California-Arizona Maneuver Area, as well as the BAAB. Potential existing hazards were assessed based on information contained in the EDR DataMap Area Study prepared for the parcels comprising the Project area. This study is available in Appendix F of the Final EIR/EA. An updated EDR

DataMap Area Study map is included with the Phase I ESA in Appendix T of this Final EIR/EA document (refer to Responses 12-15, 12-16, and 12b-4). The Phase I ESA indicates that three areas within the BAAB as having the potential for munitions-related impacts (Poorman, Jeep Range, and Skeet Range) based on findings presented in Parsons' Site Inspection Report, Former Blythe Army Airfield dated September 2011 (Kennedy/Jenks Consultants 2011). The Subject Property (BMSP) does not fall within any of three munition-related areas. Explosive hazards were ruled out for the BAAB during a 2011 field investigation because during the field reconnaissance performed in 2011, only spent small arms ammunition was noted. In addition, no evidence of the storage, use, or disposal of chemical warfare has been identified for the BAAF FUDS listing. As indicated in the ESA, the DTSC project manager for this FUDS study area, Omoruyi Patrick, indicated that no other areas within the former BAAB are under investigation other than the Poorman, Jeep Range, and Skeet Range, which are not part of the Subject Property. The instances of unexploded ordnance discovered at the sites of other solar projects would not be affected by the proposed Project or action alternatives.

Coincidentally, within a few months of the 2011 Parsons' field investigation, POWER conducted a BLM Class III archaeological and historic built environment survey of lands within the Project boundary that include the 125-foot ROW of the proposed and alternative 230 kV transmission line corridors. These lands included private and BLM-managed public lands. During the surveys, archaeologists walked parallel transects, using 15-meter (50-foot) intervals, to identify archaeological and architectural resources. The ground surface was visually examined for evidence of prehistoric or historic archaeological materials and historic structures. Visible ground surfaces were examined, including fence lines, drainage channels, and other exposures. There was little vegetation and ground surface visibility was very high. A sub-meter GPS was used to record the location of each cultural resource. As a result of these field surveys conducted by POWER, other than shotgun shells and bullets associated with domestic trash deposits, no evidence of munitions or explosives were identified.

Response 12-18

The commenter states that the Draft EIR/EA fails to disclose the extent of former military use of the Project site and the surrounding area and, as a result, the Draft EIR/EA downplays the likely presence of UXO on the site.

Issues regarding former military use at the Project site are addressed above in Response to 12-17.

Response 12-19

The commenter states that the Draft EIR/EA fails to identify the Gunnery Range, or any potential UXO that may be present at the Project site. Accordingly, the County and the BLM must develop a Phase I ESA so that the environmental baseline for hazards may be adequately set forth and the impact analysis revised in an updated and recirculated Draft EIR/EA.

Portions of the Project site were occupied by the Former BAAB. The BAAB is listed in the Formerly Used Defense Site (FUDS) database. Information obtained from the Department of Toxic Substances Control (DTSC) online records indicates that three areas within the BAAB as having the potential for munitions-related impacts (Poorman, Jeep Range, and Skeet Range) based on findings presented in Parsons' Site Inspection Report, Former Blythe Army Airfield dated September 2011 (Kennedy/Jenks Consultants 2011). Explosive hazards were ruled out for the BAAB during a 2011 field investigation. The Munitions & Explosives of Concern (MEC) pathway was determined incomplete for the BAAB FUDS. During the field reconnaissance performed in 2011, only spent small arms ammunition was noted. The Project site does not fall within any of three munition-related areas. In addition, no evidence of the storage, use, or disposal of chemical warfare has been identified for the BAAB FUDS listing. The statements offered by the commenter, that bullets and other munitions may be present in the area of the gen-tie line, are not supported by the Phase I ESA. Kennedy/Jenks Consultants conducted the Phase I ESA (refer to Appendix T) for the BMSP which included 3,600 acres of vacant and farmed land; this included the solar PV electrical generating facility and the 8.4-mile gen-tie line that together occupy a total of 3,660 acres. The Phase I ESA indicated that that the Project site does not fall within any of the three munition-related areas (Poorman, Jeep Range, and Skeet Range).

Response 12-20

The commenter states that the Draft EIR/EA does not disclose what pesticides were used on the Project site, which prevents meaningful analysis of the impacts of those chemicals on the environment and public health.

As noted in this comment, the Final EIR/EA does acknowledge portions of the Project site are in agricultural production and that there is a potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater. Due to the expected low level of concentrations of pesticides and other chemicals, it was determined that the risk of exposure to human health is not significant.

Furthermore, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) authorizes the legitimate application of herbicides and pesticides used in accordance with manufacturer prescribed and labeled instructions. Under FIFRA, all pesticides that are distributed or sold in the United States must be registered by the Environmental Protection Agency (EPA). Before the EPA may register a pesticide, it must be demonstrated that among other things, that using the pesticide according to specification “will not generally cause unreasonable adverse effects on the environment.” Therefore, the potential presence of low concentrations of agricultural chemicals on the Project site is considered a *de minimis*[1] condition (ASTMa 2014). In addition, the proposed Project is the construction and operation of a solar facility and would not contain a residential or commercial component that would expose people to potential pesticides/herbicides. Please refer to the response to comment 12-21 below.

Response 12-21

The commenter notes that farming began in Blythe in the 1970s when the use of DDT was commonly used. The commenter contends that the Draft EIR/EA failed to conduct studies of the site to fully disclose the hazardous materials that may be present, including DDT which is classified as a legacy pesticide.

The Final EIR/EA did not ignore the possibility of an impact related to hazardous materials. The criteria listed in Section 4.2.8 of the Final EIR/EA were used to determine if the proposed Project would cause or exacerbate hazards on and in the vicinity of the solar facility. While CEQA and NEPA do not encompass a study of the environment on the Project, these criteria were also applied to determine whether the Project or any of its components would be exposed to substantial, existing risks. These criteria are the same as the significance criteria for Hazards and Hazardous Materials listed in the CEQA Environmental Checklist, Appendix G of the 2012 CEQA Guidelines. Under CEQA, the proposed Project and Alternatives would have a significant impact on hazards and hazardous materials if they would “*be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment”* (HAZ-4).

[1] *De minimis condition.* An environmental condition that does not generally present a material risk of harm to the public health or the environment that generally would not be subject to an enforcement action if brought to the attention of appropriate governmental agencies.

As acknowledged in Section 4.2.8, portions of the proposed Project area are in agricultural production. As a result, there is a potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater. Should there be chemically impacted soils (i.e., fuels, pesticides, herbicides) present in the Project area, the risk of exposure to human health would not be a significant concern (refer to Blythe Mesa Solar Project Phase I Environmental Site Assessment report in Appendix C of this Final EIR/EA). The construction of the proposed Project would require minimal grading for the foundations of the substations and O&M buildings; therefore, it is anticipated that, even if the soils were contaminated, workers' exposure to impacted soils would be at low-level concentrations. As noted in Section 4.2.8, one aboveground storage tank was located within the Project solar facility site. It would be removed in compliance with all rules, laws, and regulations. Therefore, the Project would result in a less than significant hazard to the public or the environment.

Furthermore, though DDT is a long-lived hazardous substance, it is not likely to be present at the Project site in substantial concentrations. DDT was used in home and agricultural applications and for mosquito abatement beginning in the 1940s. A reduction of use in California began in 1963 due to ecological concerns and the potential health effects. By 1972, the U.S. had banned DDT for all but emergency public health uses (State Water Quality Control Board 2007).

DDT is very highly persistent in the environment, with a reported half life of between 2-15 years and is immobile in most soils. Routes of loss and degradation include runoff, volatilization, photolysis and biodegradation (aerobic and anaerobic).

Due to its extremely low solubility in water, DDT will be retained to a greater degree by soils and soil fractions with higher proportions of soil organic matter. It may accumulate in the top soil layer in situations where heavy applications are (or were) made annually; e.g., for apples. Generally DDT is tightly absorbed by soil organic matter, but it (along with its metabolites) has been detected in many locations in soil and groundwater where it may be available to organisms. This is probably due to its high persistence; although it is immobile or only very slightly mobile, over very long periods of time it may be able to eventually leach into groundwater, especially in soils with little soil organic matter.

Residues at the surface of the soil are much more likely to be broken down or otherwise dissipated than those below several inches. Studies in Arizona (a similar environment to the proposed Project site) have shown that volatilization losses may be significant and rapid in soils with very low organic matter content (desert soils) and high irradiance of sunlight, with volatilization losses reported as high as 50 percent in 5 months. In other soils this rate may be as low as 17-18 percent over 5 years. Volatilization loss will vary with the amount of DDT applied, proportion of soil organic matter, proximity to soil-air interface and the amount of sunlight (Cornell University 2014).

In addition, studies in Imperial County California have shown that pesticide residues on farm lands (including farmlands that have been farmed since the 1970s) are typically 25 to 50 percent of regulatory action levels (GS Lyon 2011). These studies noted that the typical agricultural practices, in the 1970's up to today, include aerial and ground application of pesticides and application of chemical fertilizer to both ground and irrigation water. Based on the findings of Lyon's studies, it was determined that there is the potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and groundwater. Because Imperial County and Riverside County would have similar soil characteristics and similar farming practices, it is expected that the Project area would also have only the potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater.

Current and proposed pesticide use would not exacerbate any exposure to any existing residual pesticides. As stated above in Response to 12-20, FIFRA authorizes the legitimate application of herbicides and pesticides used in accordance with manufacturer prescribed and labeled instructions. Under FIFRA, all pesticides that are distributed or sold in the United States must be registered by the EPA. Before the EPA may register a pesticide, it must be demonstrated that among other things, that using the pesticide according to specification "will not generally cause unreasonable adverse effects on the environment." Therefore, the potential presence of low concentrations of agricultural chemicals on the Project site is considered a *de minimis* condition (ASTMb 2014).

Furthermore, the Project site would transition from agricultural use to a solar facility which would result in the substantial reduction in pesticide, herbicide, and fertilizer application. In addition, the proposed Project is the construction and operation of a solar facility and would not contain a residential or commercial component that would expose people to potential pesticides/herbicides.

BMP-3, Fugitive Dust Abatement Plan, as required by the MDAQMD Rule 403, requires a Fugitive Dust Abatement Plan be prepared to address fugitive dust emissions during Project construction, operation, maintenance, and decommissioning. The plan would include measures to minimize fugitive dust emissions from wrecking, excavation, grading, clearing of land, and solid waste disposal operations.

As stated in Section 3.2.8, *Hazards and Hazardous Materials*, page 3-111 of the Final EIR/EA, "Congress passed the Occupational Safety and Health Act (OSHA) to ensure safe and healthful working conditions for working men and women. OSHA authorized enforcement of the standards developed under the Act and assisted states in their efforts to ensure safe and healthful working conditions. The Project would be subject to OSHA requirements during construction, operations and maintenance, and decommissioning."

With implementation of BMP-3 and adherence to OSHA requirements, no adverse effects would be associated with potential pesticide residues in the soils.

Response 12-22

The commenter contends that the Draft EIR/EA failed to provide data in the environmental setting for the sources of water that may be used during Project construction and operation.

Please see Response 2-4. In addition, Section 3.2.13, Section Population, Housing, Public Services, Utilities, and Socioeconomics, page 3-175 of the Final EIR/EA provides a description of the Project's water source.

> The water supplies used for the Project area's agricultural irrigation and the water supplies underlying the Project area (Palo Verde Mesa Groundwater Basin), are under the jurisdiction of the PVID. Colorado River water, supplied through PVID canals, is lifted onto the mesa by private pumps to irrigate a portion of the acreage in the PVID. The remaining mesa irrigated acreage is irrigated from deep wells developed by the landowners. However, there are no wells supporting agricultural operations on the Project area.
>
> A portion of the Project is within the City of Blythe. The City currently provides nearly 3,300 water service connections to customers, which are located within the City's municipal boundaries. The City has four individual water systems: City of Blythe proper water system, Mesa Bluffs water system, Hidden Beaches water system, and East Blythe County water district. Some rural residences with the City's corporate boundary obtain their water from private wells, as could be the case for rural residences in the Project area (Blythe General Plan 2007). The City's water supply is dependent upon a part of the

> Colorado River entitlement of the PVID. The City of Blythe lies entirely within the PVID, and the City's water use is almost entirely accounted for as a part of PVID's water use. PVID's water supply is unique in California. The District holds the Priority 1 rights to California's share of Colorado River water, and a shared portion of the Priority 3 rights, and their rights are not quantified by volume. Rather, their water rights are for irrigation water needed to serve a gross area of 104,500 acres in the Palo Verde Valley with a first priority, and 16,000 acres on the Lower Palo Verde Mesa with a shared third priority (PVID 2012). The great majority of water for the proposed Project (i.e., all of the non-potable water) would not be delivered by a public water system or using public water system connections. The proposed Project would use existing water infrastructure that currently delivers irrigation water from the PVID. The Project would use less than one ac-ft/yr of groundwater for potable use in the two O&M buildings. Riverside County Community Service Area #122 (CSA #122) has substantiated its intention to provide this potable supply by issuing a will-serve letter (October 26, 2012 c/o Steve H. Jones – Manager) for the Project's limited potable water needs. CSA #122 has provided a will-serve letter for the small amount (up to 150 gallons per day) of potable water for the two O&M buildings.

The commenter is also directed to the *Water Supply Assessment for the Blythe Mesa Solar Project* provided in Appendix G of the Final EIR/EA which provides an in-depth analysis of water requirements for the Project and sources of water supply.

Response 12-23

The commenter questions how the conclusion that the proposed Project will not significantly impact the water quality of the Colorado River can be drawn in the absence of detailed information about flows into and the water quality of the Colorado River.

As demonstrated in Section 4.2.9 of the Final EIR/EA, the EIR/EA concentrates on BMPs and Mitigation Measures. Because these measures ensure water will meet regulatory requirements and therefore be relatively clean at the point of discharge, the water will not cause significant water quality impacts regardless where it flows after discharged from the Project site. Furthermore, the points of discharge from the Project site will not be altered by the Project; accordingly there will be no change in direction of the flows that occur in baseline circumstances.

As the commenter notes, the Final EIR/EA references only the Palo Verde Outfall Drain in discussing impaired water bodies. This is because the Palo Verde Outfall Drain is the only water body in the Project area listed as impaired under Section 303(d); the Colorado River is not listed as impaired. As explained in Section 1.2.9 in the Final EIR/EA, under Section 303(d) of the CWA, states, territories, and authorized Tribes are required to develop a list of surface waters with impaired water quality. These waters on the list do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for surface waters on the lists and develop action plans, called Total Maximum Daily Loads (TMDLs), to improve water quality. On June 28, 2007, the EPA gave final approval to California's 2006 Section 303(d) List of Water Quality Limited Segments. Section 303(d)-listed or impaired streams and completed TMDL requirements are identified as part of the resource inventory of the Project area. Impaired streams are considered sensitive resources in the routing of transmission lines and are protected from water quality impacts. Within the Project region, one water body is listed as impaired on the Section 303(d) list (the Palo Verde Outfall Drain and Lagoon).

Current water quality data specific to the reach of the Colorado River near the project area is very limited. The nearest USGS stream gage upstream (USGS 09429100 Colorado River below Palo Verde Dam) does not record water quality data (USGSa 2014). Downstream, the nearest USGS stream gage (USGS 09429500 Colorado River Below Imperial Dam) provides water quality data, but is located approximately 52 miles south of the Project, and water quality data is limited to the period between August 25, 1969 – September 29, 1972 (USGSb 2014). The California Department of Water Resources (CDWR) water quality stations nearest to the project (approximately 0.5 mile south of Interstate 10; COLORADO R NR BLYTHE, station number W7187005) recorded no water quality data after September 14, 1981 (CDWRa 2014). Downstream, the nearest DWR station is COLORADO R BL CIBOLA VLY, station number W7140000, approximately 27 miles south of the project. This station ceased recording water quality data after February 2, 1981 (CDWRb 2014).

Water quality resources for the Lower Colorado River Basin, and the Project area in particular, report either TMDLs (i.e., California's 2006 Section 303(d) List of Water Quality Limited Segments) or water quality objectives (i.e., Chapter 3 of the Water Quality Control Plan for the Colorado River Basin – Region 7 (RWQCB 2006) rather than baseline water quality parameters. For this reason, baseline or current water quality data for the Colorado River near the Project area was not available for inclusion in the Final EIR/EA.

The ephemeral drainages in this area, including those on the Project site, typically either dissipate prior to reaching the edge of the Mesa or flow into the valley and reach the Colorado River only during larger storm events when flows will be high and the Project's contribution will comprise an even smaller percentage of total flows than is typical.

Response 12-24

The commenter states there is no information as to whether the Project's ephemeral streams feed directly to the Colorado River, or, in the alternative, flow into the degraded water body lying at the end of the Palo Verde Outfall drain with the sheet flow from the Palo Verde Mesa. The commenter also references DDT and other agricultural pesticides that could degrade water quality.

The Project's ephemeral streams connect to the Colorado River only in large storm events, in which case storms flows pass through the Palo Verde Outfall drain before reaching the Colorado River. In dry times and in lesser storm events the ephemeral streams dissipate before reaching the river and do not reach the outfall.

Please see response to comment 12-21 regarding residual pesticides. The BMPs and Mitigation Measures of the proposed Project and action alternatives are designed to ensure no significant impacts will occur regardless of the quality of the receiving waters or path the waters take. Implementation of BMP-1, Drainage, Erosion, and Sedimentation Control Plan, and BMP-2, Stormwater Pollution Prevention Plan will provide source control practices that protect the soil surface and prevent soil from being detached from the surface by rainfall, flowing water, or wind, as well as physical controls that trap soil particles after they have been detached and moved by rain, flowing water, or wind. Sediment control measures are usually passive systems that rely on filtering or settling the particles out of the water or wind that is transporting them (CASQA 2009).

Examples of erosion control measures include preservation of existing vegetation to maintain existing soil integrity, and non-vegetative stabilization techniques such as a layer of gravel or rocks to stabilize slopes or other areas with a high erosion potential. Wind erosion control (i.e., dust control) consists of applying water to disturbed areas to prevent dust, including that arising from contaminated soils, from being deposited into streams, washes, or other receiving waters via wind. Examples of sediment control measures include installation of silt fencing, and installation of fiber rolls or sandbag barriers, all of which filter soil particles out of flowing water before they enter receiving waters. Preventing soils, including contaminated soils, from leaving the project site will prevent them from impairing receiving waters, including those of the Colorado River.

The potential for accidental release of these hazards materials would be minimized as part of the Project with implementation of BMP-2 and BMP-9. Project construction and operation would not contribute any pesticides, since the Project would not include the use of pesticides during construction or operation. While the Project may involve the use of herbicides as part of the Integrated Weed Management Plan (BMP-10), herbicides would be applied in accordance with all recommended or required application procedures.

With implementation of the Project BMPs and Mitigation Measures Hydrology-1 through Hydrology-4 potential hydrology and water quality impacts would be reduced to a less than significant level.

Response 12-25

The commenter states that the Draft EIR/EA description of the setting for special status plants is inadequate and fails to establish the ecological context of the populations in the Project.

The Final EIR/EA, Chapter 3, *Biological Resources,* provides details on the species, habitat, and location setting the stage for the ecological context of the population. Additional information as is relates to the description of the species and details about the populations in the Project area are presented within the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of the Final EIR/EA.

Response 12-26

The commenter states that Harwood’s woollystar has a rare plant rank of 1B.2 and a global rank of G2 and state rank of S2.

The California Rare Plant Rank and regulatory status level regarding Harwood’s woollystar are included in Table 3.2.4-2 of the Final EIR/EA. These adequately capture the overall sensitivity ranking of the species.

Response 12-27

The commenter states that the Harwood milkvetch has a rare plant rank of 2.2.

The California Rare Plant Rank and regulatory status level for the Harwood milkvetch are included in Table 3.2.4-2 of the Final EIR/EA. These adequately capture the overall sensitivity ranking of the species.

Response 12-28

The commenter states that the Draft EIR/EA fails to identify the potential presence of Couch’s spadefoot and underestimates the potential for occurrence.

The Final EIR/EA acknowledges that it is difficult to be certain where this species may be present due to their long dormancies each year within the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of the Final EIR/EA. However, Couch’s spadefoot toad was not observed in the Project area during surveys. Based on the literature review, database records, and field surveys the species is expected to have a low potential to occur in the Project area.

As discussed in the Final EIR/EA Chapter 3, *Biological Resources*, on page 3-44, approximately 250 acres of the proposed solar array disturbance area is fallow (e.g., abandoned) and another approximately 404 acres consist of irrigated alfalfa. The commenter mentions that of the documented occurrences, the species is located near flooded alfalfa fields and desert scrub near agricultural fields. Within the Project area, the agricultural areas have been abandoned such that native vegetation is returning; Russian thistle, Sahara mustard, and other exotic plants were observed interspersed with the native vegetation. Suitable habitat is not known to be present within the alfalfa fields as mentioned in Chapter 3, *Biological Resources*, Table 3.2.4-3 on page 3-61. Because of the lack of habitat, lack of consistent water, and the closest record of occurrence being approximately three miles from the Colorado River Substation, the potential for occurrence is low.

Response 12-29

The comment states the Draft EIR/EA presents conflicting information regarding two ephemeral streams located on the Project site.

The water courses on the Project site were subjected to an intense and lengthy evaluation, which resulted in differing conclusions at differing times. The EIR/EA makes clear that the controlling determination is the one arrived at by USACE, which concluded that one of the two ephemeral streams likely contains Waters of the U.S.

As described in the Final EIR/EA, a Review of Federal Waters was conducted for potential jurisdictional waters and the preliminary results of the review were presented in Appendix C5 of the Final EIR/EA. The DEIR/EA states that “the two discontinuous ephemeral channels are considered potential federal waters,” to indicate that neither channel was dismissed out of hand, but rather than both channels qualified for further investigation to determine their potential as waters of the U.S. The analysis of those two channels conducted by POWER resulted in a preliminary conclusion that the two discontinuous ephemeral channels on the Project site did not meet the criteria for regulated waters of the U.S. This preliminary conclusion was reached in part because POWER concluded that the ephemeral streams are not traditional navigable waters (TNWs), relatively permanent waters (RPWs), or tributaries to RPWs with seasonal flow or tributaries to non-RPWs. As had always been contemplated as part of the analysis, POWER submitted its preliminary conclusions to the USACE for review.

As indicated in Section 3.2.9 of the Final EIR/EA, USACE field staff then conducted a field reconnaissance survey and determined that one of the two discontinuous ephemeral channels within the Project area likely meets the criteria as jurisdictional under Section 404, and the USACE delineated the potential Ordinary High Water Mark (OHWM) of this drainage within Project limits, as illustrated in Figure 3.2.9-3. The USACE reached its conclusion in part because it determined that “as the Colorado River is a Traditional Navigable Water of the United States, tributaries that drain into it are likewise considered Waters of the United States as defined in Section 404 CWA” (Final EIR/EA, page 3-122). The USACE determination was deemed to be the final analysis for purposes of the Final EIR/EA. Section 3.2.9 of the Final EIR/EA accordingly acknowledges that the area below the OHWM of this ephemeral stream may qualify was waters of the U.S., explains that these waters would be impacted by one gen-tie line pole lies within the potential OHWM area (as illustrated in Figure 3.2.9-3) and acknowledges the USACE will be consulted with in the preparation of the 404 permit. It should be noted, that based on the limits of the OHWM, as indicated by the USACE, the transmission line was designed to locate Towers 42 and 44 outside of the jurisdictional limits and reduce the potential for significant impacts to this ephemeral stream; however, due to engineering constraints it was not possible to relocate Tower 43. Temporary and permanent impacts to Waters of the U.S. resulting from construction of Tower 43 were then calculated based on engineering specifications for the tower structure and known tower construction area requirements.

Construction of the tower foundation and installation of the tower would result in a temporary disturbance area of approximately 0.023 acre. This disturbance area would typically result from clearing of vegetation; however, given the sensitivity of this work area and to reduce potential for significant impacts to Waters of the U.S., vegetation would be crushed rather than bladed (i.e., “dredged”). Permanent impacts within the limits of the OHWM would result only from installation of the tower, and would cover an area of 0.002 acre, well within the limit of 0.05 acre limit as defined by the Nationwide Permit Program. Please refer to response 2-1 above.

Response 12-30

The comment states the Draft EIR/EA presents conflicting information regarding two ephemeral streams located on the Project site.

See Response to 12-29.

Response 12-31

The commenter identifies that Figure 3.2.4-3 fails to show burrowing owl sign that is identified and depicted in the *Western Burrowing Owl Survey Report* Appendix C3 of the Final EIR/EA. Figure 3.2.4-3 in Chapter 3 of this document will be updated to include the burrowing owl sign that was depicted in Appendix C3. The changes to the Figure 3.2.4-3 do not affect the overall conclusions of the environmental analysis relative to the significance of impacts.

Response 12-32

The commenter quotes the Draft EIR/EA and notes that the surveys “were unable to determine if the owls were two separate pairs or one pair with two juveniles” and states that this information is imperative.

The Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4 and Burrowing Owl Protection on pages 4-140 and 4-143 of the Final EIR/EA outline that additional protocol surveys will be required prior to construction. Consistent with CDFW guidance, the Plan provides detailed methods and guidance for preconstruction surveys to help determine the number of burrowing owls on site and to provide mitigation for individual owls and nesting pairs.

Response 12-33

The commenter states that burrowing owl locations identified in the *Western Burrowing Owl Survey Report* Appendix C3 were not depicted on Figure 3.2.4-3. Refer to Response 12-34.

Figure 3.2.4-3 will be updated to include the burrowing owl sign that was depicted in Appendix C3. The changes to Figure 3.2.4-3 do not affect the overall conclusions of the environmental analysis relative to the significance of impacts.

Response 12-34

The commenter states that a kit fox was detected in the southern gen-tie line alternative and the Draft EIR/EA proceeds as though there are no kit foxes present in the Project area.

Refer to Chapter 4, *Biological Resources*, page 4-103, for a detailed discussion of the desert kit fox for each alternative, not just Alternative 3.

Response 12-35

The commenter states that there is a high potential for the kit fox to be present in the Project site.

As listed in Chapter 3, Table 3.2.4-3 on page 3-61 of the Final EIR/EA, the desert kit fox has a high potential to occur for each alternative and is present within Alternative 4. The Final EIR/EA provides a detailed impact analysis for desert kit fox for each alternative within Chapter 4, *Biological Resources*, starting on page 4-103. The *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of the Final EIR/EA provides additional details on the desert kit fox within the Project site. Finally, as set forth in Mitigation Measure Biology-6, Desert Kit Fox Protection, on page 4-144 of the Final EIR/EA, discussed measures that have been developed to protect this species due to the potential for occurrence within the Project area.

Response 12-36

The commenter states that the Draft EIR/EA failed to satisfy the basic purposes of CEQA and NEPA.

The Final EIR/EA sets forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project based on technical reports and studies prepared by qualified individuals. As required by CEQA, potentially feasible mitigation measures have been proposed to reduce any significant environmental impacts to less than significant.

Response 12-37

The commenter states that the Draft EIR/EA lacks substantial evidence to support its conclusion that the Project would not further degrade water quality in the Project region.

Refer to Responses 12-20, 12-21, 12-23, 12-24, and 12-38.

Response 12-38

The commenter states that the mitigation measures in the Draft EIR/EA are unrelated to water quality degradation and from the inadvertent releases of pesticides.

Refer to see Responses 12-20, 12-21, 12-23, and 12-24.

Response 12-39

The commenter states that the Draft EIR fails to disclose the extent of the potential impacts associated with Valley Fever.

The Project's potential effects with respect to the risk of Valley Fever infections are described and analyzed in Section 4.2.8, *Hazards and Hazardous Materials*, of the Final EIR/EA, which concludes that implementation of a dust abatement plan as required by the MDAQMD would minimize the spread of fungal spores, thereby reducing potential for contracting Valley Fever during construction (refer to BMP-2 Fugitive Dust). Refer also to Response 2-6.

Response 12-40

The commenter states that the Draft EIR/EA assumes that only construction workers would be exposed to Valley Fever spores during construction.

Coccidioidomycosis, commonly known as Valley Fever, is discussed and analyzed in Section 4.2.8, *Hazards and Hazardous Materials*, page 4-226 of the Final EIR/EA. Refer also to Response 2-6.

Coccidioidomycosis, commonly known as Valley Fever, is primarily a disease of the lungs that is common in the southwestern U.S. and northwestern Mexico. Valley Fever is caused by the fungus

Coccidioides, which lives in the top 2 to 12 inches of soil and dirt, particularly in areas with dry dirt and desert-like weather conditions that allow the fungus to grow. Valley Fever infection can occur year-round. Cases of Valley Fever have been reported from most counties in California. Over 75 percent of cases have been in people who live in the San Joaquin (Central) Valley. In California, the number of reported Valley Fever cases has increased greatly since 2000, with more than 4,000 cases reported in 2012 (CDPH, 2013a)

The California Department of Public Health (CDPH) reports that people working in certain occupations such as construction, agriculture, military and archaeology have an increased risk of exposure and disease because these jobs result in the disturbance of soils where fungal spores are found. In most instances Valley Fever cases are very mild. It is estimated that 60 percent or more of infected people either have no symptoms or experience flu-like symptoms and never seek medical attention. More serious forms of the disease, including pneumonia and infection of the brain, joints, bone, skin, or other organs, are rare (CDPH, 2013b).

The Project site is located in a climate which is generally conducive to the occurrence of Valley Fever; however, construction and operation of the proposed Project is not anticipated to increase exposure to Valley Fever spores because it is located on already disturbed agricultural soils.

As stated above Valley Fever spores are found within the top 2 to 12 inches of soil. During construction of the Project, the topsoil would be affected in a similar manner to existing agricultural activities, because the Project site is already regularly disturbed by the existing agriculture activities; these activities would be expected to continue should the proposed Project not be built.

BMP-3 would be implemented, which requires a Fugitive Dust Abatement Plan be prepared. This Plan would include measures to minimize fugitive dust emissions from wrecking, excavation, grading, clearing of land, and solid waste disposal operations, and would take every reasonable precaution to prevent visible particulate matter from being deposited upon public roadways as a direct result of operations. During construction, all unpaved roads, disturbed areas (e.g., areas of scraping, excavation, backfilling, grading, and compacting), and loose materials generated during Project construction activities would be watered as frequently as necessary to minimize fugitive dust generation.

In addition, BMP-17, High Wind Conditions, would also reduce fugitive dust during high wind events; it states that soil-disturbing activities and travel on unpaved roads must be suspended during periods of high winds (25 mph or greater), with the exception of those trips necessary to maintain the facility and prevent property damage.

With implementation of BMP-3 and BMP-17, the potential exposure to workers and nearby residents would likely decrease over existing conditions since the dust control measures would limit airborne dust compared to existing agricultural activities.

During operation and maintenance, no soil disturbing activities are anticipated, compared to ongoing, regular soil disturbing activities that would occur if the existing agriculture activities were to continue. Therefore, operation and maintenance of the proposed Project would decrease the risk of exposure to Valley Fever.

Similar to Project construction, decommissioning of the proposed Project could disturb soil and cause Valley Fever spores to become airborne. Similar to construction activities, the potential for exposure would be no greater, and likely less, than the exposure associated with agriculture activities. Furthermore, during decommissioning activities, construction activities would adhere to applicable air quality requirements in force at the time, it is anticipated that these requirements would be similar to MDAQMD Rule 403.

In addition, the Applicant will commit to including a WEAP, as Mitigation Measure Hazards-3, to be implemented with regards to Valley Fever to ensure worker safety and minimize worker hazards during construction and operation. The program would include a PPE program, an EAP, and an IIPP to address health and safety issues associated with normal and unusual (emergency) conditions. Construction-related safety programs and procedures would include a respiratory protection program, among other things. Construction would be undertaken sequentially in accordance with a Construction Plan that would include the final design documents, work plan, health and safety plans, permits, project schedule, and operation and maintenance manuals. Construction Plan documents would relate at least to the following:

1. Environmental health and safety training (including, but not limited, to training on the hazards of Valley Fever, including the symptoms, proper work procedures, how to use PPE, informing supervisor of suspected symptoms of work-related Valley Fever)
2. Site security measures
3. Site first aid training
4. Construction testing (non-destructive examination, hydro, etc.) requirements
5. Site fire protection and extinguisher maintenance, guidance, and documentation
6. Furnishing and servicing of sanitary facilities records
7. Trash collection and disposal schedule/records
8. Disposal of hazardous materials and waste guidance in accordance with local, state, and federal regulations

Mitigation Measure Hazards-3 has been added to the Final EIR/EA to ensure worker safety and minimize worker hazards during construction and operation of the proposed Project. This change represents a correction to the Final EIR/EA which does not alter or change the conclusion of the Project's environmental analysis. Section 4.2.8, *Hazards and Hazardous Materials*, pages 4-239 and 4-240 of the Final EIR/EA are hereby revised. Please refer to pages 13 and 14 of the Errata in Response to Comments section of this Final EIR/EA.

The fact that inhalation of dust could adversely affect human health is discussed in Section 4.2.8 of the Final EIR/EA. However, in light of the Applicant-proposed dust control measures (dust abatement plan, BMP-2) and Mitigation Measures Hazards-1 through Hazards-3, the risk of potential dust-related health impacts to construction workers, including the risk of contracting Valley Fever, would be less than significant.

Response 12-41

The commenter contends that the Draft EIR/EA proposes insufficient mitigation measures to address the impacts associated with Valley Fever.

The impacts of Valley Fever are discussed in the Final EIR/EA, which indicates that Valley Fever can be spread by fugitive dust. Feasible measures are presented in the Final EIR/EA (refer to BMP-3) to reduce dust generated by the Project, thereby minimizing any potential public health impacts associated with Valley Fever. See also Response 2-6 and 12-40. It should be noted that exposure to Valley Fever remains a risk with or without implementation of the proposed Project. While the commenter notes that the measures in the Final EIR/EA are insufficient, the commenter provides no indication as to what additional measures are available to address this impact.

Response 12-42

The commenter notes that over the past few years several severe dust storms have occurred and reported cases of Valley Fever have occurred during construction of solar energy projects. The commenter states that Project-specific aspects of development must be disclosed and sufficient mitigation measures must be developed to protect worker and nearby residents.

The Final EIR/EA provides details on Project development in Chapter 2, *Alternatives Including the Proposed Project.* Information relative to Project components are described in Section 2.2.1, *Project Facilities* (refer to pages 2-5 through 2-12).

As discussed above in Response 12-40, the impacts of Valley Fever are discussed in the Final EIR/EA, which indicates that Valley Fever can be spread by fugitive dust. Feasible measures are presented in the Final EIR/EA (refer to BMP-3) to reduce dust generated by the Project, thereby minimizing any potential public health impacts associated with Valley Fever. Also see Response 2-6.

In addition, the Applicant will commit to including a WEAP as detailed in Responses 12-6 and 12-40.

The exposure to Valley Fever during wind storms remains a risk with or without implementation of the proposed Project. While the commenter notes that the measures in the Final EIR/EA are insufficient, the commenter provides no indication as to what additional measures are available.

Response 12-43

The commenter states that the Draft EIR/EA failed to disclose and evaluate the disproportionate impacts of the Project on inmates at the Chuckwalla State Penitentiary.

The environmental justice analysis in the Final EIR/EA (pages 3-176 and 3-177) includes the population of the Ironwood State Prison study area (refer to Table 3.2.13-13, Environmental Justice Characteristics). It should be noted that Ironwood State Prison jointly occupies property with Chuckawalla Valley State Prison, totaling approximately 1,700 acres of State-owned property, of which Ironwood State Prison encompasses approximately 640 acres. The prison complex occupies an estimated 350 acres with the remaining acreage used for erosion control, drainage ditches, and catch basins (California Department of Corrections & Rehabilitation 2014). The Final EIR/EA analyzed environmental impacts associated with the proposed Project. The environmental justice analysis assessed the potential for any such major impacts to be disproportionately distributed to minority or low-income population within the local area. The Final EIR/EA did not identify impacts which are significant and unavoidable and none of the Project's impacts were determined to have a disproportionate impact on local low-income or minority populations (including Ironwood State Prison). Additionally, the combined effects of the proposed Project with the other past, present and reasonably foreseeable future projects within the Project study area have been evaluated in the cumulative analysis performed for each resource area.

Ironwood State Prison and Chuckwalla Valley State Prison are located approximately 10 miles west of the proposed Project. As stated above, the impacts of Valley Fever are discussed in the Final EIR/EA, which indicates that Valley Fever can be spread by fugitive dust. Feasible measures are presented in the Final EIR/EA (refer to BMP-3 and BMP-17) to reduce dust generated by the Project, thereby minimizing any potential public health impacts to workers at the Project site and nearby residents, including inmates at Ironwood State Prison and Chuckwalla State Penitentiary. As stated in the Response to 12-40 and 12-42, the potential exposure to nearby residents would likely decrease over existing conditions since the dust control measures would limit airborne dust compared to existing agricultural activities.

Response 12-44

The commenter states that the placement of gen-tie pole will alter the flow of water at the Project site and that the Draft EIR/EA fails to disclose the fact that this impact may be significant, and the Draft EIR/EA also fails to provide any information, evidence or data to support its conclusory determination that construction directly in an ephemeral stream will have no impacts on drainage at the Project site.

As noted in the Final EIR/EA, Chapter 2, an ephemeral stream would bisect the solar facility site for Alternative 1, Alternative 3, and Alternative 5 and the gen-tie lines for these Alternatives would also cross one ephemeral stream; an ephemeral stream would bisect Alternative 4 and its gen-tie line would cross one ephemeral stream twice. The solar panels have been designed to avoid placement within the ephemeral drainage, as have most of the towers of the gen-tie line; however, one gen-tie pole (Tower 43) would be within the potential ordinary high water mark of the drainage.

Temporary and permanent impacts to Waters of the U.S. resulting from construction of Tower 43 were then calculated for based on engineering specifications for the tower structure and known tower construction area requirements.

Construction of the tower foundation and installation of the tower would result in a temporary disturbance area of approximately 0.023 acre. This disturbance area would typically result from clearing of vegetation; however, given the sensitivity of this work area and to reduce potential for significant impacts to Waters of the U.S., vegetation would be crushed rather than bladed (i.e., “dredged”).

A temporary access road within the limits of the OHWM would be necessary to allow for access of construction vehicles and equipment. The proposed temporary access road would cover an area of approximately 0.49 acre (1,800 feet in length and 12 feet wide). It may be necessary to place a temporary fill of gravel within this section of the access road. To maintain compliance with the conditions of the Nationwide 12 Permit for Utility Line Activities and to reduce potential for significant impacts with the OHWM, this temporary fill would be placed in such a manner that it could be removed in its entirety when construction is complete. The former access road would then be returned to pre-construction elevations and revegetated, as appropriate.

Permanent impacts within the limits of the OHWM would result only from installation of the tower, and would cover an area of 0.002 acre, well within the limit of 0.05 acre limit as defined by the Nationwide Permit Program. A tower structure that occupies on 0.002 acres of an ephemeral creek will not have an appreciable effect on water flows. The diameter of the structure is not large enough to divert flows to a different drainage course and its round shape would not allow flows to back up in any direction.

The conclusion that the construction will have no significant impacts on hydrology or water quality is supported by extensive and detailed BMPs and Mitigation Measures. The same BMPs mentioned above would be applied during decommissioning activities.

The same BMPs mentioned above would be applied during decommissioning activities.

BMP-1 **Drainage, Erosion, and Sedimentation Control Plan**. As part of the County of Riverside’s Conditional Use Permit (CUP) requirements, a Drainage, Erosion, and Sedimentation Control Plan would be developed for the Project. The plan would address the drainage, erosion, and sediment control requirements to support all activities associated with construction, operation, maintenance, and decommissioning of the Project. For example, any stockpiles created would be kept on-site, with an upslope barrier in place to divert runoff. Stockpiles would be sprayed with water, covered with tarpaulins, and/or treated with appropriate dust suppressants, especially in preparation for high wind or storm conditions. Certified weed-free straw bale barriers would be installed to control sediment in runoff water; straw bale barriers would be installed only where sediment-laden water can pond, thus allowing the sediment to settle out. Topsoil from the site would be stripped, stockpiled, and stabilized before excavating earth for facility construction. Topsoil would be segregated and spread on freshly disturbed areas to reduce color contrast and aid rapid revegetation.

BMP-2 **Stormwater Pollution Prevention Plan.** In compliance with requirements of the National Pollutant Discharge Elimination System (NPDES) permit, a Stormwater Pollution Prevention Plan (SWPPP) would be developed and prepared for the Project to ensure that protection of water quality and soil resources is consistent with County and State regulations. The plan would identify site surface water runoff patterns and include measures that prevent excessive and unnatural soil deposition and erosion throughout and downslope of the Project area and Project-related construction areas, and would also include measures for non-stormwater discharge and waste management. The SWPPP would cover all activities associated with the construction of the Project, including clearing, grading, and other ground disturbance such as stockpiling or excavation erosion control. The plan would prevent off-site migration of contaminated stormwater, changes in pre-Project storm hydrographs, or increased soil erosion.

BMP-11 **Project structures, gen-tie line, and building surfaces.** Project facilities would be sited to ensure that there is adequate space (i.e., setbacks of no less than 100 feet) between solar facilities and natural washes. These setbacks would preserve and maintain the natural washes' hydrological functions. The color and finish of Project structure and building surfaces that are visible to the public will be designed to ensure minimal visual intrusion, contrast, and glare. Grouped structures will be painted the same color to reduce visual complexity and color contrast. Materials, coatings, or paints having little or no reflectivity will be used wherever possible.

Potential construction- and operation-related direct and indirect impacts to desert riparian woodland wash and unvegetated ephemeral dry wash would be less than significant through implementation of Mitigation measure Biology-9. The same mitigation measures would be applied during decommissioning activities.

Biology-9 Impacts to areas under jurisdiction of the USACE, Regional Water Quality Control Board (RWQCB), and CDFW shall be avoided as necessary to reduce impacts to less than significant levels. Where avoidance of jurisdictional areas is not feasible, including emergency repairs, and access/spur roads within the ephemeral channel, the applicant shall provide the necessary mitigation required as part of wetland permitting. This will include creation, restoration, and/or preservation of suitable jurisdictional habitat along with adequate buffers to protect the function and values of jurisdictional area mitigation. The location(s) of the mitigation will be determined in consultation with the Applicant and the responsible agency(s) as part of the permitting process.

A Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) will be developed to summarize all of the various biological mitigation, monitoring, and compliance measures and include measures from the various biological plans and permits developed for BMSP. The BRMIMP shall include the following:

1) All biological resources mitigation, monitoring, and compliance measures outlined in the BMSP Final EIR/EA;
2) All biological resource mitigation, monitoring and compliance measures required in federal agency terms and conditions, such as those provided in the USFWS concurrence letter that the Project is “not likely to incidentally take or otherwise adversely affect” federally listed species (FWS-ERIV-12B0299-12I0497);
3) All biological resource mitigation, monitoring and compliance measures required by the Riverside County, such as those provided in the December 18, 2013 comment letter (DRT-EPD Corrections) on the BMSP Final EIR/EA No. 529 (CUP 3685);
4) All biological resource mitigation, monitoring and compliance measures outlined in the Burrowing Owl Mitigation and Monitoring Plan and the Bird and Bat Conservation Strategy (the full biological plans will be included in the attachments to the BRMIMP);
5) All locations on a map, at an approved scale, of sensitive biological resource areas subject to disturbance and areas requiring temporary protection and avoidance during construction and operation;
6) Duration for each type of monitoring and a description of monitoring methodologies and frequency;
7) Performance standards to be used to help decide if/when proposed mitigation is or is not successful; and
8) A process for proposing plan modifications to appropriate agencies for review and approval.

BMSP shall provide the BRMIMP document at least 60 days prior to start of any Project-related ground disturbing activities to the BLM and the County for review and approval. Implementation of BRMIMP measures will be reported in the monthly compliance reports by the Designated Biologist (i.e., survey results, construction activities that were monitored, species observed).

Response 12-45

Refer to Response 12-44.

Response 12-46

Refer to Response 12-11.

Response 12-47

Refer to Response 12-12.

Response 12-48

Refer to Response 12-22.

Response 12-49

The commenter states that the Draft EIR/EA lacks substantial evidence to support its claim that Project construction will not result in a significant impact on air quality.

Comments regarding air quality impact analysis and methodology utilized to determine impacts are addressed in Responses to 12-50 through 12-53.

Response 12-50

The commenter contends that the Draft EIR/EA incorrectly estimates the daily fugitive dust emissions generated by the Project based on faulty data in the air quality report prepared for the proposed Project.

The air quality analysis in the Final EIR/EA was based on the technical analysis provided in the *Air Quality and Global Climate Change Technical Report* prepared by a qualified consultant. This report adequately sets forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project based on proven methodologies.

The commenter is correct in noting that MDQAMD thresholds state any emission of PM above 82 pounds per day would be significant. As noted in Table 4.2.3-2 (shown below) in the Final EIR/EA (page 4-73), emissions from construction of the Project would be below the general conformity thresholds and MDAQMD thresholds for all criteria pollutants. The proposed Project would not create substantial emissions and would not conflict with or obstruct implementation of the air basin's air quality management plan.

TABLE 4.2.3-2 ESTIMATED CONSTRUCTION EMISSIONS FOR ALTERNATIVE 1

EMISSION SOURCE	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Maximum Daily Construction Emissions, lbs/day						
Off-road Equipment	35.35	99.36	63.31	12.81	4.61	4.10
On-road Vehicles	19.10	33.84	207.51	0.02	4.04	4.00
Fugitive Dust	---	---	---	---	41.82	8.78
TOTAL	54.45	133.20	270.82	12.83	50.47	16.88
CEQA Thresholds	137	137	548	137	82	82
Above Thresholds?	No	No	No	No	No	No
Annual Construction Emissions, tons/year						
Off-road Equipment	1.71	13.90	8.61	0.39	0.62	0.55
On-road Vehicles	2.41	4.54	25.97	0.00	0.52	0.51
Fugitive Dust	---	---	---	---	5.02	0.96
TOTAL	4.12	18.44	34.58	0.39	6.16	2.02
CEQA Thresholds	25	25	100	25	15	15

Source: SRA 2013.

Response 12-51

The commenter contends that the air quality report misconstrues the results of a published paper by Midwest Research Institute (MRI) which is 15 years old. Regulatory agencies, including the MDAQMD and the SCAQMD, continue to use studies conducted by MRI for emission calculations for fugitive dust. In fact, the CalEEMod Model uses algorithms from MRI studies dating back to 1988.

Emissions of criteria pollutants were estimated based on the Project construction and operation assumptions in the *Air Quality and Global Climate Change Report* (refer to Appendix B). Section 4.2.3, *Air Quality*, page 4-68 of the Final EIR/EA provided the methodology assumptions for determining Project Emission. The methodology for analysis is shown below:

Emissions of reactive organic gases (ROG), sulfur oxides (SO_x), and greenhouse gas (GHG) from heavy equipment used in construction of the Blythe Mesa Solar Project were estimated based on 2014 emission factors for the South Coast Air Basin (SCAB) from the California Air Resources Board's (CARB's) OFFROAD2007 Model (CARB 2007a), as published on the South Coast Air Quality Management District's (SCAQMD's) website. Emissions of nitrogen oxides (NO_x), carbon dioxide (CO), and particulate matter were calculated based on the assumption that the equipment used for construction would, at a minimum, meet U.S. Environmental Protection Agency (EPA) Tier 2 emission standards. Emission factors for 2014 represent the average fleet emissions throughout the SCAB and were considered representative of construction equipment that would be used during construction of the project. Emissions from worker travel and truck traffic were calculated using the CARB's EMFAC2007 Model[2] (CARB 2007b) for on-road vehicles. Emissions of fugitive dust were estimated based on SCAQMD and EPA emission factors.

Appendix A of the *Air Quality and Global Climate Change Report* provides fugitive dust emissions broken down by activity (e.g. grading, excavation, vehicle travel, etc) shown in Table A-11a. The source for these emission factors is the USEPA AP-42 and the South Coast Air Quality Management District. According to the EPA, the "AP-42, *Compilation of Air Pollutant Emission Factors*, has been published since 1972 as the primary compilation of EPA's emission factor information" (EPA 2014). The fugitive dust emission estimates were prepared for the EPA by the Midwest Research Institute and utilized by (ENVIRON 2013).

Additionally, the CEQA Guidelines (Section 15151) state:

> An EIR should be prepared with sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness and a good faith effort at full disclosure (Cal. Code Reg. Section 15151).

An EIR's evaluation of a project's potential impacts is subject to the "rule of reason". An EIR may rely on informed judgments of technical experts. In the case of the Final EIR/EA, the air quality analysis was based on the technical analysis provided in the *Air Quality and Global Climate Change Technical Report* prepared by a qualified consultant. This report adequately sets forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project using appropriate methodologies.

Response 12-52

The commenter contends that a control efficiency of 75 percent was applied to all fugitive dust generating activities.

This is not the case. The 75 percent control efficiency was applied to construction of activities sites and areas, access roads, and travel on unpaved roads to account for fugitive dust control measures for those activities. Control efficiencies for other activities were factored in based on the SCAQMD's CEQA Air Quality Handbook methodologies in Appendix A-9.

Control efficiencies for watering are dependent on the frequency of watering. According to the WRAP Fugitive Dust Handbook (Countess Environmental 2004), average control efficiency for use of a scraper

[2] A comparison of emission factors for the EMFAC 2007 and 2011 model, using 2014 emission factors, determined that emission factors for EMFAC2007 are lower for all pollutants except particulate matter (PM) for medium-duty vehicles and SOx for light- and medium-duty vehicles. The increase that would be calculated for these pollutants using EMFAC 2011 emission factors is negligible and does not affect the conclusions of the analysis.

remained above 75 percent approximately 2 hours after watering. Applying water at an interval of 2.1 hours controlled fugitive dust emissions by 74 percent, and limiting on-site vehicle speeds to 15 mph or less controlled emissions of fugitive dust by 57 percent. The fugitive dust control measures will include watering every 2 hours to control fugitive dust, which would support a control efficiency of 75 for the activities for which this control factor was applied. This amount of watering will mitigate the emissions to below a level of significance, and no significant impact is therefore identified.

Response 12-53

The commenter states that the Draft EIR/EA does not consider DPM [diesel particulate matter] exposures to children who live near the Project site.

The risk analysis conducted for the proposed Project utilized a screening-level analysis that follows the currently approved OEHHA guidance for conducting health risk assessments, and is conservative because it relies on a screening model that does not take into account (a) the fact that construction equipment would not be used 24 hours/day; (b) assumes that the wind always blows toward the receptor, and it uses the EPA scaling factor to adjust the concentration to account for chronic exposure; (c) assumes that all of the off-road and on-road emissions occur at the site, and do not take into account the fact that the on-road emissions would instead by dispersed on the roadways; and (d) assumes that a receptor is located 100 meters or 300 feet from the site and is present 24 hours per day, 7 days per week, 365 days per year for the duration of construction. Risks are 2 orders of magnitude below the significance threshold of 10 in a million; therefore, even if the adjustment factor for 0 to 2 years of 10 is used, the risks would remain below 10 in one million for childhood exposure.

The *Air Quality and Global Climate Change Report* (page 28) did include children in the consideration of sensitive receptors in the Project area. The Final EIR/EA (page 3-36) included a discussion relative to sensitive receptors in the Project study area. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with associated greater exposure to ambient air quality. Recreational uses are also considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with recreation places a high demand on the human respiratory system.

Additionally, the Final EIR/EA provides a discussion relative to toxic air contaminant (TAC) emissions. The Final EIR/EA (pages 4-73 and 4-74) identifies that construction activities would result in emissions of diesel particulate matter from heavy construction equipment used on-site and truck traffic to and from the site, as well as minor amounts of TAC emissions from motor vehicles, such as benzene, 1,3-butadiene, toluene, and xylenes. Health effects attributable to exposure to diesel particulate matter are long-term effects based on chronic, long-term exposure to emissions. Health effects are generally evaluated based on a lifetime (70 years) of exposure.

As discussed in the *Air Quality and Global Climate Change Report* (Appendix B of the Final EIR/EA), the risk-driving TAC associated with construction activities at the Project area is diesel particulate emitted from equipment and vehicles operating on-site. Sources of diesel particulate matter at the site would include haul truck activities, heavy construction equipment, and contractor vehicles. Construction emissions were modeled using the SCREEN3 model to evaluate whether diesel particulate matter would result in a significant health risk to sensitive receptors in the Project area. A screening health risk analysis was conducted to evaluate the potential for the Project to expose sensitive receptors to substantial TAC concentrations. Based on the results of the screening health risk assessment, the maximum predicted cancer risk would be 0.549 in one million, which is below the significance threshold of 10 in one million.

The chronic non-cancer hazard index would be 0.00769, which is below the significance threshold of 1.0. This estimate assumes implementation of BMP-16 (Diesel Engines) incorporating the use of ultra-low sulfur fuel in conjunction with Tier 2 and Tier 3 diesel equipment to reduce TACs emitted during construction of the proposed gen-tie line and solar array facility. Based on the screening analysis, construction activities would not result in a significant impact to sensitive receptors.

An EIR's evaluation of a project's potential impacts is subject to the "rule of reason." An EIR may rely on informed judgments of technical experts. In the case of the Final EIR/EA, the air quality analysis was based on the technical analysis provided in the *Air Quality and Global Climate Change Technical Report* prepared by a qualified consultant. This report adequately sets forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project based on appropriate methodologies.

Response 12-54

The commenter states that the burrowing owl Draft EIR/EA mitigation measures, in particular the buffers and analysis falls short.

The Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4, Burrowing Owl Protection; on page 4-143 of the Final EIR/EA was prepared following the *2012 California Department of Fish and Wildlife [formally CDFG] Staff Report on Burrowing Owl Mitigation*. The Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4 includes the Scobie and Faminow recommendation on burrowing owl buffers outlined in the *2012 CDFW Staff Report on Burrowing Owl Mitigation*.

Response 12-55

The commenter states that the 146 acres identified as compensatory habitat is incorrect based on the California Burrowing Owl Consortium recommendations.

As mentioned in Response 12-57, the Burrowing Owl Monitoring and Mitigation Plan was prepared following the *2012 CDFW Staff Report on the Burrowing Owl Mitigation*. As noted within the *2012 CDFW Staff Report on the Burrowing Owl Mitigation*, this document replaces the Department of Fish and Game 1995 Staff Report on Burrowing Owl Mitigation.

The CDFW current guidance does not set a specific habitat compensatory ratio; however, they do request that the lands be within 50 to 100 meters and comparable to or better than the impact area. CDFW also suggest that the mitigation lands may require habitat enhancements. The Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4, Burrowing Owl Protection, on page 4-143 of the Final EIR/EA, was prepared following the *2012 CDFW Staff Report on the Burrowing Owl Mitigation* and addresses all of the current CDFW guidelines on compensatory habitat.

To address the comment regarding the ineffectiveness of the habitat replacement, because CDFW no longer suggests a habitat ratio, the California Burrowing Owl Consortium habitat ratio guidelines were used as a basis to determine the minimum amount of habitat potentially required. However, this was the minimum amount and an additional 131 acres were identified for a total of 277 acres. It should also be noted that the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measures Biology-4, will not only be consistent with the CDFW current guidelines, but will also be developed in consultation with CDFW.

Response 12-56

The commenter states that the compensatory habitat is insufficient.

As outlined in the *2012 CDFW Staff Report on the Burrowing Owl Mitigation* and included in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4, Burrowing Owl Protection; on page 4-143 of the Final EIR/EA; compensatory habitat is recommended. Per the CDFW guidelines, locating artificial or natural burrows more than 100 meters from the eviction burrow from which owls have been passively relocated reduces the success rate.

The proposed compensatory lands were identified based on the proximity from the current burrowing owl sign and based on potential habitat. However, as outlined in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measures Biology-4 of the Draft EIR/EA, an additional 131 acres are available and a vegetation management plan will be implemented within the compensatory lands. The 146 acres were identified as preliminary compensatory lands. As outlined in Mitigation Measure Biology-4, a pre-construction survey will be conducted to determine the number of burrowing owls and the amount of compensation land that may be required should avoidance not be an option. It should also be noted that the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measures Biology-4, will not only be consistent with the CDFW guidelines, but will also be developed in consultation with CDFW.

Response 12-57

The commenter states that the reduced burrowing owl avoidance buffers are not effective.

Refer to Response 12-56 regarding the development of burrowing owl buffers.

Response 12-58

The commenter states that the Draft EIR/EA fails to analyze impacts associated with the passive relocation, compensatory mitigation habitat or eviction of the burrowing owl.

Passive Relocation

Passive relocation, if it occurs, will be rare. Avoidance of the burrowing owls and burrows is the primary objective of the burrowing owl Mitigation Measure Biology-4, as outlined in the Final EIR/EA. Only as a last resort would passive relocation be considered an option.

Passive relocation, if it occurs, would affect only non-breeding birds and juveniles who are capable of foraging independently. As outlined in Mitigation Measure Biology-4 of the Final EIR/EA occupied burrows will not be disturbed during the breeding season (February 1 through August 31) unless an approved biologist verifies, through non-invasive methods, that both 1) the birds have not begun egg-laying and incubation and 2) that juveniles from the occupied burrow are foraging independently and are capable of independent survival. Occupied burrows will be protected with a buffer.

This limited amount of passive relocation, if it occurs, will not cause significant impacts. Should passive relocation be considered, the Burrowing Owl Mitigation and Monitoring Plan will be implemented to ensure impacts of relocation are less than significant. This will include monitoring of the mitigation site to ensure the appropriate maintenance for the mitigation site and that existence of the burrowing owls on site is successful and long-term (CDFW 2012). Monitoring of the site will occur four times per year for a two-year program. Two visits will be conducted during the breeding season, and the other two visits will be conducted during the non-breeding season to evaluate the burrowing owl use of the artificial burrows or other natural burrows. Maintenance of artificial burrows shall occur three to four times during the two years following relocation, as necessary

Compensatory Mitigation Habitat

Compensatory mitigation habitat will not cause significant impacts. The 146 acres identified to compensate for impacts to the burrowing owl are adjacent to the Project area and therefore exhibit habitat characteristics similar to those of the Project area. As noted in the Western Burrowing Owl Monitoring and Mitigation Program, the 2012 CDFW guidelines will be followed to identify the location within the 146 acres to install artificial burrows, and information regarding the vegetation and topographs of the locations proposed for artificial burrows must be approved by CDFW and the County of Riverside. These protections will help assure success in the use of the compensatory mitigation habitat for the owl. Therefore, the compensatory lands will not materially degrade the sustainability or survival rates of the burrowing owl.

Passive relocation is considered the preferred option to trapping (CBOC 1993). A one-way door shall be used to facilitate passive relocation of owls. The one-way door shall be left in place for 48 hours to ensure burrowing owls have left the burrow before excavation (CDFG 2012). The CDFW will not authorize the capture and relocation of burrowing owls except in the context of scientific research (CDFW 2012).

Based on the CDFW guidance for passive relocation and implementation of a monitoring program the Project will not have potentially significant impacts to the burrowing owl.

Response 12-59

The commenter states that the Avian and Bat Protection Plan (ABPP) presents mitigation measures that are vague and unenforceable, in violation with CEQA.

The ABPP has been developed with consideration and guidance from the data and suggestions presented in the *USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities* and the Avian Power Line Interaction Committee's *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.*

The recommendation of incorporating the USFWS or the National Fish and Wildlife Forensic Laboratory monitoring methods has been noted. The adaptive management process is being guided by the regulatory agencies' guidelines. As action is taken, the results are monitored and future actions will be modified accordingly and in consultation with the regulatory agencies.

Response 12-60

The commenter states that the Draft EIR/EA lacks substantial evidence to support its conclusion that the implementation of mitigation measures would reduce impacts to the Mojave fringe-toed lizard to less than significant.

The Biological Resources Section 4.2.4 of the Final EIR/EA has been updated to include quantifying information regarding direct loss of habitat and potential indirect effects to habitat adjacent to and downwind of the Project area. This additional information includes details of how the mitigation measures would reduce these impacts. Please refer to pages 31, 32, and 33 of the Errata in Response to Comments section of this Final EIR/EA document which reflects this expanded discussion.

Response 12-61

The commenter states that the Draft EIR/EA fails to address, analyze, and mitigate cumulative impacts on Mojave fringe-toed lizards.

The Final EIR/EA analyzed cumulative impacts on Mojave fringe-toed lizards. The Final EIR/EA was prepared and reviewed by County Staff and technical experts and is consistent with State CEQA Guidelines and NEPA requirements. This non-listed special-status species is known to occur along the gen-tie line corridors of the BMSP. Cumulative effects may be projected onto this species with the combined influence of the effects of the BMSP with those of the surrounding projects listed in Table 4.1-1. Numerous environmental documents for surrounding projects described the widespread distribution of the species throughout their project areas (CDFW 2013; TetraTech 2011). Because these projects will require ground to be cleared, mostly for wind or solar projects, there is potentially a very large amount of habitat that will be removed or degraded by construction of these various projects. Under Alternative 1, approximately 65 acres of habitat would be disturbed for the gen-tie line and spur roads. Loss of individuals or habitat in these areas will exert a cumulative effect on Mojave fringe-toed lizard by reducing the local population size or removing suitable habitat. Long-term predation vulnerability may occur due to vegetation loss, which decreases dispersal and refuge opportunities from predators. In addition, increased perching opportunities resulting from construction of the all associated transmission lines also increases this species' predation vulnerability. The intensity of the cumulative effect is increased due to the fact that these projects will be ongoing for several years, lost or disturbed habitat is likely to take years to recover, and unless designed with successful perch discouragers, transmission lines will provide permanent perching opportunities.

Effects from the BMSP would be reduced to less than significant levels with the implementation of Mitigation Measures Biology-1 (Monitor Construction Site for Biological Compliance) and Biology-8 (Protect Mojave Fringed-Toed Lizard). As part of the Project, habitat would also be protected with the implementation of BMP-3 (Fugitive Dust Abatement Plan), BMP-10 (Integrated Weed Management Plan), BMP-13 (Ground and Surface Disturbance), and BMP-19 (Plants and Wildlife). With implementation of the above-mentioned BMPs as part of the proposed Project, in addition to protection through the implementation of Project mitigation measures, the project's contribution to cumulative effects to the Mojave fringed-toed lizard would be less than significant.

Response 12-62

The commenter states that the Draft EIR/EA fails to identify and mitigate Project impacts to the desert tortoise.

As outlined in Chapter 4, *Biological Resources*, pages 4-99 and 4-100 of the Final EIR/EA, based on the survey work that was conducted in 2011 and 2012, a database search, and consultation with the regulatory agencies, no endangered, rare, or threatened species would be impacted or threatened by the proposed Project, Alternative 1. As noted in Chapter 4, *Biological Resources*, pages 4-118 and 4-119, additional desert tortoise mitigation may be required should Alternative 4 be chosen. The additional mitigation measures will occur in coordination and consultations with the BLM, CDFW, and USFWS. The Project Applicant will continue to work with the regulatory agencies regarding adherence to the NECO Plan.

Response 12-63

The commenter states that the Draft EIR/EA does not require a Raven Management Plan.

As outlined in the *Avian and Bat Protection Plan* Appendix C4 of the Final EIR/EA, the gen-tie line shall be designed to discourage their use by raptors and ravens for perching (e.g., by use of anti-perching devices). This design would minimize avian risk and would provide the added benefit of not increasing the potential for increased predation of special-statue species such as the desert tortoise by not creating structures that enhance perching or nesting opportunities for ravens and other tortoise predators.

Refer to Response 12-65 regarding consultations with the regulatory agencies and guidance on mitigation measures as it relates to the desert tortoise.

Response 12-64

The commenter states that there are long-term impacts associated with vegetation loss to the Mojave fringe-toed lizard and that predation due to perching increases the species' predation vulnerability. The commenter goes on to mention that the Draft EIR/EA fails to carry this perching increase analysis over to impacts on the desert tortoise by the raven.

As outlined in the *Avian and Bat Protection Plan* Appendix C4 of the Final EIR/EA, the gen-tie line shall be designed to discourage their use by raptors for perching (e.g., by use of anti-perching devices). Refer to Response 12-66 for additional details on this topic.

Response 12-65

The commenter states that the Draft EIR/EA fails to identify any issues related to Couch's spadefoot toad. Refer to Response 12-31 for discussion on the flooded alfalfa fields and agricultural sites as it relates to habitat for this species.

The commenter states that noise from the Project construction has the potential to mimic rainfall, causing the species to seek refuge in highly unfavorable conditions. The commenter also states that the species may be present near the irrigation ponds. As outlined in Chapter 3 of Final EIR/EA, *Biological Resources*, Table 3.2.4-3 page 3-61, the species has a low potential to occur based on the literature review, database records and field surveys. The field surveys included review of the irrigation ponds with no species found. Outlined in the Biological Best Management Practices, Chapter 4 of the Final EIR/EA, applicable BMPs would minimize potential impacts to all biological resources.

Response 12-66

The commenter states that the Draft EIR/EA lacks substantial evidence to support its conclusion that no substantial adverse effects to scenic resources would occur. The commenter identifies General Plan policies, but does not explain in what way it believes the evidence and support provided in the Draft EIR/EA is lacking, so a detailed response cannot be provided to a specific concern.

The Final EIR/EA provides extensive discussion and evidence regarding the visual impacts of the Project. It contains an analysis of contrast, visual simulations, and an application of CEQA thresholds. That analysis and evidence supports the conclusion that impacts to views from I-10 will be less than significant.

The impacts are depicted visually in Figure 4.2.1-3 (KOP 2 View). The evidence is summed up on pages 4-35 and 4-36 of the Final EIR/EA:

> Motorists on I-10 heading east would enjoy scenic desert views across the mesa to the mountains. However, upon approach to the Project area, the motorist would view a section of the highway that has views of development on the east end of the Palo Verde Mesa and then approach agricultural lands and developed areas on the Palo Verde Valley floor rather than open views of undeveloped desert. Motorists would view the Project in the context of its surrounding land uses, including the Blythe Energy Center, the Blythe

> Solar Project (owned by NRG), several electrical transmission lines crossing the freeway, and the Blythe Airport. The solar facility would not block views of the mountains for motorists, which would remain visible in the distance beyond the solar facility. Because of its location on the eastern edge of the Palo Verde Mesa, the context of the adjacent land uses, and motorists' present views of development, the Project would be compatible with policies to protect scenic views from I-10. There are no scenic resources such as significant trees, rocks, historic buildings, or prominent topographic features that would be degraded due to the Project.

The Final EIR/EA further explains, on page 4-36:

> The Project would be in an area of desert scrub, fallow fields, agricultural fields (wheat and jojoba), citrus groves, and existing electrical facilities. The visual character and quality of the Project area is Class C, or common to the area. No designated areas of natural beauty or scenic recreational areas are within the study area. The existing visual character of the landscape is already influenced by existing transmission lines, the Blythe Energy Center (which would be surrounded by the proposed solar facility), and the existing Blythe Solar Project (owned by NRG) to the west. Although the Project would change the existing visual character of the site from vacant land and agriculture to a solar energy facility, it would not alter the site in a manner that would substantially degrade its scenic value, which is considered low. The proposed solar facility is in a sparsely populated area with no unique or outstanding visual features. Therefore, less than significant impacts would occur with regard to degrading the existing visual character or quality of the site as a result of the construction, operation, maintenance, and decommissioning of the Project.

Accordingly, the Final EIR/EA contains substantial evidence supporting its conclusion that there will be no significant adverse impacts to views from I-10.

Policy LU-13 of the General Plan states "Require new or relocated electric or communication distribution lines, which would be visible from Designated and Eligible State and County Scenic Highways, to be placed underground." In addition, Policy C 25.2, which addresses Major Utility Corridors, states "Locate new and relocated utilities underground when possible. All remaining utilities shall be located or screened in a manner that minimizes their visibility by the public." The Final EIR/EA has been corrected to clarify that the Project can be found consistent with these General Plan policies, as interpreted in accordance with standard County practice to require undergrounding only when the new or relocated lines would create new and significant impacts from scenic corridors (refer to pages 33 through 39 of the Errata in Response to Comments section of the Final EIR/EA which reflects this revision). This interpretation is consistent with overarching General Plan policies, to "preserve and protect" existing visual features for the enjoyment of the traveling public (Policy LU13.1) and to "design developments within designated scenic highway corridors to balance the objectives of maintaining scenic resources with accommodating compatible land uses" (Policy OS 22.1). Here, as the Final EIR/EA explains, the new lines would be parallel to existing lines, and the addition of the new lines would not be significantly different from the existing views from I-10. Therefore, the Project would not fail to "preserve and protect" an unspoiled scenic view, and it would balance the need for compatible uses with scenic values by citing utility lines within view points that include existing lines. This interpretation of Policies LU 13.5 and C 25.2 is also consistent with standard County practice of approving projects that include utility lines across scenic corridors, and finding those projects consistent with the County's general plan, when the utility lines will merely accompany existing lines or development. Examples of this standard practice are the McCoy Solar Energy Project, Desert Sunlight Solar Farm Project, and the Genesis Solar Energy Project. The Board of Supervisors, which has ultimate authority for interpreting and applying its General Plan, will determine when it is considering this Project whether it agrees with this interpretation of Policies LU 13.5 and C 25.2, as it will with respect to all applicable General Plan and Area Plan policies.

Response 12-67

The commenter contends that the Project would violate Riverside County General Plan Policy C 25.2. Therefore the Draft EIR/EA needs to identify significant impacts to scenic resources and recirculate the document.

With regard to Riverside County General Plan Policy C 25.2 and scenic resources, please refer to Response 12-66.

With regard to recirculation, refer to Response 12-5 above.

Response 12-68

The commenter contends that the Draft EIR/EA defers preparation of a plan designed to minimize impacts to drainage and impacts from stormwater runoff until after Project approval. Section 4.2.9, *Hydrology and Water Quality,* provides BMPs to minimize impact to hydrology and water quality. It also provides mitigation measures where it was determined that a potential significant impact may occur.

The Final EIR/EA reflects a good faith effort to investigate and disclose environmental impacts of the project (see CEQA Guidelines §§ 15003(i), 15151), and the mitigation measures are legally adequate. CEQA states that formulation of mitigation measures may specify performance standards that would mitigate the significant effects of the project and that may be accomplished in more than one specified way (see CEQA Guidelines § 15126.4(a)(1)(B)). The Final EIR/EA identified a number of mitigation measures that require the preparation of a more precise mitigation plan after certification of the EIR/EA, which is acceptable under CEQA provided that the agency "commits itself to eventually devising measures that will satisfy specific performance criteria articulated at the time of approval." *Sacramento Old City Association v. City Council* (1991) 229 Cal.App.3d 1011, 1028-1029.

It is common for formulation of a mitigation plan to be deferred when a regulatory agency other than the Lead Agency will be reviewing or approving the mitigation and can be expected to impose mitigation requirements independent of CEQA as a condition of the permit. These requirements are often worked out through a consultation and approval process that takes place after the environmental document is completed. In this type of situation, it often makes sense to defer formulation of the specifics of mitigation measures to ensure they will meet the regulatory agency's requirements. Compliance with regulatory agency standards for mitigation can be relied upon to ensure adequate mitigation under CEQA. As a result, regulatory approval of a mitigation program might serve as an adequate performance standard as long as the regulatory agency's standards for adequate mitigation are identified in the EIR. See *Defend the Bay v. City of Irvine* (2004) 119 Cal.App.4th 1261, 1275 (holding no improper deferral of mitigation even though future investigations and consultation with regulatory agencies was required and further holding that an agency may defer defining the specifics of mitigation measures if it "commits itself to mitigation and lists the alternatives to be considered, analyzed and possibly incorporated in the mitigation plan"); *Endangered Habitats League v. County of Orange* (2005) 131 Cal.App.4th 777, 794 (upholding habitat mitigation measure because the EIR called for either off-site preservation of habitat at a specified ratio or obtaining habitat loss permits from relevant agencies).

Additionally, the County believes this comment is referring to the BMPs relative to hydrology and water quality because the mitigation measures (Hydrology-1 through Hydrology-6) do not contain language recommending the development of future plans, with the exception of Mitigation Measure Hydrology-4 which states:

Hydrology-4 Stormwater drainage inside substations would be designed to minimize erosion and increase sediment control. Internal runoff would be released from the switching station by means of surface drainage structures designed to filter contaminants from water flow. Drainage from Project area would be collected and controlled by surface improvements, as detailed in the SWPPP.

Examples of erosion control measures include preservation of existing vegetation to maintain existing soil integrity, and non-vegetative stabilization techniques such as a layer of gravel or rocks to stabilize slopes or other areas with a high erosion potential. Wind erosion control (i.e., dust control) consists of applying water to disturbed areas to prevent dust from being deposited into streams, washes, or other receiving waters via wind. Examples of sediment control measures include installation of silt fencing, and installation of fiber rolls or sandbag barriers, all of which filter soil particles out of flowing water before they enter receiving waters.

The Project BMPs and mitigation measures serve to preclude, minimize, and/or fully mitigate potential environmental impacts. The proposed Project's BMPs are specific design elements that would be implemented by the Applicant and that have been incorporated into the proposed Project to prevent the occurrence of or minimize the significance of potential environmental effects. Based on the discussion above, and other relevant case law, the mitigation measures proposed in the Final EIR/EA provide performance standards that are sufficiently detailed under CEQA to allow for meaningful agency and public review.

Mitigation Measure Hydrology-4 has been revised in the Final EIR/EA. This change represents a correction to the Final EIR/EA which does not alter or change the conclusion of the Project's environmental analysis. Section 4.2.9, *Hydrology and Water Quality*, (page 4-268) of the Final EIR/EA is hereby revised. Please refer to pages 38 and 39 of the Errata in Response to Comments section of this Final EIR/EA.

Response 12-69

The commenter states that NEPA requires a reasonably complete discussion of possible mitigation measures.

Refer to Response 12-68.

Response 12-70

The commenter contends that the Draft EIR/EA defers mitigation.

Refer to Response 12-6.

Response 12-71

The commenter's summary remarks are noted.

The Final EIR/EA adequately sets forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project based on technical reports and studies prepared by qualified individuals. As required by CEQA, potentially feasible mitigation measures have been proposed to reduce any significant environmental impacts to less than significant. The Project would not result in significant effects that cannot be mitigated. Refer to the standard response for recirculation in Response 12-5. Comments regarding the accuracy and completeness of the project description and deferment of mitigation measures are addressed in Response 12-6.

Letter 12a: Scott Cashen, Independent Biological Resources and Forestry Consultant

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Scott Cashen, M.S.—Independent Biological Resources and Forestry Consultant

July 29, 2014

Ms. Meghan A. Quinn
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Subject: Comments on the Draft Environmental Impact Report and Draft Environmental Assessment Prepared for the Blythe Mesa Solar Project

Dear Ms. Quinn:

This letter contains my comments on the Draft Environmental Impact Report and Draft Environmental Assessment ("DEIR/DEA") prepared for the Blythe Mesa Solar Project ("Project") by Riverside County ("County") and the Bureau of Land Management ("BLM"). Renewable Resources Group ("Applicant") proposes to construct, operate, maintain, and decommission an up to 485-megawatt photovoltaic solar generating facility and 8.4-mile generation interconnection (gen-tie) line. The Project would occupy a total of 3,660 acres in the Palo Verde Mesa region of Riverside County.

I am an environmental biologist with 21 years of professional experience in wildlife ecology, forestry, and natural resource management. To date, I have served as a biological resources expert for over 80 projects, the majority of which have been renewable energy facilities. My experience and scope of work in this regard has included assisting various clients with evaluations of biological resource issues, reviewing environmental compliance documents prepared pursuant to the California Environmental Quality Act ("CEQA") and the National Environmental Policy Act ("NEPA"), submitting written comments in response to CEQA and NEPA documents, and testifying as an expert witness before the California Energy Commission and California Public Utilities Commission. My educational background includes a B.S. in Resource Management from the University of California at Berkeley, and a M.S. in Wildlife and Fisheries Science from the Pennsylvania State University.

I have gained particular knowledge of the biological resource issues associated with the Project through the scientific research I have conducted in the Colorado Desert, and through my work on numerous other renewable energy projects in the Project region. The comments herein are based on my review of the environmental documents prepared for the Project, a review of scientific literature pertaining to biological resources known to occur in the Project area, consultations with other biological resource experts, and the knowledge and experience I have acquired during more than 21 years of working in the field of natural resources management.

BASELINE CONDITION ISSUES

Special-Status Plants

Harwood's woollystar (*Eriastrum harwoodii*) occurs within all three potential gen-tie corridors.[1] Harwood's milk-vetch (*Astragalus insularis* var. *harwoodii*) occurs on the Project site (Figure 1) and within the northern gen-tie line corridor.[2] Harwood's woollystar has a Rare Plant Rank of 1B.2, which indicates it is rare throughout its range and fairly endangered in California.[3] The species has a global rank of G2 and a state rank of S2, which indicates it is "at high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors" at both the statewide and global scale.[4] Harwood's milk-vetch has a Rare Plant Rank of 2.2, which indicates it 12a-1
is rare or endangered in California, but more common elsewhere.[5] The species has a state rank of "S2.2?," which represents slightly less certainty than a rank of S2.[6]

Although the DEIR/DEA provides the Rare Plant Ranks for Harwood's woollystar and Harwood's milk-vetch, it fails to establish the ecological context of the populations in the Project area relative to other extant populations in the region (e.g., size of the population in Project area versus other populations). This precludes the public and decision makers from being able to evaluate the relative severity of Project impacts to these two species.

Couch's Spadefoot

The Couch's spadefoot is listed as a BLM Sensitive Species and a California Species of Special Concern. The Couch's spadefoot is an extremely rare species in California and its range is limited to a very small region in the southeastern portion of the state.[7] The Project site is within the geographic range of the species. 12a-2

The California Natural Diversity Database ("CNDDB") has only six documented records of the species in the state.[8] One of the records is associated with a flooded alfalfa field.[9] Three of the remaining records are associated with desert scrub near agricultural fields.[10] Portions of the Project site and gen-tie line corridor contain these conditions.[11] Based on

[1] DEIR/DEA, p. 3-48.

[2] *Ibid*, Figure 3.2.4-2. *See also* California Natural Diversity Database, Biogeograhic Data Branch, Department of Fish and Wildlife. 2014 Jul 1 (Version 5).

[3] California Department of Fish and Game, Natural Diversity Database. 2011 Jan. Special Vascular Plants, Bryophytes, and Lichens List. Available at: <http://www.dfg.ca.gov/habcon/plant/info.html>.

[4] *Ibid*.

[5] *Ibid.*

[6] *Ibid.*

[7] Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division.

[8] California Natural Diversity Database, Biogeograhic Data Branch, Department of Fish and Wildlife. 2014 Jul 1 (Version 5).

[9] *Ibid.*

[10] *Ibid.*

[11] DEIR/DEA, Figure 3.2.4-1.

this information, I believe the DEIR/DEA has inappropriately concluded that the Couch's spadefoot has a "low" potential of occurring in the Project area.[12] 12a-2

The DEIR/DEA Provides Inconsistent Information on the Presence of Special-Status Species

The DEIR/DEA provides inconsistent information on the presence of several special-status species. For example: 12a-3

1. DEIR/DEA Figure 3.2.4-3 does not depict all of the burrowing owls, burrowing owl burrows, and burrowing owl signs that were detected during the Applicant's burrowing owl surveys.[13]
2. The DEIR/DEA indicates no bighorn sheep or sign were detected in the Project study area.[14] This information conflicts with the Biological Resources Technical Report, which indicates a bighorn sheep skull was found within the proposed solar array project footprint.[15] In addition, the "Affected Environment" section of the DEIR/DEA lists Nelson's bighorn sheep as one of the species detected within the Project study area.[16] 12a-4
3. The Biological Resources Technical Report indicates the ferruginous hawk has a low potential of occurring within the Project area.[17] This information conflicts with the DEIR/DEA, which indicates the species is present along the gen-tie line routes.[18] Unlike most other special-status bird species, the special-status designation applied to the ferruginous hawk pertains to birds on their wintering grounds. 12a-5

PROJECT IMPACT ISSUES

Special-Status Plants

The DEIR/DEA indicates the Project would result in direct impacts to special-status plant species.[19] It also acknowledges the potential for the Project to have several different types of indirect impacts to special-status plant species.[20] The DEIR/DEA, however, concludes implementation of BMP-13 (Ground and surface disturbance), BMP-14 (Travel and traffic), BMP-15 (New access roads and parking lots), and BMP-19 (Plants and wildlife) "would ensure that direct loss of habitat as a result of construction would be 12a-6

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[12] *Ibid*, Table 3.2.4-3.

[13] *Ibid* and Appendix C3: Western Burrowing Owl Survey Report, Figure 2.

[14] *Ibid*, p. 4-102, Table 3.2.4-3 and Figure 3.2.4-3.

[15] *Ibid*, Vol III, Appendix C1: Biological Resources Technical Report, pp. 23 and 54.

[16] *Ibid*, p. 3-57.

[17] *Ibid*, Vol III, Appendix C1: Biological Resources Technical Report, p. 51.

[18] *Ibid*, Table 3.2.4-3 and Figure 3.2.4-3.

[19] *Ibid*, p. 4-94.

[20] *Ibid*, pp. 4-94 and -95.

less than significant."[21] Although the referenced BMPs would reduce impacts, they do not require avoidance of special-status plants, or compensatory mitigation for direct impacts to the plants. As a result, the DEIR/DEA does not have the scientific basis to conclude impacts to special-status plants would be less than significant. 12a-6

As discussed previously, the DEIR/DEA failed to establish the ecological context of the special-status plant populations in the Project area relative to other extant populations in the region. As a result, I used the CNDDB and the Biogeographic Information & Observation System ("BIOS") to generate maps that depict: (a) the CNDDB records for Harwood's woollystar and Harwood's milk-vetch in the Project region; and (b) the corresponding renewable energy projects in the region.[22] The resulting maps suggest that the Project, in conjunction with other approved and reasonably foreseeable future projects, would impact the majority of the known populations of Harwood's woollystar and Harwood's milk-vetch in the Project region (Figures 2 and 3). 12a-7

Couch's Spadefoot

The DEIR/DEA does not discuss potential impacts to the Couch's spadefoot, nor does it provide mitigation to ensure impacts are less than significant.

Subterranean refuge sites used by the Couch's spadefoot may be susceptible to disturbance from off-road vehicles that create noise similar to rainfall, inducing emergence under highly unfavorable (hot, dry) conditions that would be almost certainly fatal to adults (Brattstrom and Bondello 1979).[23] Noise from Project construction has the potential to mimic these conditions. In addition, breeding sites used by the Couch's spadefoot are potentially vulnerable to Project disturbance that alters the percolation characteristics of the substrate in a manner that makes pools too short-lived for larvae to attain metamorphosis.[24] Given the extremely rare status of the species in California, any adverse impacts to the Couch's spadefoot would be significant and remain unmitigated. 12a-8

Burrowing Owl

The Project may involve the eviction of burrowing owls from their burrows.[25] The DEIR/DEA, however, fails to adequately evaluate potential impacts to burrowing owls from the temporary or permanent closure of burrows, or to identify mitigation measures sufficient to reduce such impacts below a level of significance. Consistent with California Department of Fish and Wildlife ("CDFW") guidelines, passive relocation is a potentially significant impact under CEQA that must be analyzed.[26] Specifically, the temporary or permanent closure of burrows may result in: (a) significant loss of burrows 12a-9

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[21] *Ibid*, p. 4-95.

[22] BIOS data layers ds490, ds491, and ds492. Available at: <http://www.dfg.ca.gov/biogeodata/bios/>.

[23] Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division.

[24] *Ibid.*

[25] DEIR/DEA, p. 4-138.

[26] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation, p. 10.

and habitat for reproduction and other life history requirements; (b) increased stress on burrowing owls and reduced reproductive rates; (c) increased depredation; (d) increased energetic costs; and (e) risks posed by having to find and compete for available burrows.[27] The County and BLM must disclose and thoroughly analyze the impacts associated with evicting burrowing owls from the Project site.

The need for full analysis of potential impacts from passive relocation (i.e., eviction) is further supported by research that indicates most translocation projects have resulted in fewer breeding pairs of burrowing owls at the mitigation site than at the original site, and that translocation projects generally have failed to produce self-sustaining populations.[28] Investigators attribute the limited success of translocation to: (a) strong site tenacity exhibited by burrowing owls, and (b) potential risks associated with forcing owls to move into unfamiliar and perhaps less preferable habitats.[29] 12a-9

Mojave Fringe-Toed Lizard

Mojave fringe-toed lizards: (a) have patchy distribution; (b) are vulnerable to local extirpations from habitat disturbance and fragmentation; and (c) are dependent on fragile ecosystems requiring protection against both direct and indirect disturbance. Aside from the population on the Project site, the DEIR/DEA fails to describe the distribution and status of Mojave fringe-toed lizard populations in the region. This precludes the ability to evaluate the relative significance of Project impacts to the population that occurs along the gen-tie line corridors. The BLM has the ability to at least partially describe the distribution and status of Mojave fringe-toed lizards in the region based on the survey results from other projects under the BLM's jurisdiction. 12a-10

Based on my own independent research I determined: (a) the Mojave fringe-toed lizards in the Project area are in the southeasternmost portion of the species' range; and (b) Mojave fringe-toed lizard populations are believed to be decreasing.[30]

The Project's gen-tie line and access road would fragment a relatively large population (or metapopulation) of Mojave fringe-toed lizards in the corner of the species' range. This would greatly increase the risks of range contraction and local extirpation, neither of which would be mitigated by the measures prescribed in the DEIR/DEA. 12a-11

[27] *Ibid.*

[28] Smith BW, JR Belthoff. 2001. Burrowing owls and development: short-distance nest burrow relocation to minimize construction impacts. J. Raptor Research 35:385-391.

[29] *Ibid.*

[30] Cablk ME, JS Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands administered by the Bureau of Land Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p. *See also* Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division, p. 94.

Cumulative Impacts

The DEIR/DEA acknowledges that the projects considered in County and BLM's cumulative impacts analysis may remove or degrade a very large amount of habitat for the Mojave fringe-toed lizard.[31] Data available from the CNDDB and BIOS supports that conclusion (Figure 4).[32] There are two reasons the cumulative impacts scenario has the potential to have especially severe implications on the persistence of Mojave fringe-toed lizards in the Chuckwalla Valley. First, the Mojave fringe-toed lizard exhibits a metapopulation structure.[33] The fate of plant and animal metapopulations depends on three things: the persistence of local populations, the success of emigration and immigration, and movements in and out of the metapopulation as a whole.[34] The Project, in conjunction with other approved and reasonably foreseeable future projects, would impact all three of these things.[35] 12a-12

Second, Mojave fringe-toed lizard populations are known to be highly susceptible to the adverse effects of habitat fragmentation, edge effects, and anthropogenic disturbance.[36] These adverse effects include mortality from vehicle strikes; the introduction and spread of invasive plants; erosion and sedimentation of disturbed soils; fragmentation and degradation of remaining habitat (including from the application of dust suppression chemicals); harm from accidental spraying or drift of herbicides; and an increase in access for avian predators (such as loggerhead shrikes) due to new perching structures.[37] 12a-13

The DEIR/DEA lacks any quantitative analysis of cumulative impacts to the Mojave fringe-toed lizard. Nevertheless, it jumps to the conclusion that: 12a-14

> Effects from the BMSP would be reduced to less than significant levels with the implementation of Mitigation Measures Biology-1 (Monitor Construction Site for Biological Compliance) and Biology-8 (Protect Mojave fringed-toed lizard). As

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[31] DEIR/DEA, p. 4-129.

[32] BIOS data layers ds490, ds491, and ds492. Available at: <http://www.dfg.ca.gov/biogeodata/bios/>.

[33] Definition of the term "metapopulation" has been subject to debate since it was first coined in 1969, but for the purposes of conservation and management a working definition is a population that has a spatially discrete distribution, and for which at least one or more local populations has a non-trivial probability of extinction. *See* McCullough DR. 1996. Introduction. Pages 1-10 in DR McCullough, editor. Metapopulations and Wildlife Conservation. Island Press, Washington (DC).

[34] Wiens JA. 1996. Wildlife in Patchy Environments: Metapopulations, Mosiacs, and Management. Pages 53-84 in DR McCullough, editor. Metapopulations and Wildlife Conservation. Island Press, Washington (DC).

[35] DEIR/DEA, p. 4-129.

[36] Cablk ME, JS Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands administered by the Bureau of Land Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p. *See also* Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division, p. 94.

[37] Cablk ME, JS Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands administered by the Bureau of Land Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p. *See also* Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division, p. 94.

> part of the Project, habitat would also be protected with the implementation of BMP-3 (Fugitive Dust Abatement Plan), BMP-10 (Integrated Weed Management Plan), BMP-13 (Ground and surface disturbance), and BMP-19 (Plants and wildlife). With implementation of the above-mentioned BMPs as part of the proposed Project, in addition to protection through the implementation of Project mitigation measures, the cumulative effects to the Mojave fringed-toed lizard between the BMSP and past, present and foreseeable projects would be less than significant.[38]

All of the referenced conditions (except Biology-8) would be limited to attempts to reduce impacts to the Mojave fringe-toed lizard and its habitat; they do not offset the impacts identified in the DEIR/DEA's analyses (e.g., reduced population size, long-term predation vulnerability, and decreased dispersal opportunities).[39] Although Biology-8 entails habitat compensation, the conditions associated with that measure are too vague to ensure the mitigation would have any long-term benefit to the conservation of Mojave fringe-toed lizards in the Chuckwalla Valley. I discuss this issue in the subsequent section pertaining to mitigation. 12a-14

Based on the information provided above, and other factors (e.g., deterministic and stochastic factors) that affect the persistence of small populations, I believe that the cumulative impacts scenario threatens the persistence of Mojave fringe-toed lizards in the Chuckwalla Valley. I also believe that the Project's incremental contribution to cumulative impacts would be cumulatively considerable, and potentially unmitigated.

Avian Collisions

One hundred million to 1 billion birds are killed annually by daytime window collisions at low-level structures in the U.S. alone.[40] The visual system of birds is simply not capable of perceiving glass as a physical obstacle.[41] Whereas the extent of the threat remains unknown, the presence of dead and injured birds (including numerous water birds) at solar facilities under construction in California demonstrates that solar arrays present a collision hazard to birds.[42] At PV facilities, birds appear to mistake the broad reflective surfaces of the solar arrays for water.[43] When this occurs, the birds become susceptible to mortality by: (a) colliding with the solar arrays; or (b) becoming stranded (often injured) on a substrate from which they cannot take flight, thereby becoming susceptible to predation and starvation.[44]

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[38] DEIR/DEA, p. 4-129.

[39] *Ibid.*

[40] Evans Ogden LJ. 2002. Summary Report on the Bird Friendly Building Program: Effect of Light Reduction on Collision of Migratory Birds. Special Report for the Fatal Light Awareness Program (FLAP). Available at: http://www.flap.org/.

[41] Klem D Jr. 2009. Preventing Bird-Window Collisions. The Wilson Journal of Ornithology 121(2):314–321.

[42] Kagan RA, TC Viner, PW Trail, EO Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. 28 pp.

[43] *Ibid.*

[44] *Ibid.*

The DEIR/DEA's analysis of the collision risk to birds contains several inaccurate statements, including:

- "[i]n most cases, the cause of death [at solar facilities in Riverside County] was either clearly unrelated to a collision with panels/mirrors (e.g., confirmed impact with a vehicle or tangled in construction water pond netting) or uncertain (e.g., found deceased with no clear evidence of a collision) (Riverside County 2013)."[45]

- "[t]he Desert Sunlight Project…recorded a total of 19 waterfowl mortalities. Only one was confirmed as caused by collision with a solar panel."[46] 12a-15

- "No fatalities of any bird species, including waterfowl, were reported as a result of collision with the solar trough mirrors [at the Genesis Solar Energy Project]."[47]

- "Of the total avian and bat mortalities reported for each of the three projects listed above [Desert Sunlight, Genesis, Ivanpah] from 2012-2014 the Desert Sunlight Project reported the least amount of mortality by 27 percent difference."[48]

- "[d]espite no scientific evidence of fatality risk to birds associated with PV solar arrays…"[49]

Each of these statements conflicts with information provided in a recent report prepared by the National Fish and Wildlife Forensics Laboratory (2014).[50]

The DEIR/DEA proceeds by attempting to discount the potential for many birds to even be in the Project area. For example, it states: (a) "[a]n important distinguishing factor for the BMSP is there will be no evaporation ponds and therefore the Project eliminates this potential attractant of waterfowl to the Project;" and (b) "[s]everal solar projects within Riverside County are located within undisturbed habitat, which would be expected to host a greater number of avian species than BMSP."[51] 12a-16

Although the Project will not have evaporation ponds, the northern portion of the Project site is located immediately adjacent to two sewage treatment ponds, and two other ponds of unknown use (Figure 5). Sewage treatment ponds are known to attract an abundance of birds due to the food they supply.[52] Based on my calculations, the sewage treatment

[45] DEIR/DEA, p. 4-100.
[46] *Ibid.*
[47] *Ibid.*
[48] *Ibid.*
[49] *Ibid*, p. 4-101.
[50] Kagan RA, TC Viner, PW Trail, EO Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. 28 pp.
[51] DEIR/DEA, p. 4-101.
[52] Access: <http://www.sctimes.com/story/life/outdoors/2014/05/03/birders-never-turn-noses-sewage-treatment-sites/8618855/>.

ponds adjacent to the Project site are approximately twice as large as the evaporation ponds adjacent to the Desert Harvest facility (Figure 6). 12a-16

The DEIR/DEA provides the unsubstantiated statement that solar projects in undisturbed habitat would be expected to host a greater number of avian species than Project site. Animal species richness is often greater near ecotones than within adjacent homogeneous habitats.[53] Therefore, one could also argue that the *Project site* would be expected to host a greater number of avian species. Ultimately, both arguments are speculative because they are not supported by empirical data. As the DEIR/DEA acknowledges, the Applicant's consultant did not conduct point count surveys to assess avian abundance in the Project area.[54] As a result, the number of birds that may be exposed to the Project remains unknown. Despite this uncertainty, a 485-MW PV solar facility dispersed across 3,660 acres <u>will undoubtedly kill birds</u>. 12a-17

Irrigation Ponds

The Project site contains six irrigation ponds that provide accessible fresh water for wildlife.[55] The DEIR/DEA does not identify the wildlife species that use (or may use) the ponds. It also does not identify the fate of the ponds, and the corresponding impacts to wildlife once the ponds are filled and/or surrounded by Project fencing. 12a-18

MITIGATION ISSUES

Special-Status Plants

The DEIR/DEA's proposed mitigation for Project impacts to special-status plants is limited to one measure: Biology-3. This mitigation measure requires the Applicant to conduct pre-construction surveys for State and federally listed Threatened and Endangered, Proposed, Petitioned, and Candidate plants in a 250-foot radius around all areas subject to ground-disturbing activity.[56] If any plants with these designations are detected during the pre-construction survey, the Applicant is required to implement measures to avoid and minimize impacts from "unauthorized trespass by workers and equipment, staging and storage of equipment and materials, refueling activities, and littering or dumping debris."[57] The proposed mitigation measure does not reduce Project impacts to a less-than-significant level. 12a-19

First, the measure directs the Applicant to conduct pre-construction surveys for State and federally listed Threatened and Endangered, Proposed, Petitioned, and Candidate plants. However, according to the Biological Resources Technical Report, no plants with any of 12a-20

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[53] Morrison ML, BG Marcot, and RW Mannan. 2006. Wildlife-Habitat Relationships: Concepts and Applications. 3rd ed. Washington (DC): Island Press. p. 283.
[54] DEIR/DEA, Vol III, Appendix C4: Avian and Bat Protection Plan, p. 27.
[55] *Ibid*, Appendix C3: Western Burrowing Owl Survey Report, Figure 2 and p. 9.
[56] *Ibid*, p. 4-137.
[57] *Ibid*.

those designations have the potential to occur in the Project area.[58] Pre-construction surveys should be floristic in nature (meaning that every plant taxon that occurs on site is identified to the taxonomic level necessary to determine rarity and listing status), and include documentation of plants with a Rare Plant Rank of 1 or 2.[59] 12a-20

Second, the DEIR/DEA fails to establish any circumstances under which special-status plants *must* be avoided. Instead, its conditions are limited to having the Applicant avoid and minimize impacts to special-status plants outside of the designated construction footprint.[60] As has been done for the Desert Riparian Woodland Wash, it appears feasible to make slight modifications to the gen-tie line (and associated features) to reduce impacts to special-status plants.[61] 12a-21

Third, the DEIR/DEA lacks any compensatory mitigation for impacts to special-status plants. For the Blythe Solar Power Project (which also has the potential to affect Harwood's woollystar and Harwood's milk-vetch), the California Energy Commission ("CEC") concluded compensatory mitigation was required to reduce impacts to special-status plant species to less than significant levels.[62] A similar conclusion is warranted for this project. 12a-22

Burrowing Owl

The mitigation measures proposed in the DEIR/DEA do not ensure Project impacts to burrowing owls would be mitigated to a less-than-significant level. 12a-23

<u>Buffers</u>

The DEIR/DEA accurately relays the importance of buffering burrowing owl burrows from construction activities. It also accurately reports the buffer distances recommended by the CDFW.[63] However, in establishing the buffer distances that will be applied to the Project, the DEIR/DEA states: 12a-24

> The approved Biologist will coordinate with the Construction Contractor to determine the level of disturbance and buffer distance needed. As topography and site conditions allow, setback distances can be reduced. Where appropriate, the setback distances can be reduced by screening burrows (i.e., installing hay bales or another type of material to create a visual and auditory barrier between

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[58] *Ibid*, Vol III, Appendix C1 (Biological Resources Technical Report), p. 31.

[59] California Department of Fish and Game. 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. Available at: <http://www.dfg.ca.gov/wildlife/nongame/survey_monitor.html#Plants>.

[60] DEIR/DEA, p. 4-137.

[61] *Ibid*, p. 4-94.

[62] California Energy Commission. 2013 Dec 5. Blythe Solar Power Project: Energy Commission Staff Recommended Conditions of Certification. BIO-19: Special-Status Plant Impact Avoidance, Minimization and Compensation. Docket number 09-AFC-06C.

[63] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 14. *See also* DEIR/DEA, Vol II, pp. 4-137 and -138.

> construction and the burrow) as a means of minimizing disturbance to owls… In addition, the approved Biologist will monitor the set-back distances to ensure that the applied distance is an effective buffer. Effective buffers are those that minimize indirect impacts on the burrowing owl by providing a distance between the burrow and construction activities.[64] 12a-24

The proposed process for reducing buffer distances suffers several flaws and does not ensure effective burrowing owl mitigation.

First, the DEIR/DEA provides no evidence that buffer distances shorter than the ones recommended by CDFW are effective. Until reduced buffers have been proven effective, the County and BLM should require buffers consistent with CDFW guidelines.

Second, the DEIR/DEA provides no assurances that the Applicant's "approved Biologist" would be as qualified as the experts that established the buffer guidelines, or that the 12a-25 biologist would have the expertise to reduce buffers without adversely affecting burrowing owls.[65]

Third, there is already evidence that buffers should not be reduced. The appropriate buffers for burrowing owl burrows is largely dependent on: (a) the level of disturbance; and (b) the sensitivity of the individual owls.[66] Construction activities associated with 12a-26 the Project will cause a high level of disturbance requiring the maximum buffer distances recommended by CDFW.[67] In addition, the Applicant's survey data indicate that the burrowing owls on the Project site are very sensitive to disturbance.[68] The combination of these two factors makes it inappropriate for the County and BLM to experiment with reduced buffer distances.

Fourth, the actions associated with screening burrows (i.e., installing hay bales or another type of material to create a visual and auditory barrier between construction and the burrow) may result in adverse effects to the owls. Research has shown that owls exposed to human surveyors (in a vehicle or on foot) are ≥5 times more likely to be displaced than 12a-27 owls in the control group.[69] All survey methods displaced owls ≤18 times farther than the control group, which led to the researchers inferring that human disturbance caused by surveys exceeds the tolerance of habituated owls. The Applicant's consultant reported that burrowing owls occupying "Area 2" were easily distressed and would flush and call

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[64] *Ibid.*

[65] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 9-10. *See also* Scobie C, A Marsh, R Fisher. 2013 Jul. Influence of Petroleum Development on Burrowing Owl Ecology. Available at: <www.ptac.org/attachments/1166/download>.

[66] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 7-9.

[67] *Ibid*, p. 9.

[68] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 10.

[69] Manning JA, RSA Kaler. 2011. Effects of Survey Methods on Burrowing Owl Behaviors. Journal of Wildlife Management 75(3):525-530.

12a-27

to one another whenever biologists entered the vicinity.[70] Disturbance (including flushing) can decrease survivorship and affect nesting behavior.[71] As a result, screening burrows (i.e., to allow reduced buffers) cannot be considered an acceptable mitigation alternative.

12a-28

Fifth, CDFW guidelines state that reduced buffer distances need to be accompanied by a "broad-scale, long-term, scientifically-rigorous monitoring program" that ensures burrowing owls are not detrimentally affected.[72] The DEIR/DEA fails to implement this approach, or define any success criteria for minimizing indirect impacts to burrowing owls exposed to reduced buffers.

<u>Habitat Compensation</u>

12a-29

The DEIR/DEA indicates: "146 acres of habitat have been identified adjacent to the Project area" to compensate for impacts to burrowing owls in the northern portion of the Project area.[73] To mitigate impacts, compensatory habitat must be protected and managed in perpetuity for the conservation of burrowing owls.[74] The DEIR/DEA fails to identify how the proposed compensation lands will be protected in perpetuity, or the mechanism (e.g., endowment) that will ensure the lands are maintained and managed for burrowing owl conservation.

12a-30

The DEIR/DEA cites the California Burrowing Owl Consortium (1993) guidelines to support its conclusion that 146 acres of compensatory habitat would "fully mitigate" Project impacts to 1,970 acres of burrowing owl habitat.[75] The DEIR/DEA's conclusion is unjustified. The minimum habitat replacement recommendations issued by the California Burrowing Owl Consortium over 20 years ago are no longer accepted by the CDFW because they have proven **ineffective** in the conservation of burrowing owls.[76] As the DEIR/DEA acknowledges throughout the remainder of the document, the current mitigation guidelines are provided in CDFW's 2012 *Staff Report on Burrowing Owl Mitigation*. Those guidelines state:

> the current scientific literature supports the conclusion that mitigation for permanent habitat loss *necessitates replacement with an equivalent or greater habitat area* for breeding, foraging, wintering, dispersal, presence of burrows, burrow surrogates, presence of fossorial mammal dens, well drained soils, and

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[70] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 10.

[71] Manning JA, RSA Kaler. 2011. Effects of Survey Methods on Burrowing Owl Behaviors. Journal of Wildlife Management 75(3):525-530.

[72] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 9-10.

[73] DEIR/DEA, p. 4-138.

[74] California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>, pp. 11-13.

[75] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16.

[76] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. pp. 1-2.

abundant and available prey within close proximity to the burrow.[77]

I concur with the CDFW in this regard, especially given the importance that the burrowing owl population in the Palo Verde Valley has to the statewide conservation of the species.[78] 12a-30

Additional Compensation Lands

The DEIR/DEA indicates an additional 131 acres of land (across five sites) are available for habitat compensation, if needed.[79] Whereas I support the Applicant's efforts to identify potential sites for habitat compensation, the DEIR/DEA fails to meet CDFW guidelines by demonstrating the proposed sites have any value for conservation of burrowing owls.[80] Indeed, the majority of the proposed sites appear to lack the attributes that would make them suitable for burrowing owl occupancy (Figures 7 through 12). 12a-31

Trigger for Habitat Compensation

The DEIR/DEA establishes an inappropriate trigger for burrowing owl habitat compensation. It states: "per the 2012 CDFG mitigation guidelines, a pre-construction survey will be conducted to determine the number of burrowing owls and the amount of compensation land that shall be required to be protected."[81] This statement is misleading. The intent of pre-construction surveys is to avoid take of burrowing owls, not to establish compensatory habitat requirements.[82] According to CDFW guidelines: [o]ccupancy of burrowing owl habitat is confirmed at a site when at least one burrowing owl, or its sign at or near a burrow entrance, is observed within the last three years."[83] Moreover, because burrowing owls can be difficult to detect, data from a pre-construction survey supplements, but does not replace, the data from protocol surveys.[84] Because burrowing owls have been detected on the Project site within the past three years, compensatory mitigation is required regardless of the results of the pre-construction surveys. 12a-32

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[77] *Ibid,* p. 8. [emphasis added].

[78] Wilkerson RL and RB Siegel. 2011. Distribution and Abundance of Western Burrowing Owls (*Athene Cunicularia Hypugaea*) in Southeastern California. The Southwestern Naturalist 56(3): 378-384.

[79] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16 and Figure 4: Potential Burrowing Owl Mitigation Land.

[80] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. pp. 11-13 and Appendices E and F.

[81] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16.

[82] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. Appendix D.

[83] *Ibid,* p. 6.

[84] Klute DS, LW Ayers, MT Green, WH Howe, SL Jones, JA Shaffer, SR Sheffield, TS Zimmerman. 2003. Status assessment and conservation plan for the western Burrowing Owl in the United States. Bio Tech Pub FWS/BTP-R6001-2003. Washington: US Fish and Wildlife.

Success Criteria

The DEIR/DEA lacks clear, measurable performance standards and contingency plans to ensure the proposed mitigation measures are successful. According to the DEIR/DEA:

> All evicted burrowing owls will be monitored daily from dawn until dusk to determine their post-eviction fate until one of the following events occurs: 1) the burrowing owl is observed to reside in the artificial burrow for at least 10 consecutive days; 2) the owl is consumed by a predator or otherwise dies, and its death is documented and reported to CDFG, USFWS, and the County of Riverside; or 3) the monitoring team is unable to locate the owl in the vicinity of the Project area for 10 consecutive days, in which case the monitoring team will report the owl as "disappeared" in the final post-eviction report sent to the three agencies.[85]

There are two significant problems with this approach:

First, the DEIR/DEA fails to identify how the biological monitor would be able to distinguish between the owls evicted from the Project site, and any owls that already reside in the proposed mitigation sites. This confounds the ability to determine the fate of owls evicted from the Project site. CDFW's 2012 Staff Report provides the following discussion of this issue: 12a-33

> Monitoring is qualitatively different from site surveillance; monitoring normally has a specific purpose and its outputs and outcomes will usually allow a comparison with some baseline condition of the site before the mitigation (including avoidance and minimization) was undertaken. Ideally, monitoring should be based on the Before-After Control-Impact (BACI) principle (McDonald et al. 2000) that <u>requires knowledge of the pre-mitigation state</u> to provide a reference point for the state and change in state after the project and mitigation have been implemented.[86]

As the DEIR/DEA acknowledges, burrowing owl and habitat assessment surveys have not been conducted on all of the proposed compensation lands.[87]

Second, the proposed mitigation allows evicted owls to die (or disappear) without any supplemental mitigation to compensate for the take. If this occurs, the Project would cause a decline in the burrowing owl population, and significant impacts to the species would remain unmitigated.[88]

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[85] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 15.

[86] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. p. 14. [emphasis added].

[87] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 14.

[88] Although the DEIR/DEA mentions an adaptive management program, it does not provide any details about the program, including performance standards and the enforcement mechanism.

Artificial Burrow Maintenance

The DEIR/DEA states: "[m]aintenance of artificial burrows shall occur three to four times during the year immediately following relocation, as necessary."[89] One year of maintenance is insufficient for the long-term success of mitigation lands. As reported in CDFW's 2012 Staff Report: "[a]ny long-term reliance on artificial burrows as natural burrow replacements must include semi-annual to annual cleaning and maintenance and/or replacement (Barclay et al. 2011, Smith and Conway 2005, Alexander et al. 2005) as an ongoing management practice."[90] 12a-34

Desert Tortoise

Habitat Compensation

The Project would result in the permanent loss of habitat for the desert tortoise.[91] However, the DEIR/DEA does not quantify the amount of desert tortoise habitat that would be impacted by the Project, nor does it identify whether impacts to desert tortoise habitat are considered significant. 12a-35

The Project is within the Northern and Eastern Colorado Desert Coordinated Management ("NECO") Plan area. The NECO Plan requires project proponents to provide compensatory mitigation (through land acquisition or a mitigation fee) for impacts to desert tortoise habitat.[92] For projects outside of a DWMA, the compensation ratio is 1:1 (1 acre of compensation land for every 1 acre disturbed).[93] The DEIR/DEA does not require the Applicant to provide compensatory mitigation for Project impacts to desert tortoise habitat, and thus, it does not adhere to the requirements of the NECO Plan.

Raven Management

The common raven is a known predator of the desert tortoise. The infrastructure and increase in human activities associated with renewable energy facilities benefit raven populations by providing perch and nest sites, and subsidies of food and water.[94] 12a-36

The U.S. Fish and Wildlife Service ("USFWS") has concluded that approved renewable energy projects and associated transmission facilities should implement mitigation

[89] DEIR/DEA, Vol III, Appendix A (Western Burrowing Owl Mitigation and Monitoring Plan) to Appendix C1 (Biological Resources Technical Report), p. 16.

[90] California Department of Fish and Game. 2012 Mar 7. Staff Report on Burrowing Owl Mitigation. Available at: <www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf>. p. 13. [emphasis added].

[91] DEIR/DEA, p. 4-97.

[92] U.S. Bureau of Land Management. 2002. Northern and Eastern Colorado Desert Coordinated Management Plan and Final Environmental Impact Statement, Appendix D: Desert Tortoise Mitigation Measures. p. D-2.

[93] *Ibid.*

[94] Desert Managers Group. 2010 Nov. Renewable Energy Development in the California Desert: Common Raven Predation on the Desert Tortoise, November 2010 Summary. 8 pp. Available at: <http://www.dmg.gov/documents/20101130_RPT_Common_Raven_Predation_on_DT_USFWS.pdf>.

measures designed to reduce raven predation on desert tortoises at both the local and population level.[95] Each project applicant should develop an on-site plan to minimize availability of food sources and the potential for ravens to occupy the project site.[96] In addition, because it is not possible to completely exclude ravens from using project infrastructure, each project applicant should make a financial contribution to the USFWS's regional raven management plan.[97] Although the DEIR/DEA requires the Applicant to prepare a Trash Abatement Plan, it does not require a Raven Management Plan (which would include measures beyond trash abatement), nor does it require the Applicant to make a financial contribution to the USFWS's regional raven management plan. Because the DEIR/DEA fails to require sufficient mitigation to address the Project's contribution to the local and regional raven populations, impacts to the desert tortoise remain potentially significant. 12a-36

Mojave Fringe-Toed Lizard

To mitigate for permanent habitat loss and direct impacts to Mojave fringe-toed lizards, the DEIR/DEA requires the Applicant to provide compensatory mitigation for impacts to stabilized or partially stabilized desert dune habitat (i.e., dune, sand ramp, or fine-sandy wash habitat). The DEIR/DEA indicates this measure can be satisfied through land acquisition or payment of a fee. If compensation lands are acquired, the Applicant is required to provide funding for the acquisition in fee title or in easement, initial habitat improvements, and long-term maintenance and management of the compensation lands.[98] These conditions are too vague to ensure effective mitigation that reduces Project impacts to a less-than-significant level. 12a-37

First, the vegetation communities map provided in the DEIR/DEA does not depict stabilized or partially stabilized desert dune habitat.[99] As a result, it is unclear how the compensatory mitigation requirement would be calculated. Additionally, it is unclear how the proposed measure would mitigate "direct impacts to Mojave fringe-toed lizards."[100]

Second, the DEIR/DEA fails to provide any evidence that there are suitable mitigation sites in the Chuckwalla Valley. It also fails to establish conditions (e.g., occupancy by Mojave fringe-toed lizards) that ensure the mitigation site(s) has any value to the conservation of the species in the Chuckwalla Valley. Based on the cumulative impacts map (Figure 4), acquisition of mitigation sites in the Chuckwalla Valley may not be feasible. If this inference is correct, the County and BLM need to analyze the potential fate of the Chuckwalla Valley population, and justify the value that potential mitigation sites elsewhere would have to the overall conservation of the species. 12a-38

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[95] U.S. Fish and Wildlife Service. 2010 May. Renewable Energy Development And Common Raven Predation on the Desert Tortoise: Summary. 3 pp.

[96] *Ibid.*

[97] *Ibid.*

[98] DEIR/DEA, p. 4-140.

[99] *Ibid*, Figure 3.2.4-1.

[100] *Ibid*, p. 4-140.

Third, the DEIR/DEA fails to identify the dollar amount if the Applicant elects to pay the fee in lieu of acquiring habitat. It also fails to establish a mechanism for ensuring the fee is used for Mojave fringe-toed lizard habitat acquisition, and that there is adequate funding for "initial habitat improvements and long-term maintenance and management." 12a-39

Fourth, the DEIR/DEA does not establish success standards for the proposed mitigation, or a mechanism to ensure those standards are met. This issue is confounded because the DEIR/DEA does not designate an authority (e.g., CDFW) responsible for approving the Applicant's habitat compensation proposal. 12a-40

Other Special-Status Species

Two special-status plant species and 11 special-status wildlife species were detected within the Project study area.[101] Additional special-status species have the potential to occur in the Project area.[102] According to the DEIR/DEA: "[h]abitat-based mitigation or other appropriate mitigation as discussed previously for desert tortoise and western burrowing owl shall provide mitigation for impacts to non-listed special-status species that inhabit overlapping suitable habitat."[103] This statement lacks credibility because (as discussed previously): (a) the DEIR/DEA does not require habitat-based mitigation for impacts to the desert tortoise; (b) the requirement for, and extent of, compensatory mitigation for the burrowing owl is contingent on the results of a pre-construction survey; and (c) the DEIR/DEA does not provide evidence that the proposed compensation lands would benefit the other special-status species that would be (or may be) affected by the Project. 12a-41

Avian Collisions

The Applicant's *Avian and Bat Protection Plan* ("ABPP") outlines the approach that would be used to mitigate Project impacts to birds and bats. The ABPP recognizes the inherent difficulties in predicting the extent of bird and bat fatalities at the Project site.[104] As a result, the cornerstone of the ABPP is "adaptive management" based on post-construction fatality monitoring data. The adaptive management strategy presented in the ABPP is so poorly structured that is has little, if any, value in mitigating Project impacts to birds and bats. 12a-42

Adaptive Management Triggers

The ABPP identifies various fatality thresholds that *may* trigger adaptive management and additional mitigation.[105] For example, the ABPP establishes a threshold of more than four total native bird fatalities/MW/year, more than 0.3 raptor fatalities/MW/year, or

[101] *Ibid*, pp. 3-48 and -57. Includes species that Table 3.2.4-3 identifies as "present."
[102] *Ibid*, Tables 3.2.4-2 and -3.
[103] *Ibid*, p. 4-139.
[104] *Ibid*, Vol III, Appendix C4: Avian and Bat Protection Plan, p. 29.
[105] *Ibid*, p. 30.

more than three bat fatalities/MW/year.[106] This equates to 1,940 native birds, 145.5 raptors, or 1,455 bats per year. These are unacceptable levels of mortality that cannot go unmitigated. 12a-42

Even if lower fatality thresholds are established, there is virtually zero possibility that adaptive management would be triggered because fatality monitoring would be limited to incidental detections made by facility operators and field engineers during normally scheduled activities.[107] This is not a scientifically acceptable approach. 12a-43

In addition, the Applicant has committed to only three years of post-construction fatality monitoring, even though it expects avian abundance and species diversity in the Project area would vary widely each year.[108] This issue is confounded because the ABPP does not identify the sampling area, interval, or intensity. It also does not identify whether the trigger for adaptive management is based on *observed* fatalities, or *estimated* fatalities (i.e., adjusted for carcass removal and searcher efficiency). This is significant for a species that naturally occur at low densities (e.g., raptors), and that may have inherently few, but significant, mortalities. 12a-44

The USFWS has developed monitoring methods to examine take at solar power facilities.[109] In addition, the CEC has been requiring all recently licensed solar projects to monitor the death and injury of birds from collisions with solar facility features.[110] Research by Klem (2009) identified several techniques that enable birds to avoid collisions with glass and other reflective surfaces.[111] In addition, the National Fish and Wildlife Forensics Laboratory (2014) recommended several mortality monitoring and avoidance measures for PV facilities.[112] The techniques described in these sources are feasible mitigation measures that should be required of the Project.

This concludes my comments on the DEIR/DEA.
Sincerely,

Scott Cashen, M.S.
Senior Biologist

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[106] *Ibid.*

[107] *Ibid*, p. 28.

[108] *Ibid*, p. 27 and DEIR/DEA, p. 4-139.

[109] USFWS, Pacific Southwest Region. 2011May 2. Monitoring Migratory Bird Take at Solar Facilities: An Experimental Approach.

[110] California Energy Commission. 2010 Jul. Supplemental Staff Assessment for the Calico Solar Project. p. C.2-230

[111] Klem D Jr. 2009. Preventing Bird-Window Collisions. The Wilson Journal of Ornithology 121(2):314–321.

[112] Kagan RA, TC Viner, PW Trail, EO Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. National Fish and Wildlife Forensics Laboratory. pp. 2, 3, 17, 20, and 24.

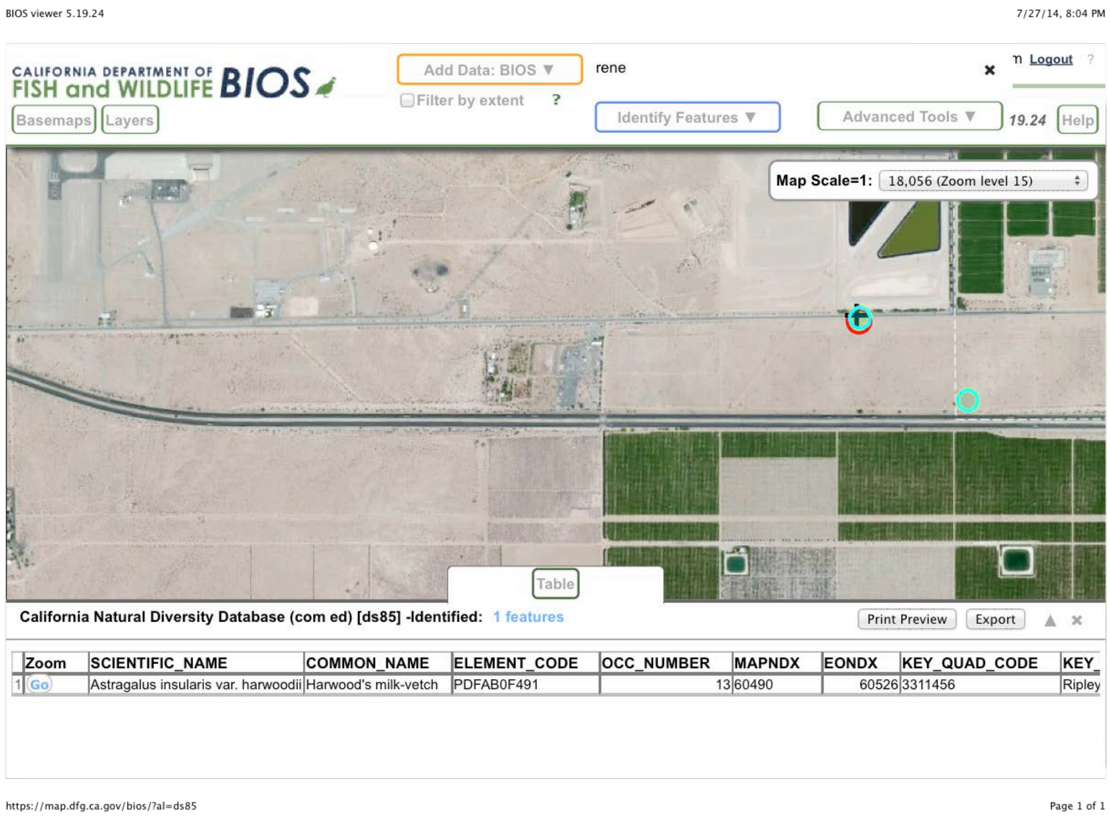


Figure 1. California Natural Diversity Database record of Harwood's milk-vetch (blue-green circles) on the Project site. The SE location had 25 plants in 2004; an unknown number of plants were detected at the NW location in 2013.[113] Neither location was included on the maps provided in the DEIR/DEA.

[113] California Natural Diversity Database, Biogeograhic Data Branch, Department of Fish and Wildlife. 2014 Jul 1 (Version 5).

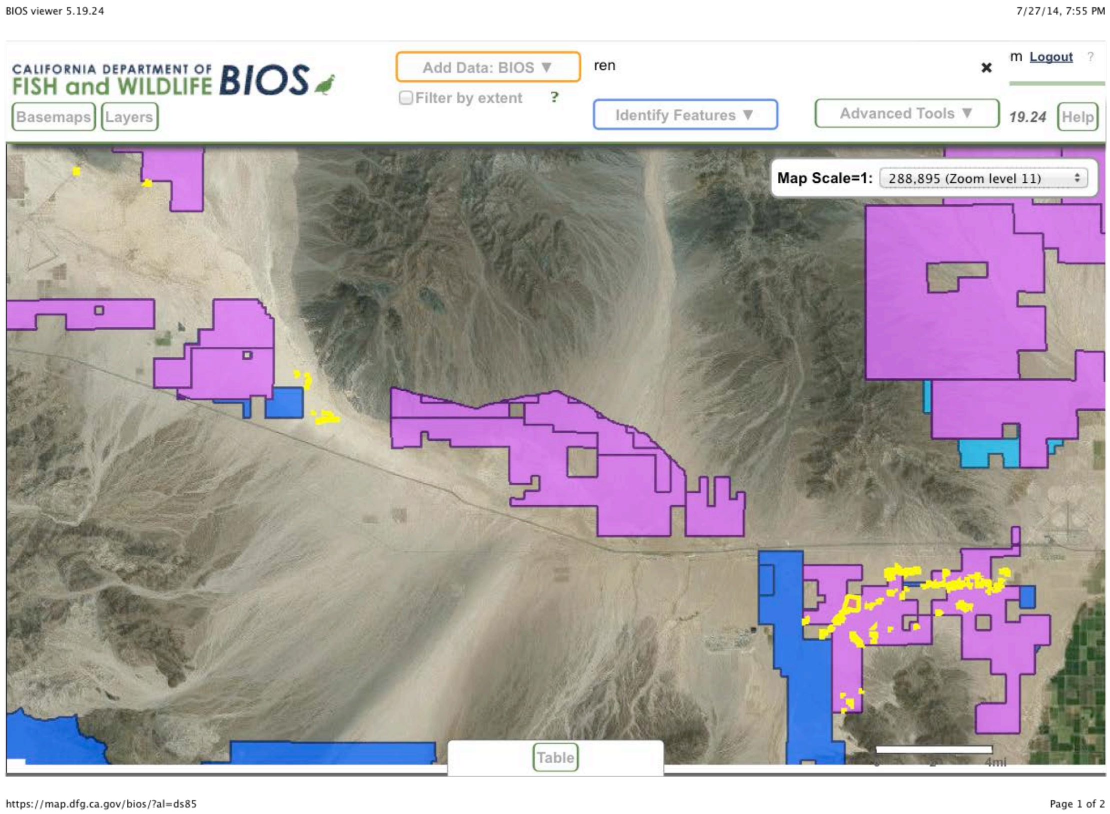


Figure 2. Existing, approved, and proposed renewable energy projects (blue and purple) in relation to CNNDB records of Harwood's woollystar (yellow). Proposed Project is not depicted on the map.

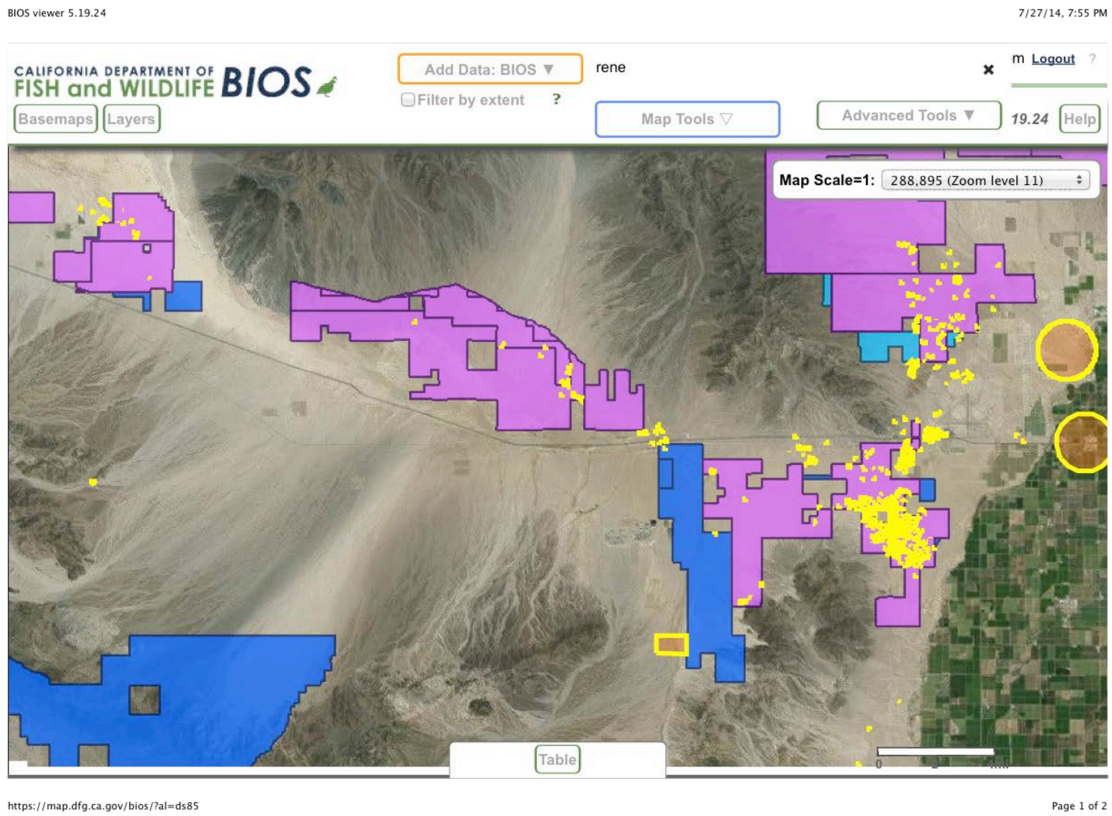
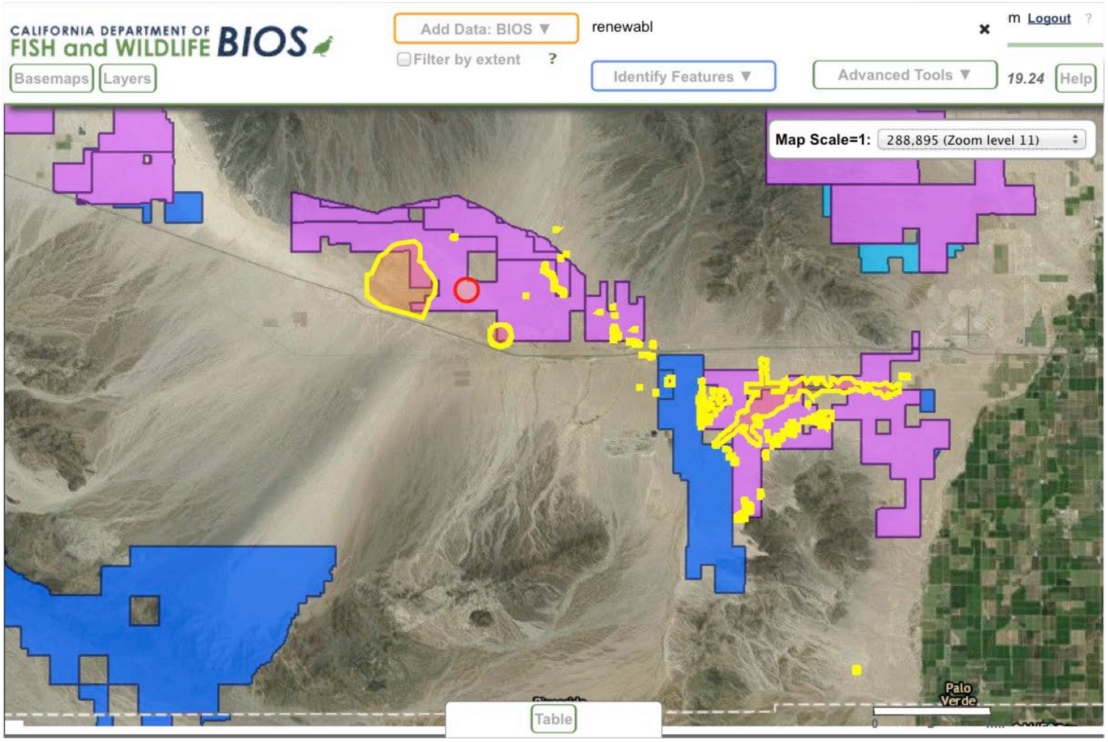


Figure 3. Existing, approved, and proposed renewable energy projects (blue and purple) in relation to CNNDB records of Harwood's milk-vetch (yellow). Proposed Project is not depicted on the map.

BIOS viewer 5.19.24 7/28/14, 5:06 PM



https://map.dfg.ca.gov/bios/?al=ds85 Page 1 of 2

Figure 4. Existing, approved, and proposed renewable energy projects (blue and purple) in relation to CNNDB records of Mojave fringe-toed lizard (yellow). These projects would impact most or all known Mojave fringe-toed lizard populations in the Chuckwalla Valley. Proposed Project is not depicted on the map.

Figure 5. Ponds adjacent to the boundary (yellow line) of the northern portion of the Project site.

Figure 6. Evaporation ponds (two empty) at Desert Harvest PV Solar Facility (left) and Sewage treatment ponds adjacent to the proposed Project site (right). Both images are at an elevation of approximately 3,000 feet above ground surface to facilitate size comparisons.

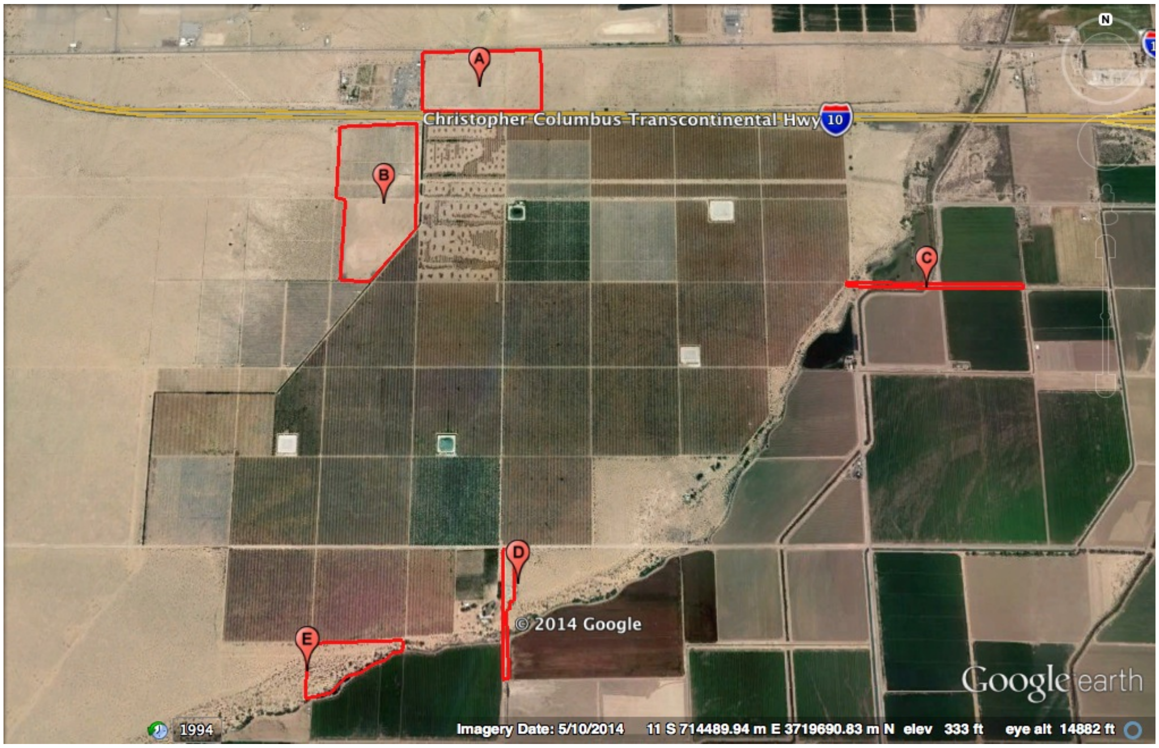


Figure 7. Other potential burrowing owl mitigation lands (red polygons) identified by the Applicant. Corresponds to *Western Burrowing Owl Monitoring and Mitigation Plan*, Figure 4.

Figure 8. Mitigation site "A." Site is largely barren.

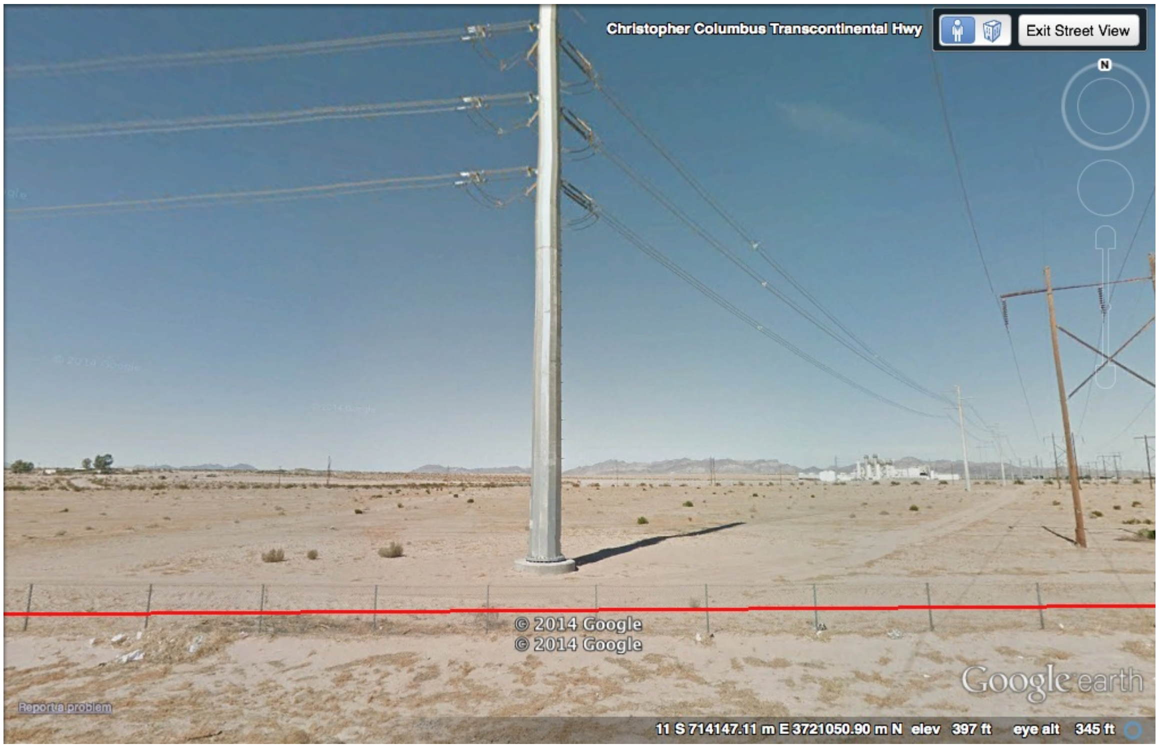


Figure 9. Google Earth Street View of Site A.

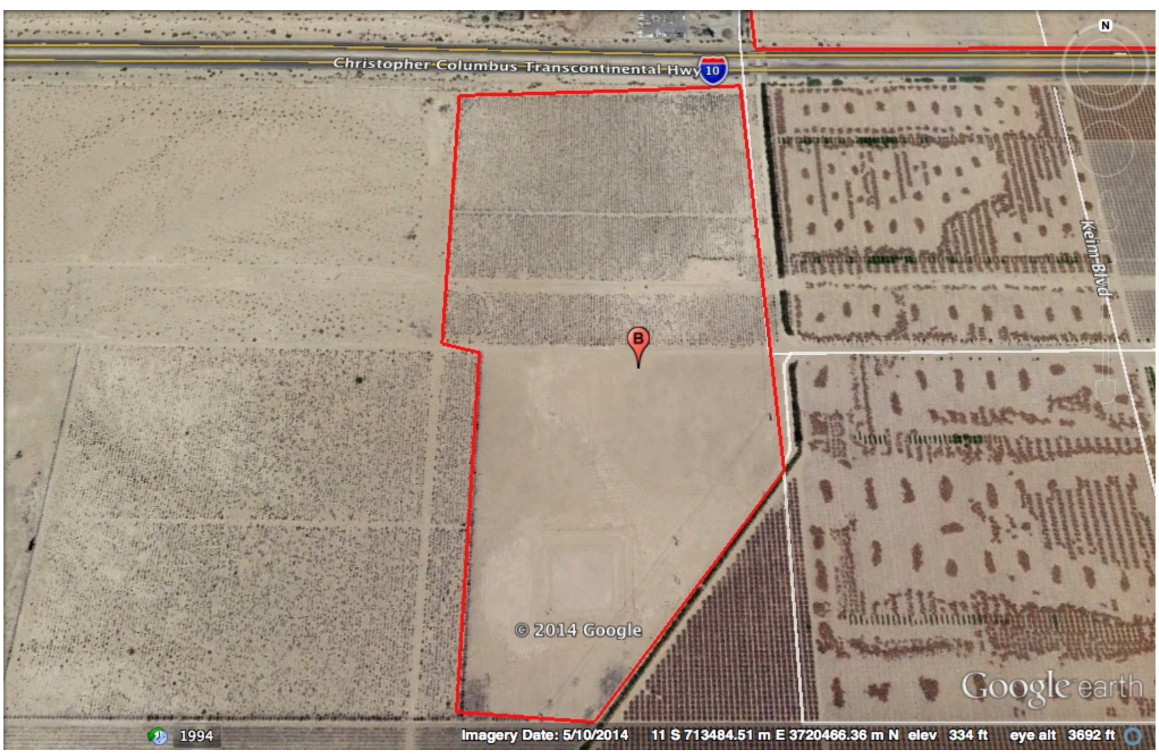


Figure 10. Mitigation site “B.” Southern portion of site is largely barren; northern portion appears to be abandoned jojoba.

Figure 11. Mitigation site "C." Site appears to consist of road shoulder.

Figure 12. Mitigation Site "D." Site consists of rural residence and other unsuitable burrowing owl habitat.

Scott Cashen, M.S.
Senior Biologist / Forest Ecologist
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Scott Cashen has 20 years of professional experience in natural resources management. During that time he has worked as a field biologist, forester, environmental consultant, and instructor of Wildlife Management. Mr. Cashen currently operates an independent consulting business that focuses on CEQA/NEPA compliance issues, endangered species, scientific field studies, and other topics that require a high level of scientific expertise.

Mr. Cashen has knowledge and experience with many taxa, biological resource issues, and environmental regulations. This knowledge and experience has made him a highly sought after biological resources expert. To date, he has been retained as a biological resources expert for over 40 projects. Mr. Cashen's role in this capacity has encompassed all stages of the environmental review process, from initial document review through litigation support and expert witness testimony.

Mr. Cashen is a recognized expert on the environmental impacts of renewable energy development. He has been involved in the environmental review process for 28 renewable energy projects, and he has been a biological resources expert for more of California's solar energy projects than any other private consultant. In 2010, Mr. Cashen testified on 5 of the Department of the Interior's "Top 6 Fast-tracked Solar Projects" and his testimony influenced the outcome of each of these projects.

Mr. Cashen is a versatile scientist capable of addressing numerous aspects of natural resource management simultaneously. Because of Mr. Cashen's expertise in both forestry and biology, Calfire had him prepare the biological resource assessments for all of its fuels treatment projects in Riverside and San Diego Counties following the 2003 Cedar Fire. Mr. Cashen has led field studies on several special-status species, including plants, fish, reptiles, amphibians, birds, and mammals. Mr. Cashen has been the technical editor of several resource management documents, and his strong scientific writing skills have enabled him to secure grant funding for several clients.

AREAS OF EXPERTISE

- CEQA, NEPA, and Endangered Species Act compliance issues
- Comprehensive biological resource assessments
- Endangered species management
- Renewable energy
- Forest fuels reduction and timber harvesting
- Scientific field studies, grant writing and technical editing

EDUCATION

M.S. Wildlife and Fisheries Science - The Pennsylvania State University (1998)
B.S. Resource Management - The University of California, Berkeley (1992)

PROFESSIONAL EXPERIENCE

Litigation Support / Expert Witness

As a biological resources expert, Mr. Cashen reviews CEQA/NEPA documents and provides his client(s) with an assessment of biological resource issues. He then prepares written comments on the scientific and legal adequacy of the project's environmental documents (e.g., EIR). For projects requiring California Energy Commission (CEC) approval, Mr. Cashen has submitted written testimony (opening and rebuttal) in conjunction with oral testimony before the CEC.

Mr. Cashen can lead field studies to generate evidence for legal testimony, and he can incorporate testimony from his deep network of species-specific experts. Mr. Cashen's clients have included law firms, non-profit organizations, and citizen groups.

<u>REPRESENTATIVE EXPERIENCE</u>

Solar Energy Facilities
- Abengoa Mojave Solar Project
- Avenal Energy Power Plant
- Beacon Solar Energy Project
- Blythe Solar Power Project
- Calico Solar Project
- Calipatria Solar Farm II
- Carrizo Energy Solar Farm
- Catalina Renewable Energy Project
- Fink Road Solar Farm
- Genesis Solar Energy Project
- Heber Solar Energy Facility
- Imperial Valley Solar Project
- Ivanpah Solar Electric Generating
- Maricopa Sun Solar Complex
- Mt. Signal and Calexico Solar
- San Joaquin Solar I & II
- Solar Gen II Projects
- SR Solis Oro Loma
- Vestal Solar Facilities
- Victorville 2 Power Project

Geothermal Energy Facilities
- East Brawley Geothermal
- Mammoth Pacific 1 Replacement
- Western GeoPower Plant and

Wind Energy Facilities
- Catalina Renewable Energy Project
- Ocotillo Express Wind Energy
- San Diego County Wind Ordinance
- Tres Vaqueros Repowering Project
- Vasco Winds Relicensing Project

Biomass Facilities
- Tracy Green Energy Project

Development Projects
- Alves Ranch
- Aviano
- Chula Vista Bayfront Master Plan
- Columbus Salame
- Concord Naval Weapons Station
- Faria Annexation
- Live Oak Master Plan
- Napa Pipe
- Roddy Ranch
- Rollingwood
- Sprint-Nextel Tower

Project Management

Mr. Cashen has managed several large-scale wildlife, forestry, and natural resource management projects. Many of these projects have required hiring and training field crews, coordinating with other professionals, and communicating with project stakeholders. Mr. Cashen's experience in study design, data collection, and scientific writing make him an effective project manager, and his background in several different natural resource disciplines enable him to address the many facets of contemporary land management in a cost-effective manner.

REPRESENTATIVE EXPERIENCE

Wildlife Studies

- Peninsular Bighorn Sheep Resource Use and Behavior Study: (*CA State Parks*)
- "KV" Spotted Owl and Northern Goshawk Inventory: (*USFS, Plumas NF*)
- Amphibian Inventory Project: (*USFS, Plumas NF*)
- San Mateo Creek Steelhead Restoration Project: (*Trout Unlimited and CA Coastal Conservancy, Orange County*)
- Delta Meadows State Park Special-status Species Inventory: (*CA State Parks, Locke*)

Natural Resources Management

- Mather Lake Resource Management Study and Plan – (*Sacramento County*)
- Placer County Vernal Pool Study – (*Placer County*)
- Weidemann Ranch Mitigation Project – (*Toll Brothers, Inc., San Ramon*)
- Ion Communities Biological Resource Assessments – (*Ion Communities, Riverside and San Bernardino Counties*)
- Del Rio Hills Biological Resource Assessment – (*The Wyro Company, Rio Vista*)

Forestry

- Forest Health Improvement Projects – (*CalFire, SD and Riverside Counties*)
- San Diego Bark Beetle Tree Removal Project – (*SDG&E, San Diego Co.*)
- San Diego Bark Beetle Tree Removal Project – (*San Diego County/NRCS*)
- Hillslope Monitoring Project – (*CalFire, throughout California*)

Biological Resources

Mr. Cashen has a diverse background with biological resources. He has conducted comprehensive biological resource assessments, habitat evaluations, species inventories, and scientific peer review. Mr. Cashen has led investigations on several special-status species, including ones focusing on the foothill yellow-legged frog, mountain yellow-legged frog, desert tortoise, steelhead, burrowing owl, California spotted owl, northern goshawk, willow flycatcher, Peninsular bighorn sheep, red panda, and forest carnivores.

REPRESENTATIVE EXPERIENCE

Avian

- Study design and Lead Investigator - Delta Meadows State Park Special-Status Species Inventory *(CA State Parks: Locke)*
- Study design and lead bird surveyor - Placer County Vernal Pool Study *(Placer County: throughout Placer County)*
- Surveyor - Willow flycatcher habitat mapping *(USFS: Plumas NF)*
- Independent surveyor - Tolay Creek, Cullinan Ranch, and Guadacanal Village restoration projects *(Ducks Unlimited/USGS: San Pablo Bay)*
- Study design and Lead Investigator - Bird use of restored wetlands research *(Pennsylvania Game Commission: throughout Pennsylvania)*
- Study design and surveyor - Baseline inventory of bird species at a 400-acre site in Napa County *(HCV Associates: Napa)*
- Surveyor - Baseline inventory of bird abundance following diesel spill *(LFR Levine-Fricke: Suisun Bay)*
- Study design and lead bird surveyor - Green Valley Creek Riparian Restoration Site *(City of Fairfield: Fairfield, CA)*
- Surveyor - Burrowing owl relocation and monitoring *(US Navy: Dixon, CA)*
- Surveyor - Pre-construction raptor and burrowing owl surveys *(various clients and locations)*
- Surveyor - Backcountry bird inventory *(National Park Service: Eagle, Alaska)*
- Lead surveyor - Tidal salt marsh bird surveys (*Point Reyes Bird Observatory: throughout Bay Area*)
- Surveyor – Pre-construction surveys for nesting birds (*various clients and locations)*

Amphibian

- Crew Leader - Red-legged frog, foothill yellow-legged frog, and mountain yellow-legged frog surveys *(USFS: Plumas NF)*

- Surveyor - Foothill yellow-legged frog surveys *(PG&E: North Fork Feather River)*
- Surveyor - Mountain yellow-legged frog surveys *(El Dorado Irrigation District: Desolation Wilderness)*
- Crew Leader - Bullfrog eradication *(Trout Unlimited: Cleveland NF)*

Fish and Aquatic Resources

- Surveyor - Hardhead minnow and other fish surveys *(USFS: Plumas NF)*
- Surveyor - Weber Creek aquatic habitat mapping (*El Dorado Irrigation District: Placerville, CA*)
- Surveyor - Green Valley Creek aquatic habitat mapping *(City of Fairfield: Fairfield, CA)*
- GPS Specialist - Salmonid spawning habitat mapping *(CDFG: Sacramento River)*
- Surveyor - Fish composition and abundance study (*PG&E: Upper North Fork Feather River and Lake Almanor*)
- Crew Leader - Surveys of steelhead abundance and habitat use *(CA Coastal Conservancy: Gualala River estuary)*
- Crew Leader - Exotic species identification and eradication *(Trout Unlimited: Cleveland NF)*

Mammals

- Principal Investigator – Peninsular bighorn sheep resource use and behavior study (*California State Parks: Freeman Properties*)
- Scientific Advisor –Study on red panda occupancy and abundance in eastern Nepal *(The Red Panda Network: CA and Nepal)*
- Surveyor - Forest carnivore surveys *(University of CA: Tahoe NF)*
- Surveyor - Relocation and monitoring of salt marsh harvest mice and other small mammals *(US Navy: Skagg's Island, CA)*
- Surveyor – Surveys for Monterey dusky-footed woodrat. Relocation of woodrat houses (*Touré Associates: Prunedale*)

Natural Resource Investigations / Multiple Species Studies

- Scientific Review Team Member – Member of the science review team assessing the effectiveness of the US Forest Service's implementation of the Herger-Feinstein Quincy Library Group Act.
- Lead Consultant - Baseline biological resource assessments and habitat mapping for CDF management units *(CDF: San Diego, San Bernardino, and Riverside Counties)*

- Biological Resources Expert – Peer review of CEQA/NEPA documents (*Adams Broadwell Joseph & Cardoza: California)*
- Lead Consultant - Pre- and post-harvest biological resource assessments of tree removal sites *(SDG&E: San Diego County)*
- Crew Leader - T&E species habitat evaluations for Biological Assessment in support of a steelhead restoration plan *(Trout Unlimited: Cleveland NF)*
- Lead Investigator - Resource Management Study and Plan for Mather Lake Regional Park *(County of Sacramento: Sacramento, CA)*
- Lead Investigator - Biological Resources Assessment for 1,070-acre Alfaro Ranch property *(Yuba County, CA)*
- Lead Investigator - Wildlife Strike Hazard Management Plan *(HCV Associates: Napa)*
- Lead Investigator - Del Rio Hills Biological Resource Assessment *(The Wyro Company: Rio Vista, CA)*
- Lead Investigator – Ion Communities project sites (*Ion Communities: Riverside and San Bernardino Counties*)
- Surveyor – Tahoe Pilot Project: Validation of California's Wildlife Habitat Relationships (CWHR) Model *(University of California: Tahoe NF)*

Forestry

Mr. Cashen has five years of experience working as a consulting forester on projects throughout California. Mr. Cashen has consulted with landowners and timber operators on forest management practices; and he has worked on a variety of forestry tasks including selective tree marking, forest inventory, harvest layout, erosion control, and supervision of logging operations. Mr. Cashen's experience with many different natural resources enable him to provide a holistic approach to forest management, rather than just management of timber resources.

REPRESENTATIVE EXPERIENCE

- Lead Consultant - CalFire fuels treatment projects *(SD and Riverside Counties)*
- Lead Consultant and supervisor of harvest activities – San Diego Gas and Electric Bark Beetle Tree Removal Project *(San Diego)*
- Crew Leader - Hillslope Monitoring Program *(CalFire: throughout California)*
- Consulting Forester – Forest inventories and timber harvest projects *(various clients throughout California)*

Grant Writing and Technical Editing

Mr. Cashen has prepared and submitted over 50 proposals and grant applications. Many of the projects listed herein were acquired through proposals he wrote. Mr. Cashen's clients and colleagues have recognized his strong scientific writing skills and ability to generate technically superior proposal packages. Consequently, he routinely prepares funding applications and conducts technical editing for various clients.

PERMITS

U.S. Fish and Wildlife Service Section 10(a)(1)(A) Recovery Permit for the Peninsular bighorn sheep

CA Department of Fish and Game Scientific Collecting Permit

PROFESSIONAL ORGANIZATIONS / ASSOCIATIONS

The Wildlife Society (Conservation Affairs Committee member)

Cal Alumni Foresters

Mt. Diablo Audubon Society

OTHER AFFILIATIONS

Scientific Advisor and Grant Writer – *The Red Panda Network*

Scientific Advisor – *Mt. Diablo Audubon Society*

Grant Writer – *American Conservation Experience*

Scientific Advisor and Land Committee Member – *Save Mt. Diablo*

TEACHING EXPERIENCE

Instructor: Wildlife Management - The Pennsylvania State University, 1998

Teaching Assistant: Ornithology - The Pennsylvania State University, 1996-1997

Cashen Footnote #8

Multiple Occurrences per Page

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Element Code is (AAABF01020)

Scaphiopus couchii				**Element Code:**	AAABF01020
Couch's spadefoot					
Listing Status:	**Federal:**	None	**CNDDB Element Ranks:**	**Global:**	G5
	State:	None		**State:**	S2S3
	Other:	BLM_S-Sensitive, CDFW_SSC-Species of Special Concern, IUCN_LC-Least Concern			
Habitat:	**General:**	TEMPORARY DESERT RAINPOOLS THAT LAST A LEAST 7 DAYS, WITH WATER TEMPS > 15 C & WITH SUBTERRANEAN REFUGE SITES CLOSE BY.			
	Micro:	AN INSECT FOOD BASE ESPECIALLY TERMITES MUST BE AVAILABLE.			

Occurrence No.	1 **Map Index:** 41370	**EO Index:**	41370	**Element Last Seen:**	1993-03-02
Occ. Rank:	Unknown	**Presence:**	Presumed Extant	**Site Last Seen:**	1993-03-02
Occ. Type:	Natural/Native occurrence	**Trend:**	Unknown	**Record Last Updated:**	1999-07-12

Quad Summary: Mortmar (3311558)

County Summary: Riverside

Lat/Long:	33.55264 / -115.93716	**Accuracy:**	1/5 mile
UTM:	Zone-11 N3713061 E598665	**Elevation (ft):**	50
PLSS:	T07S, R10E, Sec. 22 (S)	**Acres:**	0.0

Location: NEAR THE COACHELLA CANAL, 0.7 MILES SE OF THE CONFLUENCE WITH HIDDEN SPRINGS CANYON, ~2 MILES NORTH OF MORTMAR.

Detailed Location: COORDINATES GIVEN AS: T7S, R10E, NW 1/4 OF THE NW 1/4 OF SECTION 22.

Ecological:

General: UNKNOWN NUMBER OBSERVED BREEDING BY KIM NICOL AND BOB MCKERNAN, 1993 (MCKERNAN FROM SAN BERNARDINO NATURAL HISTORY MUSEUM).

Owner/Manager: USBOR

Occurrence No.	2 **Map Index:** 42999	**EO Index:**	42999	**Element Last Seen:**	1989-08-13
Occ. Rank:	Unknown	**Presence:**	Presumed Extant	**Site Last Seen:**	1989-08-13
Occ. Type:	Natural/Native occurrence	**Trend:**	Unknown	**Record Last Updated:**	2000-05-23

Quad Summary: Palo Verde (3311446)

County Summary: Imperial

Lat/Long:	33.42237 / -114.73192	**Accuracy:**	1/10 mile
UTM:	Zone-11 N3700412 E710881	**Elevation (ft):**	230
PLSS:	T09S, R21E, Sec. 02 (S)	**Acres:**	0.0

Location: 0.75 MILE NORTH OF THE HIGHWAY 78 CROSSING OF PALO VERDE LAGOON/OUTFALL DRAIN, SOUTH OF PALO VERDE.

Detailed Location:

Ecological: HABITAT CONSISTS OF A FLOODED ALFALFA FIELD.

General: 4 ADULT MALES AND 1 ADULT FEMALE COLLECTED BY M. JENNINGS AND M. HAYES (CAS #173701-173705), 13 AUG 1989. (SVL RANGED FROM 56 MM TO 64 MM)

Owner/Manager: UNKNOWN

Occurrence No.	3 **Map Index:** 63522	**EO Index:**	63614	**Element Last Seen:**	2002-07-01
Occ. Rank:	Poor	**Presence:**	Presumed Extant	**Site Last Seen:**	2002-07-01
Occ. Type:	Natural/Native occurrence	**Trend:**	Unknown	**Record Last Updated:**	2005-12-28

Quad Summary: Palo Verde (3311446)

County Summary: Imperial

Lat/Long:	33.39347 / -114.74820	**Accuracy:**	80 meters
UTM:	Zone-11 N3697174 E709435	**Elevation (ft):**	238
PLSS:	T09S, R21E, Sec. 15 (S)	**Acres:**	0.0

Location: ALONG NORTH BAJA PIPELINE RIGHT-OF-WAY. 0.5 MI WEST OF OUTFALL DRAIN AND 1.5 MILES WEST OF HWY 78.

Detailed Location: TOAD FOUND ON RIGHT-OF-WAY MOVING EAST TOWARDS THE WASH AREA.

Ecological: DESERT SCRUB ON HIGH SLOPE RUNNING INTO WASH WITH TAMARISK, MESQUITE, PALO VERDE, ETC. SURROUNDING AREA IS COUNTY LANDFILL AND AGRICULTURAL FIELDS.

General: 1 TOAD FOUND AND RELOCATED TO CIBOLA NATIONAL WILDLIFE REFUGE.

Owner/Manager: BLM

Occurrence No.	4 **Map Index:** 73557	**EO Index:**	74525	**Element Last Seen:**	2007-02-01
Occ. Rank:	Good	**Presence:**	Presumed Extant	**Site Last Seen:**	2007-02-01
Occ. Type:	Natural/Native occurrence	**Trend:**	Unknown	**Record Last Updated:**	2009-02-09

Quad Summary: Mecca (3311651)

County Summary: Riverside

Lat/Long:	33.57069 / -116.07874	**Accuracy:**	80 meters
UTM:	Zone-11 N3714936 E585503	**Elevation (ft):**	-180
PLSS:	T07S, R09E, Sec. 08 (S)	**Acres:**	0.0

Location: BETWEEN HWY 111 & RAILROAD TRACKS, SOUTH OF 4TH ST, WEST OF MECCA.

Detailed Location:

Ecological: FLOODED DESERT SCRUB. A RAILROAD, HIGHWAYS, AGRICULTURAL FIELDS, SMALL TOWN DEVELOPMENT, AND SOME NATURAL HABITATS SURROUND LOCATION.

General: 1 ADULT OBSERVED DURING UNION PACIFIC RAILROAD SENSITIVE SPECIES PROJECT.

Owner/Manager: UNION PACIFIC

Occurrence No.	5 **Map Index:** 73558	**EO Index:**	74526	**Element Last Seen:**	2007-02-01
Occ. Rank:	Good	**Presence:**	Presumed Extant	**Site Last Seen:**	2007-02-01
Occ. Type:	Natural/Native occurrence	**Trend:**	Unknown	**Record Last Updated:**	2009-02-09

Quad Summary: Wister (3311535)

County Summary: Imperial

Lat/Long:	33.26487 / -115.56019	**Accuracy:**	80 meters
UTM:	Zone-11 N3681576 E634102	**Elevation (ft):**	-180
PLSS:	T10S, R14E, Sec. 30 (S)	**Acres:**	0.0

Location: ~3.0 MI NW OF NILAND, EAST SIDE OF RAILROAD TRACKS, NE OF THE INTERSECTION OF BEACH RD & GADWALL RD.

Detailed Location:

Ecological: FLOODED DESERT SCRUB. A RAILROAD, HIGHWAYS, AGRICULTURAL FIELDS, SMALL TOWN DEVELOPMENT, AND SOME NATURAL HABITATS SURROUND AREA.

General: 1 ADULT OBSERVED DURING UNION PACIFIC RAILROAD SENSITIVE SPECIES PROJECT.

Owner/Manager: UNION PACIFIC

Occurrence No.	6	**Map Index:** 88772	**EO Index:**	89786	**Element Last Seen:**	2012-08-27
Occ. Rank:	Unknown		**Presence:**	Presumed Extant	**Site Last Seen:**	2012-08-27
Occ. Type:	Natural/Native occurrence		**Trend:**	Unknown	**Record Last Updated:**	2013-04-12

Quad Summary: Roosevelt Mine (3311457)

County Summary: Riverside

Lat/Long:	33.55030 / -114.85451	**Accuracy:**	1/10 mile
UTM:	Zone-11 N3714358 E699186	**Elevation (ft):**	530
PLSS:	T07S, R20E, Sec. 24 (S)	**Acres:**	0.0

Location: ABOUT 3.4 MILES NW OF HODGE MINE, 4.4 MILES NNE OF WILEY WELL CAMPGROUND, N OF MULE MOUNTAINS, CHUCKWALLA VALLEY.

Detailed Location: MAPPED GENERALLY TO PROVIDED COORDINATES. DETECTION WAS INCIDENTAL AND MADE DURING BIRD POINT COUNT SURVEYS.

Ecological: LOW, LOOSE DUNES AND DESERT SCRUB WITH LITTLE LIVING VEGETATION. BRASSICA TOUNEFORTII, SALSOLA AUSTRALIS, CREOSOTE BRUSH SCRUB AND OENOTHERA DELTOIDES ARE THROUGHOUT THE AREA.

General: 1 COUCH'S SPADEFOOT TOAD OBSERVED "WALKING OUT IN THE LARGE WASH" ON 27 AUG 2012.

Owner/Manager: BLM

Cashen Footnote #41

The Wilson Journal
of Ornithology

PREVENTING BIRD–WINDOW COLLISIONS

DANIEL KLEM JR[1]

Published by the
Wilson Ornithological Society

WILSON ORNITHOLOGICAL SOCIETY 1888

The Wilson Journal of Ornithology 121(2):314–321, 2009

PREVENTING BIRD–WINDOW COLLISIONS

DANIEL KLEM JR[1]

ABSTRACT.—Birds behave as if clear and reflective glass and plastic windows are invisible, and annual avian mortality from collisions is estimated in the billions worldwide. Outdoor flight cage and field experiments were used to evaluate different methods to prevent collisions between birds and windows. Stripe and grid patterns of clear UV-reflecting and UV-absorbing window coverings presented an effective warning that birds avoid while offering little or no obstructed view for humans. Birds used UV-reflected signals to avoid space occupied by clear and reflective sheet glass and plastic. Window coverings with effective UV-reflecting and UV-absorbing patterns as warning signals can prevent unintentional killing of birds from collisions with windows. One-way films that made the outer surface of windows opaque or translucent were successful in deterring bird strikes. Ceramic frit glass consisting of a visual pattern of densely spaced 0.32-cm diameter dots, 0.32 cm apart was an effective collision deterrent. Uniformly covering windows with decals or other objects that are separated by 5 to 10 cm was completely or near-completely effective in preventing strikes. Twice the number of window strikes occurred at non-reflective sheet glass compared to conventional clear panes. Continuous monitoring of windows revealed one in four bird strikes left no evidence of a collision after 24 hrs and, without continuous monitoring, 25% of bird strikes were undetected. *Received 11 September 2008. Accepted 19 January 2009.*

Avian mortality resulting from collisions with clear and reflective sheet glass and plastic is estimated to be in the billions worldwide (Klem 1990, 2006). Collisions are predicted and expected wherever birds and windows co-exist (Klem 1989, 1990, 2006). Birds behave as if windows are invisible, and it is important to prevent this unintended killing, estimated to represent the largest human-associated source of avian mortality except habitat destruction (Klem 2006, 2009a, b). The diversity of species and the invisible threat suggest that birds in general are vulnerable to windows, but documented casualties of species of special concern indicates that avian mortality from window collisions is contributing to population declines of specific species and birds in general (Klem 2009a, b).

I evaluated several methods to prevent bird strikes at windows using previously effective outdoor flight cage and field experiments (Klem 1989, 1990). Most preventive treatments examined the use of ultraviolet (UV) signals to alert birds to windows, and the availability of materials affected the composition of what was tested in each experiment. The ability of birds to avoid clear plastic and the ability of one-way films, fritted glass, and feathers to prevent collisions were also evaluated. Specifically, I tested: (1) clear plastic with a UV-absorbing component, (2) single and uniform covering of multiple UV-reflecting maple leaves, (3) a string of colored contour feathers, (4) a one-way external film having an unobstructed view from inside and an obstructed view of dot pattern from outside, (5) a ceramic frit glass with a uniform covering of translucent dots, (6) a variety of UV-absorbing stripe patterns created by plastic strips, and different UV-absorbing and UV-reflecting complete covering, striped, and grid patterns created by external films.

METHODS

Flight cage and field experiments were conducted on a 0.2-ha open mowed grass suburban backyard surrounded and isolated from neighbors by mature shrubs and evergreens in Upper Macungie Township, Lehigh County, Pennsylvania (40° 34′ 35″ N, 75° 34′ 57″ W). Four field experiments were conducted on a 2-ha open rural area of mowed pasture bordered by second growth deciduous forest and shrubs in Henningsville, Berks County, Pennsylvania (40° 27′ 53″ N, 75° 40′ 07″ W).

Flight Cage Experiments.—These tests were conducted from 13 March to 30 April 2004. The basic design was reported previously by Klem (1990) and consisted of a trapezoidal flight cage 1.2 m high, 3.6 m in length, and 0.3 m wide at the narrow end and 2.6 m wide at the broad end. Five Dark-eyed Juncos (*Junco hyemalis*), one White-throated Sparrow (*Zonotrichia albicollis*), and one House

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Sparrow (*Passer domesticus*) were captured in March for use as subjects, housed in small cages, and tested from mid-March and throughout April. Except for the House Sparrow which was an adult female, age and gender of all other subjects were unknown; previous studies of collision casualties document equal vulnerability for all age and gender classes (Klem 1989).

Individuals were released from a holding box at the narrow end and forced to discriminate between left and right flight paths as they attempted to escape to wooded evergreen habitat visible outside the broad end of the cage. One half of the cage at the broad end was left unobstructed in all experiments. The other half was obstructed by clear plastic or objects tested to prevent bird strikes. During testing of a subject, the obstructed and unobstructed sides were changed for half the trials to ensure no bias flight path preference for one side or the other. Actual clear plastic was tested with two Dark-eyed Junco subjects to learn if they were capable of discriminating between clear plastic and unobstructed airspace. Previous studies revealed that Dark-eyed Junco subjects were not capable of discriminating between clear glass and unobstructed airspace (Klem 1990). Objects tested were hung on the obstructed side with clear monofilament line to appear as if taped, stuck, or applied as a coating to clear glass or plastic to prevent accidental collision injuries to subjects in subsequent experiments. No Institutional Animal Care and Use Committee existed during this study, but guidelines for the care of wild birds in research were followed (Gaunt and Oring 1999). All subjects were released unharmed at the end of the experimental period.

Eight flight cage experiments were conducted. Each experiment tested one to five subjects, and each subject flew a minimum of 10 trials per experiment with additional trials (up to 24) to clarify results (Table 1). A trial consisted of recording a subject passing through the unobstructed side of the cage or the side containing the object tested. If the subject chose the obstructed side it was scored as a window strike; if the subject flew through the unobstructed side it was scored as avoidance. Two to three objects were evaluated on any test day. Individuals were tested with a single object on any one test day, and subjects tested with more than one object were tested on different days. The objects tested were: (1) clear plastic with a UV-absorbing component, (2) single translucent UV-reflecting maple leaf (WindowAlert Decal) measuring 10 × 10 cm; (3) uniform covering of 12 UV-reflecting maple leaves as in #2, placed 10 cm apart in vertical columns and 5 cm apart in horizontal rows; (4) a single clear monofilament line attached to the quill of four colored (from top: red, blue, yellow, and green) contour feathers (FeatherGuard™) measuring 14.4–19.6 cm long and separated by 33 cm; (5) 0.32-cm thick vertically oriented 2.5-cm wide UV-absorbing plastic strips forming stripes separated by 10 cm; (6) vertically oriented 2.5-cm wide UV-absorbing strips forming stripes as in #5 but separated by 5 cm, (7) 2.5-cm wide UV-absorbing plastic strips forming stripes as in #5 but horizontally oriented and separated by 5 cm; and (8) ceramic frit glass uniformly covered with a pattern of translucent-appearing dots 0.32-cm in diameter separated by 0.32 cm. Binomial tests were used to examine the significance of each experiment (Siegel 1956).

Field Experiments.—The basic design of all field experiments was reported previously (Klem 1989, 1990) and consisted of wood-framed picture windows, accurately simulating those in houses; all were placed in the same habitat oriented in the same direction 1 m from a tree-shrub edge facing an open field (Klem 1989: figure 1). Each window measured 1.2 m wide × 0.9 m high and was mounted 1.2 m above ground. Plastic mesh trays were placed under each window to catch casualties. Three window units were used in the first and second experiments, and were separated by 4.2, 3.8, and 4.1 m. Three and seven window units were used in the third to sixth experiments separated by 7.8, 7.4, 7.9, 9.0, 7.4, and 8.3 m. A single platform feeder measuring 30.5 cm on a side and 1.2 m above ground mounted on crossed wooden-legs was centered and placed 10 m in front of each window to simulate a feeding station at a rural residential home. Feed consisted of a 1:1 mixture of black-oil sunflower seeds and white proso millet. All feeders were kept full throughout each experiment. No object was permitted at the same window on consecutive days for all experiments, and each object test-

TABLE 1. Preventive methods used in outdoor flight cage experiments to examine avoidance of bird–window collisions.

Preventive method Species tested	Number tested	Number significantly avoiding method[a]	Number test trials	Avoidance	Non-avoidance	*P*
Clear sheet plastic						
Dark-eyed Junco	2	0	14	8	6	0.395
			10	6	4	0.377
Single UV-reflecting maple leaf in center of pane						
Dark-eyed Junco	5	1	16	15	1	<0.001
			17	7	10	0.834
			10	2	8	0.989
			15	7	8	0.696
			10	5	5	0.623
Uniform covering of 12 UV-reflecting maple leaves, 10 cm separating 2 vertical columns, 5 cm separating 6 horizontal rows						
Dark-eyed Junco	4	2	24	18	6	0.011
			10	4	6	0.828
			10	2	8	0.989
			12	10	2	0.019
Feathers on monofilament line						
Dark-eyed Junco	1	0	18	11	7	0.240
White-throated Sparrow	1	0	10	4	6	0.828
UV-absorbing 2.5 cm wide stripes forming vertical columns 10 cm apart						
Dark-eyed Junco	5	1	10	6	4	0.377
			10	10	0	<0.001
			10	8	2	0.055
			10	6	4	0.377
			10	7	3	0.172
UV-absorbing 2.5 cm wide stripes forming vertical columns 2.5 cm apart						
Dark-eyed Junco	5	3	10	10	0	<0.001
			10	8	2	0.055
			10	10	0	<0.001
			10	8	2	0.055
			10	9	1	0.011
UV-absorbing 2.5 cm wide stripes forming horizontal rows 5.0 cm apart						
Dark-eyed Junco	5	5	10	10	0	<0.001
			10	10	0	<0.001
			16	13	3	0.011
			15	12	3	0.018
			10	10	0	<0.001
Ceramic frit pane with translucent dot pattern, 0.32 cm diameter dots separated by 0.32 cm spaces						
Dark-eyed Junco	5	5	10	10	0	<0.001
			12	10	2	0.019
			18	13	5	0.048
			10	10	0	<0.001
			10	10	0	<0.001
House Sparrow	1	1	10	9	1	0.011

[a] Binomial tests were used to examine if results of 10 to 24 trials per subject differed ($P < 0.05$) from the expected equal distribution.

ed in each experiment was randomly assigned and moved to a new window unit daily. Windows were checked each day 30 min after first light and checked and changed daily 30 min before last light for all experiments. Windows were covered with opaque tarps and not monitored during inclement weather such as high winds, rain, or snow.

The parameter measured in all experiments was the number of detectable bird strikes. A strike was recorded when either dead or injured birds were found beneath a window, or when fluid or a blood smear, feather, or body smudge was found on the glass. The data are likely incomplete and conservative because some strikes may not have left evidence of a collision (Klem 1989, 1990, Klem et al. 2004). Predators and scavengers also are known to remove some injured or dead birds (Klem 1981, Klem et al. 2004). The length of each experiment was ascertained by the number of recorded strikes required to statistically evaluate the differences between treatments. The experiments for some species occurred during non-breeding and migratory periods, but previous studies indicate no seasonal difference in the ability of birds to avoid windows (Klem 1989).

The first experiment was conducted over 20 days from 5 to 27 December 2005 and tested the clear glass control, non-reflective clear glass pane exhibiting no glare when viewed from any angle, and the same plastic strips and spacing used in flight cage experiment #6; the 0.32-cm thick edges of the plastic strips were visible as translucent lines except when viewed from directly in front of the window.

The second experiment was conducted over 50 days from 1 February to 29 March 2006 and tested the clear glass control, complete covering of a commercially available clear UV-absorbing film supplied by CPFilms Inc. (Martinsville, VA, USA), and the same clear UV-absorbing film cut and applied as 2.5 cm wide UV-absorbing strips forming stripes separated by 5 cm of clear glass; no edgings of the strips were visible from any angle of view.

The third experiment was conducted over 90 days from 22 November 2006 to 23 February 2007 and tested five commercially available exterior window films by CPFilms Inc. UV measurements for wavelengths between 300 and 380 nm were recorded with a Cary 5000 Spectrophotometer. The clear glass control transmitted 74.6% UV while each of the films absorbed most UV, allowing UV transmittance of 0.13% or less. Each film type reflected 8.8% UV or less. The experimental windows were: (1) clear glass control; (2) complete covering of clear UV-absorbing film applied to exterior glass surface (UVC-O), (3) same as #2 but applied to interior glass surface (UVC-I); (4) complete covering of UV-absorbing REX20 film transmitting 20% and reflecting 65% visible light, having a high reflective quality; (5) complete covering of UV-absorbing REX35 film transmitting 35% and reflecting 55% visible light, having a high reflective quality; (6) complete covering of UV-absorbing NEX1020 film containing a metallic layer with a moderate reflective quality, and (7) complete covering of UV-absorbing RK20 Rynar film with a low reflective quality.

The fourth experiment was conducted over 50 days from 10 March to 3 May 2007 and retested the clear glass control, UVC-O film applied as 2.5 cm wide vertically oriented strips forming stripes separated by 2.5 cm clear glass, and commercially available CollidEscape film supplied by Large Format Digital Inc. (Edgerton, WI, USA) applied to the exterior glass surface, permitting a relatively unobstructed view looking at the inside surface of a covered pane and a completely obstructed view looking at the outside surface. Windows covered in CollidEscape appear uniformly white.

The fifth experiment was conducted over 90 days from 29 October 2007 to 9 February 2008 and tested a new clear UV-reflecting film, alone and in combination with existing exterior clear UV-absorbing film from CPFilms Inc. The new clear film reflected 80% UV. The experimental windows were: (1) clear glass control; (2) complete covering of clear UV-reflecting film applied to exterior surface (CUV-O); (3) same as #2 but applied to interior glass surface (CUV-I); (4) 2.5-cm wide UV-reflecting film strips forming stripes oriented vertically and separated by 5 cm UV-absorbing film strips forming stripes oriented vertically and applied to the outside glass surface (S-1R); (5) 5-cm wide UV-reflecting film strips forming stripes oriented vertically and separated by 2.5 cm UV-absorbing film strips forming stripes oriented vertically and applied to the outside glass surface (S-2R-O); (6) same as #5 but applied to the interior glass surface (S-2R-I); and (7) a grid pattern consisting of 10-cm wide UV-reflecting vertical columns separated by 2.5-cm wide UV-absorbing vertical columns, and 8-cm wide UV-reflecting horizontal rows separated by 2.5-cm wide UV-absorbing horizontal rows applied to the outside glass surface (GRID).

The sixth experiment was conducted over 50 days from 29 February to 25 April 2008 and retested the clear glass control and clear UV-reflecting and UV-absorbing films CUV-O, S-1R, and S-2R-O.

All windows were continuously monitored for 17 hrs over 4 days (6, 12, 24, and 30 Jan 2007) during the fourth experiment to learn if strikes occurred without leaving any visible evidence. Additionally, 60 hrs of continuous observation were conducted over 14 days (11, 13, 14, 17, 18, 21, 25, and 28 Mar and 3, 7, 8, 10, 14, and 15 Apr 2008) during the sixth experiment to observe active avoidance or failure to avoid the experimental windows. The flight path of individual birds moving from a platform feeder toward a window was recorded and assessed as active avoidance if the bird changed direction immediately in front and passed around or over a window.

I used SPSS (SPSS Inc. 2006) for all statistical analyses of the field experiments. Chi-square goodness-of-fit was used to evaluate experimental results: number of strikes per treatment compared to a uniform distribution of strikes across all treatments per experiment. Test results were considered statistically significant when $P < 0.05$.

RESULTS

Flight Cage Experiments.—Dark-eyed Juncos did not discriminate between clear plastic and unobstructed airspace. There was mixed discrimination among Dark-eyed Juncos and individual White-throated and House sparrows compared with other preventive methods evaluated (Table 1). Only the UV-absorbing 2.5-cm wide horizontally oriented plastic strips forming stripes separated by 5 cm and the ceramic frit dots uniformly covering the entire window resulted in statistically significant avoidance for all subjects. The UV-reflecting maple leaves were more effective in alerting birds to a barrier when applied in enough numbers to be separated by 10 cm in vertical columns and 5 cm in horizontal rows; a single UV-reflecting maple leaf in the center of a window was ineffective in alerting four of five subjects to the presence of a clear window barrier.

Field Experiments.—Forty-two strikes were recorded in the first experiment; 17 (41%) were fatal. The number of strikes differed significantly across all treatments with 14 (33%) at the clear glass control, 28 (67%) at the non-reflective glass, and none at the vertically oriented 2.5-cm UV-absorbing plastic strips forming stripes separated by 5 cm ($\chi^2 = 28.0$, df = 2, $P = 0.001$). Species numbers and window at which fatalities occurred were: two White-throated Sparrows and three House Sparrows at the clear glass control; and four Northern Cardinals (*Cardinalis cardinalis*), two House Finches (*Carpodacus mexicanus*), four White-throated Sparrows, and two Dark-eyed Juncos at the non-reflecting glass.

Fifty-five strikes were recorded in the second experiment; 11 (20%) were fatal. The number of strikes differed significantly across all treatments with 35 (64%) at the clear glass control, 12 (22%) at the complete UV-absorbing film covering, and 8 (14%) at the vertically oriented 2.5-cm wide UV-absorbing film strips forming stripes separated by 5 cm ($\chi^2 = 23.2$, df = 2, $P = 0.001$). Species numbers and window at which fatalities occurred were: two Northern Cardinals and one Dark-eyed Junco at the clear glass control; two White-throated Sparrows, two Song Sparrows (*Melospiza melodia*), and one House Sparrow at the complete UV-absorbing film covering; and one White-throated Sparrow, one Song Sparrow, and one House Sparrow at the vertically oriented 2.5-cm wide UV-absorbing film strips forming stripes separated by 5 cm.

One-hundred and ninety-four strikes were recorded in the third experiment; 20 (10%) were fatal. The total number of strikes differed significantly across all treatments, with 51 (26%) at the clear glass control, 24 (12%) at UVC-O, 20 (10%) at UVC-I, 30 (15%) at REX20, 24 (12%) at REX35, 21 (11%) at NEX1020, and 24 (12%) at RK20 ($\chi^2 = 25.0$, df = 6, $P < 0.001$). Species killed and the windows at which fatalities occurred were: one White-throated Sparrow, one American Tree Sparrow (*Spizella arborea*), five Dark-eyed Juncos, and two House Finches at the clear glass control; one Black-capped Chickadee (*Poecile atricapillus*), one White-throated Sparrow, two House Finches, and one Northern Cardinal at UVC-O; one House Finch at UVC-I; two American Tree Sparrows at REX20; two Dark-eyed Juncos at REX35; and one Mourning Dove (*Zenaida macroura*) at RK20.

Seventy-seven strikes were recorded in the fourth experiment; two (3%) were fatal. The total number of strikes differed significantly across all treatments, with 49 (64%) at the clear glass control, 27 (35%) at the vertically oriented 2.5-cm wide UV-absorbing film strips forming stripes separated by 5 cm, and one (1%) at the CollidEscape covered window ($\chi^2 = 44.99$, df = 2, $P = 0.001$). Eight (30%) of the 27 strikes at the window with the UV-absorbing film stripes occurred over film, there were 14 (52%) strikes at clear glass between film, and five (18%) strikes included parts of both film and non-film areas; there was no significant difference between striped and no striped impact sites ($\chi^2 = 1.64$, df = 1, $P = 0.20$).

Eighty-six strikes were recorded in the fifth experiment; 13 (15%) were fatal. The total number of strikes differed significantly across all treatments with 60 (70%) at the clear glass control, eight (9%) at CUV-O, seven (8%) at CUV-I, two (2%) at S-1R, one (1%) at S-2R-O, four (5%) at S-2R-I, and four (5%) at the GRID ($\chi^2 = 219.23$, df = 6, $P < 0.001$). All 13 fatalities occurred at the clear glass control and were: one Black-capped Chickadee, one White-breasted Nuthatch (*Sitta carolinensis*), two House Finches, one American Goldfinch (*Carduelis tristis*), one American Tree Sparrow, and seven Dark-eyed Juncos.

Fifty-five strikes were recorded in a validating sixth experiment retesting selected treatments of experiment #5; 11 (20%) were fatal. The total number of strikes differed significantly across all treatments, with 38 (69%) at the clear glass control, 11 (20%) at CUV-O, three (5.5%) at S-1R, and three (5.5%) at S-2R-O ($\chi^2 = 60.13$, df = 3, $P = 0.001$). Species numbers and windows at which fatalities occurred were: one Black-capped Chickadee, two American Tree Sparrows, and five Dark-eyed Juncos at the clear glass control, and two American Tree Sparrows and one Dark-eyed Junco at CUV-O.

Flight paths of 67 individual birds flying from the bird feeders toward the windows were recorded during 60 hrs of continuous observation over 14 days to examine the movements of individuals during the sixth experiment. Six (55%) of 11 individuals flying toward the clear glass control moved to avoid and five (45%) hit the window. Fourteen (93%) of 15 individuals flying toward CUV-O moved to avoid and one (7%) hit the window. All 24 individuals flying toward S-1R moved to avoid the window. Fifteen (88%) of 17 individuals flying toward S-2R-O moved to avoid and two (12%) hit the window. One strike in four left no evidence of a collision lasting 24 hrs based on 17 hrs of continuous observation.

DISCUSSION

The application of clear and reflective UV-absorbing films to the exterior of windows offered some protection from strikes by reducing the deceptive quality of reflections. The use of clear UV-absorbing external films to create stripe patterns had mixed results. The incremental use of 0.32-cm thick plastic strips used to form stripes and then external films in experiments were attempts to create UV signals to learn if test subjects and birds flying in the wild would behave as if they could see and avoid the treated panes. All attempts to create protective patterns visible to birds using a UV-absorbing plastic and film offered a weak UV-reflecting signal, no greater than 13% UV-reflectance. A new clear UV-reflecting exterior film that produced a UV-reflecting signal with 80% reflectance offered an improved opportunity to meaningfully test the utility of UV signals to deter bird–window collisions. The promise of UV signals serving to alert birds to danger was uncertain given that lower wavelengths of UV, blue, and purple colors are often associated with attraction behavior, sexual selection, and finding food (Burkhardt 1982, Bennett and Cuthill 1994, Vitala et al. 1995, Bennett et al. 1996, Hunt et al. 1998).

Color signals used by birds and other animals as warnings or an alert to danger (aposematic coloration) are most often in the upper visual wavelengths perceived as yellows, or-anges, and reds. Supporting the questionable value of UV signals to deter window strikes were comparative records of strike rates at wind turbines painted with UV-reflecting and conventional non-UV-reflecting paints (Young et al. 2003). Notwithstanding the ability to attract, it is reasonable to suspect that UV signals could also be used to alert birds to the presence of clear and reflective sheet glass and plastic. Repeated validating field experiments supplemented by detailed recording of avoidance by individual birds revealed that a combination of UV-reflecting and UV-absorbing stripe and grid patterns were effective in preventing bird–window collisions. These results document that birds were able to recognize the window-covering UV stripes and grid pattern as barriers to avoid. Applications that combine alternating and contrasting UV-reflecting and UV-absorbing patterns to existing clear and reflective windows have promise of preventing bird strikes while offering little or no visual distraction for humans.

The results of both flight cage and field experiments provide additional confirmation that birds behave as if clear sheet glass and plastic in the form of windows are invisible, and that several methods are available to effectively prevent bird–window collisions. The clarity and lack of any visible cues best explains twice as many strikes at the non-reflective glass pane compared to a conventional clear window. These findings support the interpretation that decals or other objects such as feathers placed on or hung in front of a window are ineffective at preventing bird strikes when used alone. Increasing their numbers so they uniformly cover the window surface, and separating decals or strings of feathers and beads by 5 to 10 cm provides complete or near-complete avoidance.

One-way films that result in a complete opaque or translucent covering when viewed from outside, but only weakly diminish the view from inside, were expected and confirmed to be effective strike deterrents. The uniformly dense dot pattern created as ceramic frit was effective in alerting birds to the presence of a glass barrier. The presence of dotted ceramic frit glass in the science building at Swarthmore College in Swarthmore, Pennsylvania, USA since installation has experienced as few as two known collisions a year (E. C. Everbach, pers. comm.). This same dotted ceramic frit glass has experienced no known collisions at a corridor in the renovated science building on the campus of Muhlenberg College in Allentown, Pennsylvania, but a dozen collision fatalities have been documented at conventional clear glass panes elsewhere in this same building for 1 year since installation (DK, pers. obs.). The dot or other objects creating patterns of visual noise must be placed on the exterior surface of windows to be visible; exceptions are at see-through sites such as corridors and where glass walls meet at corners and where protective patterns will be visible when placed on interior surfaces.

These experiments further reveal that strike frequency at intensely monitored sites is likely to be incomplete and conservative because some impacts may not leave any evidence of a collision. Moreover, predators and scavengers may have removed some casualties that were not detected such as a Northern Shrike (*Lanius excubitor*) that was seen taking a window casualty during the final field experiment (Klem 1981, Klem et al. 2004).

Methods using UV signals to alert birds to window hazards should have special utility because they offer visual cues in wavelengths that birds are known to see but humans do not (Burkhardt 1982, Bennett and Cuthill 1994, Vitala et al. 1995, Bennett et al. 1996, Hunt et al. 1998). The promise of using UV signals to prevent collisions between birds and windows is especially relevant to architectural professionals for addressing and eliminating avian injury and mortality by retrofitting existing buildings and using new types of glass and plastic panes in new construction.

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Cashen Footnote #42

Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis

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Executive Summary

This report summarizes data on bird mortality at three solar energy facilities in southern California: Desert Sunlight, Genesis, and Ivanpah. These facilities use different solar technologies, but avian mortality was documented at each site. Desert Sunlight is a photovoltaic facility, Genesis employs a trough system with parabolic mirrors, and Ivanpah uses a power tower as a focal point for solar flux.

FINDINGS

Trauma was the leading cause of death documented for remains at the Desert Sunlight and Genesis sites. Trauma and solar flux injury were both major causes of mortality at the Ivanpah site. Exposure to solar flux caused singeing of feathers, which resulted in mortality in several ways. Severe singeing of flight feathers caused catastrophic loss of flying ability, leading to death by impact with the ground or other objects. Less severe singeing led to impairment of flight capability, reducing ability to forage and evade predators, leading to starvation or predation. Our examinations did not find evidence for significant tissue burns or eye damage caused by exposure to solar flux.

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

These solar facilities appear to represent "equal-opportunity" hazards for the bird species that encounter them. The remains of 71 species were identified, representing a broad range of ecological types. In body size, these ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders

(swallows) to strictly aquatic feeders (grebes) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species, and nocturnal as well as diurnal species were represented. Although not analyzed in detail, there was also significant bat and insect mortality at the Ivanpah site, including monarch butterflies. It appears that Ivanpah may act as a "**mega-trap,**" attracting insects which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

			Foraging Zone			**Residency Status**	
SITE	No. Remains	Identifiable Remains	Air	Terr	Water	Resident	Migrant
Ivanpah	141	127	28	85	14	63	64
Genesis	31	30	12	12	6	20	10
Desert Sun	61	56	7	22	27	18	38
TOTALS	233	213	47	119	47	101	112

CONCLUSIONS AND RECOMMENDATIONS

In summary, three main causes of avian mortality were identified at these facilities: impact trauma, solar flux, and predation. Birds at all three types of solar plants were susceptible to impact trauma and predators. Predation was documented mostly at the photovoltaic site, and in many cases appeared to be associated with stranding or nonfatal impact trauma with the panels, leaving birds vulnerable to resident predators. Solar flux injury, resulting from exposures to up to 800° F, was unique to the power tower facility. Our findings demonstrate that a broad ecological variety of birds are vulnerable to morbidity and mortality at solar facilities, though some differential mortality trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present; and insectivores at Ivanpah, where insects are attracted to the solar tower.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions should include:

Monitoring/detection measures:

1) Install video cameras sufficient to provide 360 degree coverage around each tower to record birds (and bats) entering and exiting the flux

2) For at least two years (and in addition to planned monitoring protocol), conduct daily surveys for birds (at all three facilities), as well as insects and bats (in the condenser building at Ivanpah) around each tower at the base of and immediately adjacent to the towers in the area cleared of vegetation. Timing of daily surveys can be adjusted to minimize scavenger removal of carcasses as recommended by the TAC. Surveys in the late afternoon might be optimal for bird carcasses, and first light for bat carcasses.

3) Use dogs for monitoring surveys to detect dead and injured birds that have hidden themselves in the brush, both inside and outside the perimeter of the facility

4) To decrease removal of carcasses, implement appropriate raven deterrent actions

Bird Mortality Avoidance Measures:

1) Increase cleared area around tower at Ivanpah to decrease attractive habitat; at least out to fence

2) Retrofit visual cues to existing panels at all three facilities and incorporate into new panel design. These cues should include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other

3) Suspend power tower operation during peak migration times for indicated species

4) Avoid vertical orientation of mirrors whenever possible, for example tilt mirrors during washing

5) Properly net or otherwise cover ponds

6) Place perch deterrent devices where indicated, eg. on tower railings near the flux field

7) Employ exclusionary measures to prevent bats from roosting in and around the condenser facility at Ivanpah.

It must be emphasized that we currently have a very incomplete knowledge of the scope of avian mortality at these solar facilities. Challenges to data collection include: large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; rapid degradation of carcass quality hindering cause of death and species determination; and inconsistent documentation of carcass history.

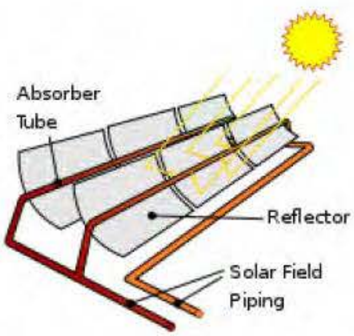
To rectify this problem, video cameras should be added to the solar towers to record bird mortality and daily surveys of the area at the base of and immediately adjacent to the towers should be conducted. At all the facilities, a protocol for systematic, statistically-rigorous searches for avian remains should be developed, emphasizing those areas where avian mortality is most likely to occur. Investigation into bat and insect mortalities at the power tower site should also be pursued.

Finally, there are presently little data available on how solar flux affects birds and insects. Studies of the temperatures experienced by objects in the flux; of the effects of high temperatures on feather structure and function; and of the behavior of insects and birds in response to the flux and related phenomena (e.g. "light clouds") are all essential if we are to understand the scope of solar facility effects on wildlife.

Introduction

The National Fish and Wildlife Forensics Laboratory was requested to determine cause of death for birds found at facilities that generate electricity from solar energy. Solar generating facilities can be classified into three major types: photovoltaic sites, trough systems and solar power towers. There is much written about these systems so this report will not include any technical details, but simply mention the differences and their potential impact on birds.

1) **Photovoltaic systems** directly convert the sun's light into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the photovoltaic cells. An example of this type of solar power plant is Desert Sunlight Solar Farm (AKA First Solar).



2) **Trough systems** are composed of parabolic mirrors which focus and reflect the sun to a tube that converts the heat from the sun into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the trough structures. An example of this type of solar power plant is Genesis Solar Energy Project.

3) **Solar power towers** use thousands of mirrors to reflect the solar energy to a tower, where water in a boiler is converted to steam, generating the electricity. The perceived threat to birds is associated traumatic impact with the mirrors and the danger associated with the heat produced by the mirrors. An example of this type of solar power plant is Ivanpah Solar Electric Generating System.

Methods

Carcasses were collected at the different solar power plant sites by either US Fish and Wildlife Service employees or by energy company staff. The collection of the carcasses was opportunistic; that is, not according to a pre-determined sampling schedule or protocol. There was no attempt to quantify the number of carcasses that scavengers or predators removed from the solar facilities' grounds, or to compare the distribution of carcasses inside and outside the boundaries of the solar facility sites.

Additionally, three USFWS/-OLE staff, including two Forensics Lab staff (EOE and RAK), visited the Ivanpah Solar plant from October 21 – 24, 2013. Their on-site observations are included in this report.

A total of 233 birds collected from three different facilities were examined; 141 from a solar thermal power tower site (Ivanpah, Bright Source Inc.), 31 from a parabolic trough site (Genesis, NextEra Energy Inc.) and 61 from a photovoltaic (PV) panel site (Desert Sunlight, First Solar Inc.). Nine of the Ivanpah birds were received fresh; 7 of those were necropsied during a site visit by a Forensics Laboratory pathologist (RAK). The rest of the birds were received frozen and allowed to thaw at room temperature prior to species identification and necropsy. Species determination was made by the Forensics Laboratory ornithologist (PWT) for all birds either prior to necropsy or, for those necropsied on-site, from photos and the formalin-fixed head. All data on carcass history (location of the carcass, date of collection and any additional observations) were transcribed, although these were not available for all carcasses.

As part of the gross pathological examination, whole carcasses were radiographed to help evaluate limb fractures and identify any metal foreign bodies. Alternate light source examination using an Omnichrome Spectrum 9000+ at 570 nm with a red filter helped rule in or out feather burns by highlighting subtle areas of feather charring (Viner et al., 2014). All birds or bird parts from Ivanpah without obvious burns were examined with the alternate light source, as well as any bird reportedly found near a power line and a random sub-sample of the remaining birds from Genesis and Desert Sunlight (Viner, T. C., R. A. Kagan, and J. L. Johnson, 2014, Using an alternate light source to detect electrically singed feathers and hair in a forensic setting. Forensic Science International, v. 234, p. e25-e29).

Carcass quality varied markedly. If carcasses were in good post mortem condition, representative sections of heart, lung, kidney, liver, brain and gastrointestinal tract as well as any tissues with gross lesions were collected and fixed in 10% buffered formalin. Full tissue sets were collected from the fresh specimens. Formalin-fixed tissues were routinely processed for histopathology, paraffin-embedded, cut at 4 µm and stained with hematoxylin and eosin. Tissues from 63 birds were examined microscopically: 41 from Ivanpah, 1 from Genesis and 21 from Desert Sunlight.

Birds with feather burns were graded based on the extent of the lesions. Grade 1 birds had curling of less than 50% of the flight feathers. Grade 2 birds had curling of 50% or more of the flight feathers. Grade 3 birds had curling and visible charring of contour feathers (Figure 1).

Figure 1: Three grades of flux injury based on extent and severity of burning. Grade 1 (top); Yellow-rumped Warbler with less than 50% of the flight feathers affected (note sparing of the yellow rump feathers). Grade 2 (middle); Northern Rough-winged Swallow initially found alive but unable to fly, with greater than 50% of the flight feathers affected. Grade 3 (bottom); MacGillivray's Warbler with charring of feathers around the head, neck, wings and tail.

Bird Species Recovered at Solar Power Facilities

Tables 1-4 and Appendix 1 summarize 211 identifiable bird remains recovered from the three solar facilities included in this study. These birds constitute a taxonomically diverse assemblage of 71 species, representing a broad range of ecological types. In body size, these species ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders (e.g. swifts and swallows) to strictly aquatic feeders (pelicans and cormorants) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species. Nocturnal as well as diurnal species were represented.

In Tables 1-4 and Appendix 1, bird species are categorized into very general ecological types by foraging zone and residency status. Foraging Zones were "air" (a significant portion of foraging activity performed in the air), "terrestrial" (including foraging both in vegetation and on the ground), and "water" (foraging associated with water, including waders as well as aquatic birds). Residency Status was "resident" (for breeding or year-round residents) and "migrant" (for both passage migrants and non-breeding-season residents). For a number of species, the appropriate classification for residency status was uncertain, due to a lack of detailed knowledge of the sites. The present classification is based on published range maps, and is subject to revision as more information becomes available.

This dataset is not suitable for statistical analysis, due to the opportunistic and unstandardized collection of avian remains at the facilities, and the lack of baseline data on bird diversity and abundance at each site. Nevertheless, a few conclusions can be noted. First, these data do not support the idea that these solar facilities are attracting particular species. Of the 71 bird species identified in remains, only five species were recovered from all three sites. These five were American Coot, Mourning Dove, Lesser Nighthawk, Tree Swallow, and Brown-headed Cowbird, again emphasizing the ecological variety of birds vulnerable to mortality at the solar facilities. Over two-thirds (67%) of the species were found at only a single site

(Appendix 1). That being said, the Desert Sunlight facility had particularly high mortality among waterbirds, suggesting a need to render the ponds at that site inaccessible or unattractive to these species.

The diversity of birds dying at these solar facilities, and the differences among sites, suggest that there is no simple "fix" to reduce avian mortality. These sites appear to represent "equal-opportunity" mortality hazards for the bird species that encounter them. Actions to reduce or mitigate avian mortality at solar facilities will need to be designed on a site-specific basis, and will require much more data on the bird communities at each site, and on how mortality is occurring. Carefully-designed mortality studies might reveal significant patterns of vulnerability that are not evident in these data.

Table 1. Summary data on avian mortality at the three solar sites included in this study. See summary for discussion of Foraging Zone and Residency Status categories.

				Foraging Zone			Residency Status	
SITE	**No. Species**	**No. Remains**	**Identifiable Remains**	**Air**	**Terr**	**Water**	**Resident**	**Migrant**
Ivanpah	49	141	127	26	85	14	63	64
Genesis	15	31	30	12	12	6	20	10
Desert Sun	33	61	56	7	22	27	18	38
TOTALS	71	233	213	47	119	47	101	112

Table 2. Species identified from avian remains at the Desert Sunlight photovoltaic solar facility. MNI = minimum number of individuals of each species represented by the identifiable remains. In some cases (e.g. Cinnamon/Blue-winged Teal), closely related species could not be distinguished based on the available remains, but the Foraging Zone and Residency Status could still be coded, due to the ecological similarities of the species involved. Total identified birds = 56.

DESERT SUNLIGHT		Zone	Residency	MNI
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	1
Eared Grebe	*Podiceps nigricollis*	water	migrant	3
Sora	*Porzana carolina*	water	migrant	1
American Avocet	*Recurvirostra americana*	water	migrant	1
Cinnamon/Blue-winged Teal	*Anas discors/clypeata*	water	migrant	1
Western Grebe	*Aechmophorus occidentalis*	water	migrant	9
Brown Pelican	*Pelecanus occidentalis*	water	migrant	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	2
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	1
Yuma Clapper Rail	*Rallus longirostris*	water	resident	1
American Coot	*Fulica americana*	water	migrant	5
Mourning Dove	*Zenaida macroura*	terr	resident	3
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
Costa's Hummingbird	*Calypte costae*	air	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Black-throated/Sage Sparrow	*Amphispiza sp.*	terr	resident	1
Black Phoebe	*Sayornis nigricollis*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	2
Common Raven	*Corvus corax*	terr	resident	1
Horned Lark	*Eremophila alpestris*	terr	migrant	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	1
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	1
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	1
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
Western Tanager	*Piranga ludoviciana*	terr	migrant	2
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1

Table 3. Species identified from avian remains at the Genesis trough system solar facility. Total identified birds = 30.

GENESIS		Zone	Residency	MNI
Eared Grebe	*Podiceps nigricollis*	water	migrant	2
Great Blue Heron	*Ardea herodias*	water	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Ring-billed Gull	*Larus delawarensis*	water	migrant	2
California Gull	*Larus californianus*	water	resident	1
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Say's Phoebe	*Sayornis saya*	air	resident	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	5
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	1
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Chipping Sparrow	*Spizella passerina*	terr	resident	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	6

Table 4. Species identified from avian remains at the Ivanpah power tower solar facility. Total identified birds = 127

IVANPAH		Zone	Residency	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	4
Cooper's Hawk	*Accipiter cooperii*	air	migrant	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Peregrine Falcon	*Falco peregrinus*	air	resident	1
American Coot	*Fulica americana*	water	migrant	7
Sora	*Porzana carolina*	water	migrant	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	2
Greater Roadrunner	*Geococcyx californianus*	terr	resident	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	1
Mourning Dove	*Zenaida macroura*	terr	resident	11
Barn Owl	*Tyto alba*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	3
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
White-throated Swift	*Aeronautes saxatalis*	air	resident	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	1
Northern Flicker	*Colaptes auratus*	terr	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	3
Warbling Vireo	*Vireo gilvus*	terr	migrant	1
Common Raven	*Corvus corax*	terr	resident	2
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Verdin	*Auriparus flaviceps*	terr	resident	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	1
American Pipit	*Anthus rubescens*	terr	migrant	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	1
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	14
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Yellow Warbler	*Setophaga petechia*	terr	migrant	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	2
Lazuli Bunting	*Passerina amoena*	terr	migrant	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	3
Chipping Sparrow	*Spizella passerina*	terr	resident	3
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	3
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	2
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	6

IVANPAH		Zone	Residency	MNI
Pine Siskin	*Spinus pinus*	terr	migrant	1
House Finch	*Carpodacus mexicanus*	terr	resident	13
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	3

Cause of Death of Birds Found at the Solar Power Plants

Photovoltaic facility (Desert Sunlight):

Sixty-one birds from 33 separate species were represented from Desert Sunlight. Due to desiccation and scavenging, a definitive cause of death could not be established for 22 of the 61 birds (see Table 5). Feathers could be examined in all cases, however, and none of the 61 bird remains submitted from the PV facility had visible evidence of feather singeing, a clear contrast with birds found at Ivanpah.

Blunt force impact trauma was determined to have been the cause of death for 19 Desert Sunlight birds including two Western Grebes (*Aechmophorus occidentalis*) and one each of 16 other species. Impact (blunt force) trauma is diagnosed by the presence of fractures and internal and/or external contusions. In particular, bruising around the legs, wings and chest are consistent with crash-landings while fractures of the head and/or neck are consistent with high-velocity, frontal impact (such as may result from impacting a mirror).

Predation was the immediate cause of death for 15 birds. Lesions supporting the finding of predation included decapitation or missing parts of the body with associated hemorrhage (9/15), and lacerations of the skin and pectoral muscles. Eight of the predated birds from Desert Sunlight were

Figure 2: Predation trauma (top) resulting in traumatic amputation of the head and neck (American Avocet) and impact trauma (bottom) causing bruising of the keel ridge of the sternum (Brown Pelican).

grebes, which are unable to easily take off from land. This suggests a link between predation and stranding and/or impact resulting from confusion of the solar panels with water (see Discussion).

Parabolic trough facility (Genesis):

Thirty-one birds were collected from this site. There were 15 species represented. Those found in the greatest numbers were Brown-headed Cowbirds and Cliff Swallows, though no more than 6 individuals from any given species were recovered. Overall, carcass quality was poor and precluded definitive cause of death determination in 17/31 birds (Table 5). Identifiable causes of death consisted of impact trauma (6/31) and predation trauma (2/31). Necropsy findings were similar to those at Desert Sunlight with fractures and hemorrhage noted grossly. Predation trauma was diagnosed in two birds, a Cliff Swallow and a Ring-billed Gull.

Power tower facility (Ivanpah):

Ivanpah is the only facility in this study that produces solar flux, which is intense radiant energy focused by the mirror array on the power-generating tower. Objects that pass through this flux, including insects and birds, encounter extreme heat, although the extent of heating depends on many variables, including the duration of exposure and the precise location in the flux beam.

From Ivanpah, 141 birds were collected and examined. Collection dates spanned a period of one year and five months (July 2012 to December 2013) and included at least seven months of construction during which time the towers were not actively fluxing (2013). There were 49 species represented (Table 4). Those found in the greatest numbers were Yellow-rumped Warblers (*Setophaga coronata;* 14), House Finches (*Carpodacus mexicanus*; 13), Mourning Doves (*Zenaida macroura*; 11) and American Coots (*Fulica americana*; 7). Yellow-rumped Warblers and House Finches were found exclusively at the power tower site.

Solar flux injury was identified as the cause of death in 47/141 birds. Solar flux burns manifested as feather curling, charring, melting and/or breakage and loss. Flight feathers of the tail and/or wings were invariably affected. Burns also tended to occur in one or more of the following areas; the sides of the body (axillae to pelvis), the dorsal coverts, the tops and/sides of the head and neck and the dorsal body wall (the back). Overlapping portions of feathers and light-colored feathers were often spared (Figures 3 and 4).

Figure 3: contour feather from the back of a House Finch with Grade 3 solar flux injury. The feather has curling and charring limited to the exposed tip.

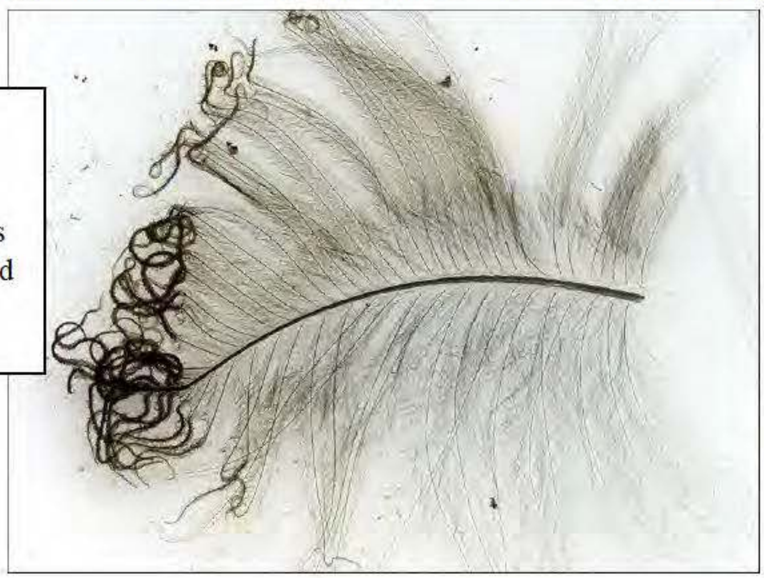


Figure 4: Feather from a Peregrine Falcon with Grade 2 solar flux injury. Note burning of dark feather bands with relative sparing of light bands.

The yellow and red rumps of Yellow-rumped Warblers and House Finches respectively remained strikingly unaffected (See Figure 1). Charring of head feathers, in contrast, was generally diffuse across all color patterns. A pattern of spiraling bands of curled feathers across or around the body and wings was often apparent.

Table 5. Cause of death (COD) data

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

Eight birds were assigned a feather damage Grade of 1 with curling of less than 50% of the flight feathers. Six of these had other evidence of acute trauma (75%). Five birds were Grade 2, including three birds that were found alive and died shortly afterwards. Of these birds, 2 (the birds found dead) also had evidence of acute trauma. Twenty-eight birds were Grade 3; with charring of body feathers. Of these birds, 21/28

(28%) had other evidence of acute trauma. Remaining carcasses (6) were incomplete and a grade could not be assigned.

Twenty-nine birds with solar flux burns also had evidence of impact trauma. Trauma consisted of skull fractures or indentations (8), sternum fractures (4), one or more rib fractures (4), vertebral fractures (1), leg fracture (3), wing fracture (1) and/or mandible fracture (1). Other signs of trauma included acute macroscopic and/or microscopic internal hemorrhage. Location found was reported for 39 of these birds; most of the intact carcasses were found near or in a tower. One was found in the inner heliostat ring and one was found (alive) on a road between tower sites. The date of carcass collection was provided for 42/47. None were found prior to the reported first flux (2013).

Figure 5: The dorsal aspect of the wing from a Peregrine Falcon (the same bird as shown in Figure 4) with Grade 2 lesions. Note extensive curling of feathers without visible charring. This bird was found alive, unable to fly, emaciated and died shortly thereafter. These findings demonstrate fatal loss of function due to solar flux exposure in the absence of skin or other soft tissue burns.

Among the solar flux cases, a variety of bird species were affected though all but one (a raptor) was a passerine (Appendix 2). House Finches and yellow-rumped Warblers were most often represented (10/47 and 12/47 respectively). For the birds in which species could be determined (41/47), insects were a major

dietary component in all but two species. These were an unidentified hummingbird (*Selasphorus*) species (known to include insects in the diet) and a Peregrine Falcon (a species that feeds on small birds).

Four birds were reportedly found alive and taken to a wildlife rehabilitation center where they died one to a few days later (exact dates were not consistently provided). Three had Grade 2 feather burns and one had Grade 3 feather burns. None had other evidence of trauma. Body condition was reduced in all of the birds (two considered thin and two emaciated) based on a paucity of fat stores and depletion of skeletal muscling. The four birds were of four different species and consisted of three passerines and one raptor.

The second most commonly diagnosed cause of death at the Ivanpah facility was impact (or blunt force) trauma (24/141 birds). Necropsy findings were as previously described at the Desert Sunlight facility. Impact marks were reported on heliostat mirrors adjacent to the carcasses in 5 cases and mirrors were described as being vertically-oriented in 5 cases. Specific carcass locations were reported for 18 of the birds. Those birds were found in a variety of areas; below heliostats (8/18), in or near tower and powerblock buildings (4/18), on roads (2/18), below power lines (2/18), in the open (1/18) and by a desert tortoise pen (1/18).

Predation was determined to be the cause of death for five of the birds. A coot and a Mourning Dove were found with extensive trauma and hemorrhage to the head and upper body consisting of lacerations, crush trauma and/or decapitation. One of the birds (an American Coot) was found near a kit fox shelter site. One bird (Northern Mockingbird) was found near the fence line and the third (a Mourning Dove) in an alley way. Two more birds (an unidentified sparrow and an American Pipit) were observed being eaten by one of the resident Common Ravens.

Discussion of Cause of Death of Birds Found at the Solar Power Plants

Impact trauma:

Sheet glass used in commercial and residential buildings has been well-established as a hazard for birds, especially passerines (Klem 1990, 2004, 2006; Loss et al. 2014). A recent comprehensive review estimated that between 365-988 million birds die annually by impacting glass panels in the United States alone (median estimate 599 million; Loss et al. 2014). Conditions that precipitate window strike events include the positioning of vegetation on either side of the glass and the reflective properties of the window. Glass panels that reflect trees and other attractive habitat are involved in a higher number of bird collisions.

The mirrors and photovoltaic panels used at all three facilities are movable and generally directed upwardly, reflecting the sky. At the Ivanpah facility, when heliostats are oriented vertically (typically for washing or installation, personal communication, RAK) they appear to pose a greater risk for birds. Of the eight birds reported found under a heliostat, heliostats were vertically-oriented in at least 5 cases. (D Klem Jr., DC Keck, KL Marty, AJ Miller Ball, EE Niciu, and CT Platt. 2004. Effects of window angling, feeder placement, and scavengers on avian mortality at plate glass. Wilson Bulletin, 116(1):69-73; D Klem Jr. 2006. Glass: A deadly conservation issue for birds. Bird Observer 34(2):73-81; D Klem Jr. 1990.

Collisions between birds and windows: mortality and prevention. Journal of Field Ornithology 61:120–128; Loss, S.R., T. Will, S.S.Loss, and P.P. Marra. 2014. Bird-building collisions in the United States: Estimates of annual mortality and species vulnerability. Condor 116: 8-23). Studies with aquatic insects have found that vertically-oriented black glass surfaces (similar to solar panels) produced highly polarized reflected light, making them highly attractive (Kriska, G., P. Makik, I. Szivak, and G. Horvath. 2008. Glass buildings on river banks as "polarized light traps" for mass-swarming polarotactic caddis flies. Naturwissenschaften 95: 461-467).

A desert environment punctuated by a large expanse of reflective, blue panels may be reminiscent of a large body of water. Birds for which the primary habitat is water, including coots, grebes, and cormorants, were over-represented in mortalities at the Desert Sunlight facility (44%) compared to Genesis (19%) and Ivanpah (10%). Several factors may inform these observations. First, the size and continuity of the panels differs between facilities. Mirrors at Ivanpah are individual, 4 x 8' panels that appear from above as stippling in a desert background (Figure 6). Photovoltaic panels at Desert Sunlight are long banks of adjacent 27.72 x 47.25" panels (70 x 120 cm), providing a more continuous, sky/water appearance. Similarly, troughs at Genesis are banks of 5 x 5.5' panels that are up to 49-65 meters long.

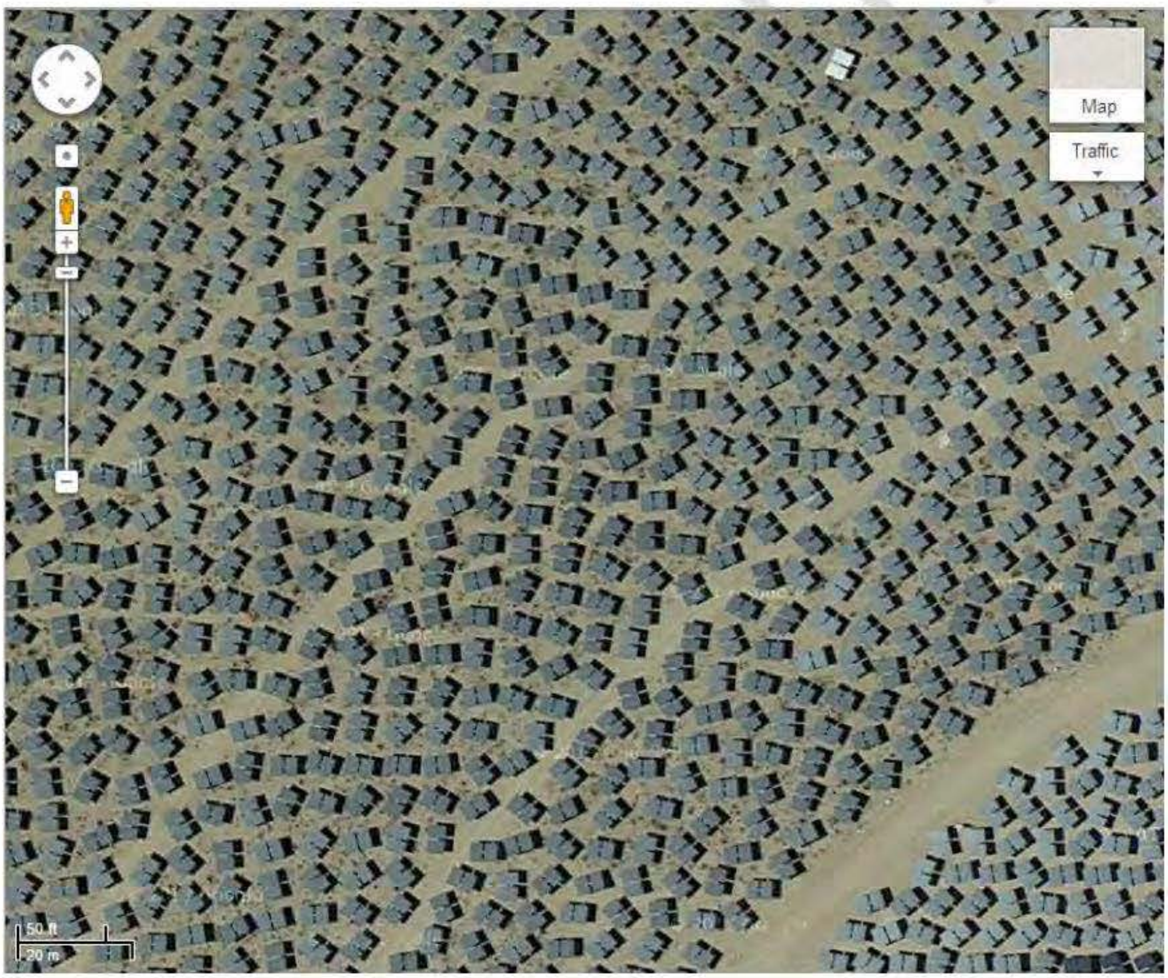


Figure 6: The Ivanpah Solar Electric Generating System as seen via satellite. The mirrored panels are 5 x 8 feet.

There is growing concern about "polarized light pollution" as a source of mortality for wildlife, with evidence that photovoltaic panels may be particularly effective sources of polarized light in the environment (see Horvath et al. 2010. Reducing the maladaptive attractiveness of solar panels to polarotactic insects. Conservation Biology 24: 1644-1653, and ParkScience, Vol. 27, Number 1, 2010; available online at: http://www.nature.nps.gov/parkscience/index.cfm?ArticleID=386&ArticleTypeID=5; as well as discussion of this issue in the Desert Sunlight Final Environmental Impact Statement, Chapter 4, pp. 14-15).

Variables that may affect the illusory characteristics of solar panels are structural elements or markings that may break up the reflection. Visual markers spaced at a distance of 28 cm or less have been shown to reduce the number of window strike events on large commercial buildings (City of Toronto Green Development Standard; Bird-friendly development guidelines. March 2007). Mirrors at the Ivanpah facility are unobscured by structures or markings and present a diffuse, reflective surface. Photovoltaic panels at Desert Sunlight are arranged as large banks of small units that are 60 x 90 cm. The visually uninterrupted expanse of both these types of heliostat is larger than that which provides a solid structure visual cue to passerines. Parabolic troughs at Genesis have large, diffusely reflective surfaces between seams that periodically transect the bank of panels at 5.5' intervals. Structures within the near field, including the linear concentrator and support arms, and their reflection in the panels and may provide a visual cue to differentiate the panel as a solid structure.

The paper by Horvath et al cited above provides experimental evidence that placing a white outline and/or white grid lines on solar panels significantly reduced the attractiveness of these panels to aquatic insects, with a loss of only 1.8% in energy-producing surface area (p. 1651). While similar detailed studies have yet to be carried out with birds, this work, combined with the window strike results, suggest that significant reductions in avian mortality at solar facilities could be achieved by relatively minor modifications of panel and mirror design. This should be a priority for further research.

Finally, ponds are present on the property of the Desert Sunlight and Genesis facilities. The pond at Genesis is netted, reducing access by migratory birds, while the pond at Desert Sunlight is open to flighted wildlife. Thus, birds are both attracted to the water feature at Desert Sunlight and habituated to the presence of an accessible aquatic environment in the area. This may translate into the misinterpretation of a diffusely reflected sky or horizonal polarized light source as a body of water.

Stranding and Predation:

Predation is likely linked to panel-related impact trauma and stranding. Water birds were heavily over-represented in predation mortalities at Desert Sunlight. Of the 15 birds that died due to predation, 14 make their primary habitat on water (coots, grebes, a cormorant, and an avocet). A single White-winged Dove was the only terrestrial-based predation mortality in the submitted specimens. This is in contrast to blunt trauma mortalities at Desert Sunlight in which 8 of the 19 birds determined to have died of impact trauma were water species.

Locations of the birds when found dead were noted on several submissions. Of the birds that died of predation for which locations were known, none were located near ponds. The physiology of several of

these water birds is such that locomotion on land is difficult or impossible. Grebes in particular have very limited mobility on land and require a run across water in order to take off (Jehl, J. R., 1996. Mass mortality events of Eared Grebes in North America. Journal of Field Ornithology 67: 471-476). Thus, these birds likely did not reach their final location intentionally. Ponds at the PV and trough sites are fenced, prohibiting terrestrial access by predators. Birds on the water or banks of the pond are inaccessible to resident predators. Therefore, it is unlikely that the birds were captured at the pond and transported by a predator into the area of the panels. Attempts to land or feed on the panels because of their deceptive appearance may have injured the birds to the point that they could not escape to safety, or inadvertently stranded the birds on a substrate from which they could not take flight. We believe that an inability to quickly flee after striking the panels and stranding on the ground left these birds vulnerable to opportunistic predators. At least two types of predators, kit foxes and ravens, have been observed in residence at the power tower and PV facilities and ravens have been reported at the trough site (personal communication and observation, RAK). Additionally, histories for multiple birds found at the tower site document carcasses found near kit fox shelters or being eaten or carried by a raven.

Solar Flux:

Avian mortality due to exposure to solar flux has been previously explored and documented (McCrary, M. D., McKernan, R. L., Schreiber, R. W., Wagner, W. D., and Sciarrotta, T. C. Avian mortality at a solar energy power plant. Journal of Field Ornithology, 57(2): 135-141). Solar flux injury to the birds of this report, as expected, occurred only at the power tower facility. Flux injury grossly differed from other sources of heat injury, such as electrocution or fire. Electrocution injury requires the bridging of two contact points and is, therefore, seen almost exclusively in larger birds such as raptors. Contact points tend to be on the feet, carpi and/or head and burns are often found in these areas. Electrocution causes deep tissue damage as opposed to the surface damage of fire or solar flux. Other sequelae include amputation of limbs with burn marks on bone, blood vessel tears and pericardial hemorrhage. Burns from fires cause widespread charring and melting of feathers and soft tissues and histopathologic findings of soot inhalation or heat damage to the respiratory mucosa. None of these were characteristics of flux injury. In the flux cases small birds were over-represented, had burns generally limited to the feathers and internal injuries attributable to impact. Flux injury inconsistently resulted in charring, tended to affect feathers along the dorsal aspects of the wings and tail, and formed band-like patterns across the body (Divincenti, F. C., J. A. Moncrief, and B. A. Pruitt. 1969. Electrical injuries: a review of 65 cases. The Journal of Trauma 9: 497-507).

Proposed mechanisms of solar flux-related death follow one or a combination of the following pathways:

- impact trauma following direct heat damage to feathers and subsequent loss of flight ability
- starvation and/or thermoregulatory dysfunction following direct heat damage to feathers
- shock
- soft tissue damage following whole-body exposure to high heat
- ocular damage following exposure to bright light.

Necropsy findings from this study are most supportive of the first three mechanisms.

Loss of feather integrity has effects on a bird's ability to take off, land, sustain flight and maneuver. Tail feathers are needed for lift production and maneuverability, remiges are needed for thrust and lift and feathers along the propatagium and coverts confer smoothness to the avian airfoil. Shortening of primary flight feathers by as little as 1.6 cm with loss of secondary and tertiary remiges has been shown to eliminate take-off ability in house sparrows further demonstrating the importance of these feathers (Brown, R. E., and A. C. Cogley, 1996. Contributions of the propatagium to avian flight: Journal of Experimental Zoology 276: 112-124). Loss of relatively few flight feathers can, therefore, render a bird unable or poorly-able to fly. Birds encountering the flux field at Ivanpah may fall as far as 400 feet after feather singeing. Signs of impact trauma were often observed in birds with feather burns and are supportive of sudden loss of function (Beaufrere, H., 2009. A review of biomechanic and aerodynamic considerations of the avian thoracic limb. Journal of Avian Medicine and Surgery 23: 173-185).

Birds appear to be able to survive flux burns in the short term, as evidenced by the collection of several live birds with singed feathers. Additionally, Forensic Lab staff observed a falcon or falcon-like bird with a plume of smoke arising from the tail as it passed through the flux field. Immediately after encountering the flux, the bird exhibited a controlled loss of stability and altitude but was able to cross the perimeter fence before landing. The bird could not be further located following a brief search (personal observation, RAK and EOE). Birds that initially survive the flux exposure and are able to glide to the ground or a perch may be disabled to the point that they cannot efficiently acquire food, escape predators or thermoregulate. Observations of emaciation in association with feather burns in birds found alive is supportive of debilitation subsequent to flux exposure. More observational studies and follow-up are required to understand how many birds survive flux exposure and whether survival is always merely short-term. As demonstrated by the falcon, injured birds (particulary larger birds), may be ambulatory enough to glide or walk over the property line indicating a need to include adjacent land in carcass searches.

There was evidence of acute skin burns on the heads of some of the Grade 3 birds that were found dead. But interestingly, tissue burn effects could not be demonstrated in birds known to have survived short periods after being burned. Hyperthermia causing instantaneous death manifests as rapid burning of tissue, but when death occurs a day or later there will be signs of tissue loss, inflammation, proteinic exudate and/or cellular death leading to multisystemic organ failure. The beginnings of an inflammatory response to injury can be microscopically observed within one to a few hours after the insult and would have been expected in any of the four birds found alive. Signs of heat stroke or inhalation of hot air should have been observable a day or more after the incident. Rather, in these cases extensive feather burns on the body largely appeared to be limited to the tips of the feathers with the overlapping portions insulating the body as designed. This, in conjunction with what is likely only a few seconds or less spent in the flux, suggests that skin or internal organ damage from exposure to high temperatures in solar flux may not be a major cause of the observed mortality.

Ocular damage following light exposure was also considered but could not be demonstrated in the submitted birds. In the four birds that initially survived, there were no signs of retinal damage, inflammation or other ocular trauma. Given the small sample size, this does not preclude sight impairment as a possible sequela but clinical monitoring of survivors would be needed to draw more definitive conclusions.

Other/Undetermined:

Powerline electrocution was the cause of death for one bird (a juvenile Common Raven) at the Ivanpah facility. Electrocution at these solar facilities is a potential hazard but, thus far, appears to be an uncommon cause of death.

Smashed birds (13/233) were found at all three locations. Detailed carcass collection information was provided for 6; all were found on roads. Though poor carcass quality in all cases precluded definitive cause death determination, circumstances and carcass condition suggest vehicle trauma as the cause of deaths. The relatively low numbers of vehicle collisions may be attributed to slow on-site vehicle speeds and light traffic. Vehicle collisions, therefore, do not appear to be a major source of mortality and would be expected to decrease as construction ends.

There was a large number of birds (85/233) for which a cause of death could not be determined due to poor carcass condition. The arid, hot environment at these facilities leads to rapid carcass degradation which greatly hinders pathology examination. Results were especially poor for birds from the Genesis facility, where the cause of death(s) for 23/31 (74%) could not be determined. These results underscore the need for carcasses to be collected soon after death. More frequent, concerted carcass sweeps are advised.

Insect mortality and solar facilities as "mega-traps"

An ecological trap is a situation that results in an animal selecting a habitat that reduces its fitness relative to other available habitats (Robertson, B.A. and R.L. Hutto. 2006. A framework for understanding ecological traps and an evaluation of existing evidence. Ecology 87: 1075-1085; Robertson, B.A., J.S. Rehage, and Sih, A. 2013. Ecological novelty and the emergence of evolutionary traps. Trends in Ecology and Evolution 28: 552-560).

A wide variety of circumstances may create ecological traps, ranging from subtle (songbirds attracted to food resources in city parks, where they are vulnerable to unnaturally high populations of predators) to direct (birds are attracted to oil-filled ponds, believing it to be water, and become trapped). It appears that solar flux facilities may act as "**mega-traps,**" which we define as artificial features that attract and kill species of multiple trophic layers. The strong light emitted by these facilities attract insects, which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

OLE staff observed large numbers of insect carcasses throughout the Ivanpah site during their visit. In some places there were hundreds upon hundreds of butterflies (including monarchs, *Danaus plexippus*) and dragonfly carcasses. Some showed singeing, and many appeared to have just fallen from the sky. Careful observation with binoculars showed the insects were active in the bright area around the boiler at the top of the tower. It was deduced that the solar flux creates such a bright light that it is brighter than the surrounding daylight. Insects were attracted to the light and could be seen actively flying the height of the tower. Birds were also observed feeding on the insects. At times birds flew into the solar flux and ignited. Bird carcasses recovered from the site showed the typical singed feathers. The large populations of insects

may also attract indigenous bat species, which were seen roosting in structures at the base of the power tower.

Monarch butterflies in North America – both east and west of the Rocky Mountains – have been documented to be in decline (see the North American Monarch Conservation Plan, available at: http://www.mlmp.org/Resources/pdf/5431_Monarch_en.pdf). Proposed causes include general habitat loss and specific loss of milkweed, upon which the butterflies feed and reproduce. Considering the numerous monarch butterfly carcasses seen at the Ivanpah facility, it appears that solar power towers could have a significant impact on monarch populations in the desert southwest. Analysis of the insect mortality at Ivanpah, and systematic observations of bird/insect interactions around the power tower, is clearly needed.

Bird species affected by solar flux include both insectivores (e.g. swallows, swifts, flycatchers, and warblers) and raptors that prey on insect-feeding birds. Based on observations of the tower in flux and the finding of large numbers of butterflies, dragonflies and other insects at the base of the tower and in adjacent buildings it is suspected that the bright light generated by solar flux attracts insects, which in turn attracts insectivores and predators of insectivores. Waterbirds and other birds that feed on vegetation were not found to have solar flux burns. Birds were observed perching and feeding on railings at the top of the tower, apparently in response to the insect aggregations there.

Further, dead bats found at the Ivanpah site could be attracted to the large numbers of insects in the area. Nineteen bats from the condenser area of the power tower facility have been submitted to NFWFL for further evaluation. These bats belong to the Vespertilionidae and Molossidae families, which contain species considered by the Bureau of Land Management to be sensitive species in California. Preliminary evaluation revealed no apparent singing of the hair, and analysis is ongoing.

Solar flux and heat associated with solar power tower facilities

Figure 7 Ivanpah solar power facilities http://ivanpahsolar.com/about

Despite repeated requests, we have been unsuccessful in obtaining technical data relating to the temperature associated with solar flux at the Ivanpah facility. The following summarizes the information we have gathered from other sources.

The Ivanpah solar energy generating facility consists of mirrors that reflect sunlight to a tower. In the tower sits a boiler that generates steam which then powers a turbine.

At the top of a 459 foot tall tower sits a boiler (solar receiver) that is heated by the sun rays reflected by 300,000 mirrors, called solar heliostats. When the concentrated sunlight strikes the boiler tubes, it heats the water to create superheated steam. The high temperature steam is then piped from the boiler to a turbine where electricity is generated (http://ivanpahsolar.com/about visited on 01/20/2014).

If all the solar heliostats are focused on the solar tower the beams multiply the strength of sunlight by 5000 times, and this generates temperatures at the solar tower in excess of 3600° Fahrenheit (> 1982° Celsius). Since steel melts at 2750° Fahrenheit (1510° Celsius), only a percentage of heliostats are focused on the solar receiver so that) the optimal temperature at the tower is approximately 900° Fahrenheit (~482° Celsius) ("How do they do it" Wag TV for Discovery Channel, Season 3, Episode 15, "Design Airplane Parachutes, Create Solar Power, Make Sunglasses" Aired August 25, 2009).

Figure 8: Seville solar power facility (http://inhabitat.com/sevilles-solar-power-tower)

A solar steam plant in Coalinga that also uses heliostat technology for extracting oil is on record stating that the steam generator is set to about 500° Celsius. (http://abclocal.go.com/kDSn/story?section=news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Temperatures measured by the authors at the edge of the solar complex on the surface of a heliostat were approximately 200° Fahrenheit (~93° Celsius). Therefore, there is a gradient of temperature from the edge of the solar field to the tower that ranges from 200° to 900° Fahrenheit.

There is a phenomenon that occurs when the heliostats are focused on the tower and electricity is being generated. The phenomenon can be described as either a circle of clouds around the tower or, at times, a cloud formed on the side that is receiving the solar reflection. It appears as though the tower is creating clouds. Currently we propose two hypotheses of why this "cloud" is formed. The first hypothesis is simply the presumption that the high heat associated with towers is condensing the air, and forming the

Figure 9: Tower 1 (bright white) is shown under power. Tower 2 (black) is not operating.

clouds. The second hypothesis is that this phenomenon does not represent clouds at all rather it is a place in space where the heliostats that are not being used to generate heat are focused. Under this scenario, it is a place where the mirrors focus the excess energy not being used to generate electricity.

Ivanpah employees and OLE staff noticed that close to the periphery of the tower and within the reflected solar field area, streams of smoke rise when an object crosses the solar flux fields aimed at the tower. Ivanpah employees used the term "streamers" to characterize this occurrence.

When OLE staff visited the Ivanpah Solar plant, we observed many streamer events. It is claimed that these events represent the combustion of loose debris, or insects. Although some of the events are likely that, there were instances in which the amount of smoke produced by the ignition could only be explained by a larger flammable biomass such as a bird. Indeed OLE staff observed birds entering the solar flux and igniting, consequently becoming a streamer.

OLE staff observed an average of one streamer event every two minutes. It appeared that the streamer events occurred more frequently within the "cloud" area adjacent to the tower. Therefore we hypothesize that the "cloud" has a very high temperature that is igniting all material that traverses its field.
One possible explanation of this this phenomenon is that the "cloud" is a convergent location where heliostats are "parked" when not in use. Conversely it undermines the condensation hypothesis, given that birds flying through condensation clouds will not spontaneously ignite.

Temperatures required to burn feathers

Many of the carcasses recovered from the Ivanpah Solar plant after the plant became operational showed singing of feathers as shown in Figure 10.

Figure 10: Singed feathers from a Northern Rough-winged Swallow

In order to investigate at what temperature feathers burn/singe, we exposed feathers to different air temperatures. Each feather was exposed to a stream of helium and air for 30 seconds. The results indicate that at 400° Celsius (752° Fahrenheit) after 30 seconds the feather begins to degrade. But at 450° and

Figure 11: Results of exposing feathers to different temperatures (in degrees Celsius)

500° Celsius (842° and 932° Fahrenheit respectively) the feathers singed as soon as they made contact with the superheated air (Figure 11). Therefore, when singed birds are found, it can be inferred that the temperatures in the solar flux at the time a bird flew through it was at least 400° Celsius (752° Fahrenheit). This inference is consistent with the desired operating temperature of a power tower solar boiler (482° Celsius).

The fact that a bird will catch on fire as it flies through the solar flux has been confirmed by a Chevron engineer who works at the Coalinga Chevron Steam plant, a joint venture of Chevron and BrightSource Solar. (http://abclocal.go.com/kDSn/story?section=news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Conclusions and Recommendations

In summary, three main causes of avian mortality were identified at these facilities; impact trauma, predation and solar flux. Birds at all three types of solar plants were susceptible to impact trauma and predators. Solar flux injury was unique to the power tower facility. Solar facilities, in general, do not appear to attract particular species, rather an ecological variety of birds are vulnerable. That said, certain mortality and species trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions include placing perch-guards on power tower railings near the flux field, properly netting or otherwise covering ponds, tilting heliostat mirrors during washing and suspending power tower operation at peak migration times.

Visual cues should be retrofitted to existing panels and incorporated into new panel design. These cues may include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other. This arrangement has been shown to significantly reduce the number of passerines hitting expanses of windows on commercial buildings. Spacing of 10 cm eliminates window strikes altogether. Further exploration of panel design and orientation should be undertaken with researchers experienced in the field (Daneil Klem Jr. of Muhlenberg College) to determine causes for the high rate of impact trauma, and designs optimized to reduce these mortalities.

Challenges to data collection included rapid degradation of carcass quality hindering cause of death and species determination; large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; and inconsistent documentation of carcass history. Searcher efficiency has been shown to have varying influences on carcass recovery with anywhere from 30% to 90% detection of small birds achieved in studies done at wind plants (Erickson et al., 2005). Scavengers may also remove substantial numbers of carcasses. In studies done on agricultural fields, up to 90% of small bird carcasses were lost within 24 hours (Balcomb, 1986; Wobeser and Wobeser, 1992). OLE staff observed apparently resident ravens at the Ivanpah power tower. Ravens are efficient scavengers, and could remove large numbers of small bird carcasses from the tower vicinity. (Erickson, W. P., G. D. Johnson, and D. P. Young, Jr., 2005, A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions: U S Forest Service General Technical Report PSW, v. 191, p. 1029-1042; Balcomb, R., 1986, Songbird carcasses disappear rapidly from agricultural fields: Auk, v. 103, p. 817-820; Wobeser, G., and A. G. Wobeser, 1992, Carcass disappearance and estimation of mortality in a simulated die-off of small birds: Journal of Wildlife Diseases, v. 28, p. 548-554.)

Given these variables it is difficult to know the true scope of avian mortality at these facilities. The numbers of dead birds are likely underrepresented, perhaps vastly so. Observational and statistical studies to account for carcass loss may help us to gain a better sense of how many birds are being killed. Complete histories would help us to identify factors (such as vertical placement of mirrors) leading to mortalities. Continued monitoring is also advised as these facilities transition from construction to full operation. Of especial concern is the Ivanpah facility which was not fully-functioning at the time of the latest carcass submissions. In fact, all but 7 of the carcasses with solar flux injury and reported dates of collection were found at or prior to the USFWS site visit (October 21-24, 2013) and, therefore, represent flux mortality from a facility operating at only 33% capacity. Investigation into bat and insect mortalities at the power tower site should also be pursued.

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Appendix 1. List of all 71 species recovered from the three solar energy sites. In this table, remains of closely related taxa that could not be definitively identified (e.g. Cinnamon/Blue-winged Teal and Black-throated/Sage Sparrow) are assigned to the biogeographically more likely taxon. In all such cases, the possible taxa are ecologically similar. All of these species are MBTA-listed.

SPECIES		Zone	Residency	Sites	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	DS,IV	5
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	DS	1
Western Grebe	*Aechmorphorus occidentalis*	water	migrant	DS	9
Eared Grebe	*Podiceps nigricollis*	water	migrant	DS,GN	5
Brown Pelican	*Pelecanus occidentalis*	water	migrant	DS	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	DS	2
Great Blue Heron	*Ardea herodias*	water	migrant	GN	1
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	DS	1
Cooper's Hawk	*Accipiter cooperii*	air	migrant	IV	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	IV	1
American Kestrel	*Falco sparverius*	air	resident	GN,IV	2
Peregrine Falcon	*Falco peregrinus*	air	resident	IV	1
American Coot	*Fulica americana*	water	migrant	DS, IV	12
Yuma Clapper Rail	*Rallus longirostris yumanensis*	water	resident	DS	1
Sora	*Porzana carolina*	water	migrant	DS,IV	2
American Avocet	*Recurvirostra americana*	water	migrant	DS	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	IV	2
Ring-billed Gull	*Larus delawarensis*	water	migrant	GN	2
California Gull	*Larus californianus*	water	resident	GN	1
Greater Roadrunner	*Geococcyx californianus*	terr	resident	IV	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	IV	1
Mourning Dove	*Zenaida macroura*	terr	resident	DS, IV	14
White-winged Dove	*Zenaida asiatica*	terr	resident	DS,GN	2
Barn Owl	*Tyto alba*	terr	resident	IV	1
Lesser nighthawk	*Chordeiles acutipennis*	air	resident	DS,GN,IV	7
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	DS,IV	2
White-throated Swift	*Aeronautes saxatalis*	air	resident	IV	1
Costa's Hummingbird	*Calypte costae*	air	resident	DS	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	IV	1
Northern Flicker	*Colaptes auratus*	terr	resident	IV	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	DS,IV	2
Say's Phoebe	*Sayornis saya*	air	resident	GN	2
Black Phoebe	*Sayornis nigricollis*	air	resident	DS	1
Loggerhead shrike	*Lanius ludovicianus*	terr	resident	DS,IV	5
Warbling Vireo	*Vireo gilvus*	terr	migrant	IV	1
Common Raven	*Corvus corax*	terr	resident	DS,IV	3
Horned Lark	*Eremophila alpestris*	terr	migrant	DS	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	DS,GN,IV	5

SPECIES		Zone	Residency	Sites	MNI
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	GN	5
No. Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	IV	2
Verdin	*Auriparus flaviceps*	terr	resident	IV	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	IV	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	IV	1
American Pipit	*Anthus rubescens*	terr	migrant	IV	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	IV	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	IV	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	IV	14
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	IV	1
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	GN	1
Townsend's warbler	*Setophaga townsendi*	terr	migrant	DS,IV	4
Yellow Warbler	*Setophaga petechia*	terr	migrant	IV	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	IV	1
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	IV	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	DS,IV	4
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	DS	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	DS,IV	4
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	DS,GN	2
Lazuli Bunting	*Passerina caerulea*	terr	migrant	IV	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	IV	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	IV	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	IV	3
Chipping Sparrow	*Spizella passerina*	terr	resident	GN,IV	4
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	DS,IV	4
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	DS,IV	3
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	IV	6
Pine Siskin	*Spinus pinus*	terr	migrant	IV	1
House Finch	*Carpodacus mexicanus*	terr	resident	IV	13
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	DS,IV	5
Brown-headed Cowbird	*Molothrus ater*	terr	resident	DS,GN,IV	8
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	DS	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	GN	2

Species recovered from one site: 47
two sites: 18
three sites: 5

Appendix 2. **Species with solar flux burns**

Common Name	Scientific name	
Yellow-rumped warbler	*Setophaga coronata*	12
House finch	*Carpodacus mexicanus*	10
Chipping sparrow	*Spizella passerina*	2
Unidentified warbler	*Parulidae*	2
Verdin	*Auriparus flaviceps*	2
Great-tailed grackle	*Quiscalus mexicanus*	2
Lucy's warbler	*Oreothlypis luciae*	1
Wilson's warbler	*Cardellina pusilla*	1
MacGillivray's warbler	*Oporornis tolmei*	1
Black-throated gray warbler	*Setophaga nigrescens*	1
Townsend's warbler	*Setophaga townsendi*	1
Orange-crowned warbler	*Oreothlypis celata*	1
Blue-gray gnatcatcher	*Polioptila caerulea*	1
Unidentified swallow	*Hirundinidae*	1
Northern rough-winged swallow	*Stelgidopteryx serripennis*	1
Warbling vireo	*Vireo gilvus*	1
Unidentified hummingbird	*Selasphorus sp.*	1
Unidentified passerine	Passeriformes	1
Unidentified finch	*Carpodacus sp.*	1
Lazuli bunting	*Passerina caerulea*	1
Unidentified sparrow	*Spizella species*	1
Unidentified blackbird	*Icteridae*	1
Peregrine falcon	*Falco peregrinus*	1

Cashen Footnote #78

DISTRIBUTION AND ABUNDANCE OF WESTERN BURROWING OWLS (*ATHENE CUNICULARIA HYPUGAEA*) IN SOUTHEASTERN CALIFORNIA

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ABSTRACT—During the 2006 and 2007 breeding seasons, we conducted a systematic survey for western burrowing owls (*Athene cunicularia hypugaea*) across the portions of California's southeastern deserts that had never been systematically surveyed for the species. We found few or no western burrowing owls in northern and eastern portions of the Mojave Desert or in the Sonoran Desert (excluding Palo Verde Valley). However, there was a substantial concentration of burrowing owls in the western Mojave Desert, which we estimated to contain ≤560 (*SE* = 268) breeding pairs. We also documented 179 breeding pairs along the banks of water-conveyance structures in Palo Verde Valley in the Sonoran Desert region. These two disjunct populations comprise a significant portion of the population of burrowing owls in California.

RESUMEN—Durante las épocas de reproducción del 2006 y 2007, se realizó un estudio sistemático de tecolotes llaneros occidentales (*Athene cunicularia hypugaea*) de las zonas de los desiertos del sudeste de California que nunca habían sido muestreados sistemáticamente para esta especie. Encontramos pocos o ningún tecolote llanero occidental ni en las partes nortes y orientales del desierto Mojave ni en el desierto Sonora (excluyendo el valle de Palo Verde). Sin embargo, encontramos una concentración notable de tecolotes llaneros en la parte occidental del desierto Mojave, que se estimó contener <560 (*SE* = 268) parejas reproductoras. Asimismo, documentamos 179 parejas de tecolotes llaneros en las orillas de las estructuras de conducción de agua en el valle Palo Verde del desierto Sonora. Estas dos poblaciones separadas de tecolotes llaneros comprenden una parte significativa de la población total de California.

The western burrowing owl (*Athene cunicularia hypugaea*) has declined in recent decades across much of its range (Wedgwood, 1978; James and Ethier, 1989; Sheffield, 1997*a*; Holroyd et al., 2001; Wellicome and Holroyd, 2001; DeSante et al., 2007), including California, where it is classified as a species of special concern (Gervais et al., 2008; Shuford and Gardali, 2008). Primary causes of the decline likely have included loss of grassland and agricultural habitats to urbanization (Trulio and Chromczak, 2007) and conversion of lands to inhospitable crops, such as orchards and vineyards (Gervais et al., 2008). Populations in Imperial Valley and in some other areas of the state, where agricultural practices permit, thrive at much higher densities than populations in natural grasslands (DeSante et al., 2004). Other suggested causes of decline include eradication of fossorial mammals (Zarn, 1974; Holroyd et al., 2001; J. V. Remsen, Jr., in litt.) and exposure to pesticides and other contaminants (Haug et al., 1993; Sheffield, 1997*b*; Gervais and Anthony, 2003). Each of these factors, and potentially others, may be important in California, which hosts one of the largest populations of western burrowing owls of any state or Canadian province (Barclay, 2007).

Excluding the desert and Great Basin regions, DeSante et al. (2007) estimated the breeding population in California was 9,266 pairs in 1993. Although burrowing owls occupy the vast deserts of southeastern California (Garrett and Dunn, 1981), estimates of size of populations for these areas based on systematic surveys have not been published. Anecdotal information indicates that burrowing owls generally are scarce in the region, particularly in easternmost portions (Garrett and Dunn, 1981), and that a substantial concentration occurs along the Colorado River in Palo Verde Valley (Gervais et al., 2008). However, quantitative, survey-based estimates of size of populations and knowledge of distributional patterns are needed for prioritizing conservation efforts in California (Burkett and Johnson, 2007).

During the breeding seasons of 2006 and 2007, as part of a larger California-wide survey (Wilkerson and Siegel, 2010), we conducted a systematic survey of portions of the deserts in southeastern California, which had not been surveyed previously. We used results of our survey to characterize patterns of distribution and abundance throughout the region and to estimate size of populations.

Materials and Methods—We divided previously unsurveyed portions of the breeding range of burrowing owls in southeastern California into four regions: northern Mojave Desert-eastern Sierra Nevada, western Mojave Desert, eastern Mojave Desert, and Sonoran Desert. We excluded Imperial and Coachella valleys because they were surveyed previously by DeSante et al. (2007). Following methods used by DeSante et al. (2007), we used ArcGIS software to divide the four regions into 5 by 5-km blocks, oriented and referenced according to the Universal Transverse Mercator (UTM) system. Surveying effort was stratified by elevational subregion because populational densities of burrowing owls generally are higher in lowland areas throughout California than in upland areas (DeSante et al., 2007). For logistical reasons, we discarded blocks that could not be accessed by roads, and then we stratified sampling effort among remaining blocks by region and subregion, randomly selecting as many blocks as we believed our field crew could survey within the time allotted in each region. We also identified additional historic breeding blocks where burrowing owls had been detected during any year beginning in 1981. Historic breeding blocks were identified by querying the California Natural Diversity Database (California Department of Fish and Game, in litt.) and consulting with knowledgeable researchers and birders with local expertise.

Boundaries of our northern Mojave Desert-eastern Sierra Nevada region corresponded to portions of Inyo and Mono counties in the Jepson areas mapped as Mojave Desert and eastern Sierra Nevada by Hickman (1993) and the California Gap Analysis Project (1998), along with a small, disjunct, but ecologically similar area southeast of Topaz Lake. We divided this region into lowland and upland subregions. Any block with $\geq$5% of land area <1,220 m elevation was included in the lowland subregion. Blocks with >95% of elevation >1,220 m were included in the upland subregion. The 1,830-m elevational contour was the upper limit for inclusion in the upland subregion; blocks with <5% of their area <1,830 m elevation were excluded from sampling. These elevational boundaries were somewhat higher than those established for other regions by DeSante et al. (2007), reflecting overall higher elevation of most land in eastern California.

Our western Mojave Desert region was bounded by the Transverse Range and Sierra Nevada, but it also included areas of the Kern Plateau at elevations <1,830 m. Except for inclusion of the Kern Plateau, boundaries matched those of the western portion of the Jepson area mapped as Mojave Desert by Hickman (1993) and the California Gap Analysis Project (1998). East of the Sierra Nevada, the border of Inyo County defined the northern boundary. Stratification by elevation in the western Mojave Desert region was the same as in the northern Mojave Desert-eastern Sierra Nevada region.

Our eastern Mojave Desert region was limited primarily to the eastern one-half of San Bernardino County, south of Inyo County to the Nevada-California state line. Boundaries match those of the southeastern portion of the Jepson area mapped as Mojave Desert by Hickman (1993) and the California Gap Analysis Project (1998). In southeastern San Bernardino County, from Cadiz Valley eastward, the eastern Mojave Desert region shares an irregular zig-zag border with the Sonoran Desert region to the south. Stratification by elevation in the eastern Mojave Desert region was the same as in the northern Mojave Desert-eastern Sierra Nevada region.

Boundaries of our Sonoran Desert region matched the Jepson area mapped as Sonoran Desert by Hickman (1993) and California Gap Analysis Project (1998), excluding Coachella and Imperial valleys, which bisect the region into two disjunct portions. The minimal land area in the Sonoran Desert region >1,220 m elevation was rocky and mountainous; characteristics that made it inhospitable habitat for burrowing owls. Thus, we did not survey an upland subregion in this region; any block with $\geq$5% land area <1,220 m elevation was included in the region.

After an intensive training session at the beginning of each field season, crew members surveyed blocks using methods developed by DeSante et al. (2007). Surveyors visually scanned all of the accessible area in their blocks at least once during morning (dawn to 1000 h) or late-afternoon (1600 h to dusk) during 1 May–30 June 2006 and 2007, when breeding burrowing owls were likely to be feeding nestlings or recently fledged young.

We provided surveyors with 1:24,000-scale topographic maps with boundaries of blocks and locations of burrowing owls known or suspected to have bred anytime beginning in 1981. Surveyors delineated extent of appropriate habitat in their block, used binoculars or spotting scopes to visually scan all areas of appropriate habitat, and plotted locations of any detections on their maps. Observers could survey habitat on foot, by automobile, or using both methods, but when surveying by automobile they were instructed to stop at least every 800 m, exit the vehicle, and scan in all directions. For each detection, surveyors provided a count of burrowing owls seen (identified to age and sex when possible) and the number of breeding pairs those individuals were believed to represent. For counts of pairs, observers were instructed to assume that lone adults had unseen mates, and represented pairs. Surveyors provided a detailed assessment of how much of each block they surveyed adequately. In some instances, this was well under 100%, due to lack of access to private property or physiographic barriers.

We estimated number of breeding pairs of burrowing owls in each subregion and region. We calculated minimum number of breeding pairs on each randomly selected block that we surveyed as the quotient of number of pairs counted divided by area of the block that was surveyed adequately. We then averaged minimum densities of populations across randomly selected blocks surveyed in each subregion. Estimates were reported with standard errors

For each subregion and region we also totaled minimum number of pairs counted, as the sum of all pairs on randomly selected blocks, all pairs on historic breeding blocks, and, in a few instances, pairs that were detected incidentally on blocks that were not officially surveyed. Because this method included data from blocks that were not randomly selected, we did not use them to extrapolate an estimate of size of population for the entire subregion or region, but rather to establish a minimum number of pairs in the subregion or region, i.e., the number of pairs actually counted.

For each subregion, we considered our best estimate of the number of pairs to be the larger of the extrapolated estimate of number of pairs, based only on results from randomly selected blocks, or the actual number of pairs counted, pooling data from randomly selected blocks and historic breeding blocks. We then summed the best estimate for each subregion to obtain best estimates of number of pairs in each region. In regions and subregions where the best estimate reflected actual number of pairs counted, or when estimated number of pairs was zero, we were unable to provide standard errors of the estimates.

RESULTS—We surveyed 38 blocks in the northern Mojave Desert-eastern Sierra Nevada region; 36 randomly selected blocks and 2 historic breeding blocks. Surveys of both random and historic breeding blocks failed to yield any burrowing owls. However, we detected one pair incidentally while traveling across an otherwise unsurveyed block ca. 5 km east of where boundaries of Kern, Inyo, and San Bernardino counties converge. Because no burrowing owl was detected in randomly selected or historic breeding blocks in this region, our random-sample-based estimates of size of populations for both lowland and upland subregions was zero. However, one pair was detected incidentally on a lowland block, so our best estimate for the lowland subregion (Table 1) is the minimum number of pairs we counted, i.e., one pair. Our best estimate for the upland subregion is zero pairs and our best estimate for number of pairs in the entire northern Mojave Desert-eastern Sierra Nevada region also was the minimum number of pairs we counted, i.e., one pair.

We surveyed 67 blocks in the western Mojave Desert region; 48 randomly selected blocks and 19 historic breeding blocks. Surveys of random blocks yielded 25 pairs and surveys of historic breeding blocks yielded 79 pairs, for a total of 94 pairs of burrowing owls detected in the region. In the 42 randomly selected, lowland blocks we surveyed, we detected 25 pairs, yielding a random-sample-based estimate of 560 ± 268 pairs throughout the lowland subregion (Table 1). This estimate was greater than the total number of pairs detected in the lowland subregion (25 pairs on randomly selected blocks plus 79 pairs on historic breeding blocks), so it serves as our best estimate for pairs in the lowland subregion. No burrowing owl was detected on randomly selected upland blocks in the region, so our best estimate for the upland subregion was zero pairs, and our estimate for the entire western Mojave Desert region was 560 ± 268 pairs. However, pairs we detected were clustered mostly in Antelope, Apple, and Lucerne valleys, where agriculture and residential areas generally were more concentrated than elsewhere in the region. Although we also detected a few pairs northward as far as Ridgecrest and eastward to Barstow, extrapolating results from these three valleys across the region as a whole may have overestimated the number of pairs in the region. Conversely, because we did not survey all blocks within the three valleys where we detected numerous pairs, and because we did detect numerous pairs on random blocks elsewhere in the region, our minimum count of 94 pairs in the region is an underestimate of the actual size of population. Actual number of pairs may be between our extrapolated best estimate of 560 pairs and the minimum count of 94 pairs.

We surveyed 45 blocks in the eastern Mojave Desert region; 43 randomly selected blocks and two historic breeding blocks. Surveys of random blocks yielded one pair of burrowing owls in the southeastern portion of the region, while surveys of historic breeding blocks yielded none, for a total of one pair detected in the region. In the 41 randomly selected lowland blocks, we located one pair of burrowing owls, yielding a random-sample-based estimate of 32 ± 32 pairs throughout the lowland subregion. Because we detected no pair on the two lowland-historic-breeding blocks, our best estimate for the lowland subregion was 32 ± 32 pairs. None was detected on the six randomly selected upland blocks in the region and there was no upland-historic-breeding block to survey, so our best estimate for the upland subregion was zero pairs. Our

TABLE 1—Number of blocks surveyed, number of pairs of western burrowing owls (*Athene cunicularia hypugaea*) detected, and estimates of size of populations in desert regions of southeastern California, 2006–2007.

		Random and historic breeding blocks			Random blocks only					
Region	Total area of region (km²)	Number of blocks surveyed	Km² surveyed (percentage of region)	Number of pairs detected	Number of blocks surveyed	Km² surveyed (percentage of region)	Number of pairs detected	Mean number of pairs per block (*SE*)	Estimated number of pairs (*SE*)	Best estimate of number of pairs (*SE*)
Northern Mojave Desert-eastern Sierra Nevada										
Lowland	17,731	28	432 (2.4)	1	28	431 (2.4)	0	0.00	0	1
Upland	7,826	10	153 (2.0)	0	8	103 (1.3)	0	0.00	0	0
All	25,557	38	585 (2.2)	1	36	534 (2.1)	0	0.00	0	1
Western Mojave Desert										
Lowland	23,525	61	1,362 (5.8)	94	42	902 (3.8)	25	0.60 (0.29)	560 (268)	560 (268)
Upland	1,725	6	128 (7.4)	0	6	128 (7.4)	0	0.00	0	0
All	25,250	67	1,490 (5.9)	94	48	1,030 (4.1)	25		560 (268)	560 (268)
Eastern Mojave Desert										
Lowland	31,767	42	825 (2.6)	1	40	775 (2.4)	1	0.03 (0.03)	32 (32)	32 (32)
Upland	2,037	3	55 (2.7)	0	3	55 (2.7)	0	0.00	0	0
All	33,804	45	880 (2.6)	1	43	830 (2.5)	1		32 (32)	32 (32)
Sonoran Desert										
All	18,470	47	751 (4.1)	179	31	413 (2.2)	18	0.58 (0.58)	429 (429)	179

estimate for number of pairs in the entire eastern Mojave Desert region was 32 ± 32 pairs.

We surveyed 47 blocks in the Sonoran Desert region; 31 randomly selected blocks and 16 historic breeding blocks. We considered the entire region to be lowland. Surveys of random blocks yielded 18 pairs of burrowing owls, all in one block in Palo Verde Valley, while surveys of historic breeding blocks yielded 161 pairs (distributed across 14 contiguous blocks in Palo Verde Valley), for a total of 179 pairs detected in the region. In the 31 randomly selected lowland blocks, we detected 18 pairs of burrowing owls, yielding a random-sample-based estimate of 429 ± 429 pairs throughout the Sonoran Desert region. However, we do not trust this estimate, because the entire count of pairs was within Palo Verde Valley. Because we fully surveyed all blocks that encompassed Palo Verde Valley (one was randomly selected and the others were historic breeding blocks), we considered our best estimate of the number of pairs in the Sonoran Desert region to be our minimum count of pairs in Palo Verde Valley, i.e., 179 pairs.

DISCUSSION—Our survey of southeastern California represents the first systematic survey to assess size of populations of burrowing owls across this portion of the state. Burrowing owls were distributed heterogeneously within the study area. We detected few or none in the northern Mojave Desert-eastern Sierra Nevada region, the eastern Mojave Desert region, and the Sonoran Desert region (excluding Palo Verde Valley). However, we detected larger aggregations of burrowing owls in the western Mojave Desert region, and in one small area of the Sonoran Desert region, i.e., Palo Verde Valley.

Our count of 179 pairs in Palo Verde Valley largely corroborated anecdotal knowledge about the area (Gervais et al., 2008). In the valley, burrowing owls comprised a substantial aggregation in an area that was contained in 15 contiguous blocks. As in Imperial Valley (DeSante et al., 2004; Rosenberg and Haley, 2004), a large population of burrowing owls nest along the banks of earthen and concrete irrigation canals and other water-conveyance structures in Palo Verde Valley.

Perhaps, the most striking result of our survey was the large number of pairs that were occupying the western Mojave Desert region. Our best estimate for number of pairs in the region is comparable to number of pairs estimated to occur in the Middle Central Valley region by DeSante et al. (2007), and is exceeded in numerical importance with respect to the statewide population only by Imperial Valley and Southern Central Valley regions (DeSante et al., 2007).

Our survey method likely contained sources of error. As DeSante et al. (2007) pointed out, the inability of observers to reliably detect all burrowing owls in surveyed areas (Conway and Simon, 2003; Conway et al., 2008), particularly in desert areas with limited access, may have biased our counts toward low estimates. Perhaps, even more problematic than relatively low probability of detection, there was the possibility that detection during our study may have varied substantially across blocks and regions. Factors such as number of access roads and physiographic characteristics could have affected the proportion of pairs in a given area that we were able to detect. An additional complication is that surveyors were unable to gain access to some military installations to conduct surveys.

Even with potential sources of error, our results indicated a high level of spatial heterogeneity in populations throughout southeastern California, particularly in the western Mojave and Sonoran desert regions. This spatial heterogeneity, combined with logistical constraints that required us to sample such a vast area, suggests that both our minimum counts and our estimates of size of populations with their large standard errors should be interpreted cautiously. Nevertheless, we believe that the broad patterns in distribution and abundance that we report are meaningful for guiding conservation planning efforts and that documenting exact locations of 275 pairs of burrowing owls will provide a useful baseline for assessing future changes.

High spatial variability, especially combined with low sampling efficiency, makes precise estimates of size of populations difficult, but it may also present opportunities for conservation. If most burrowing owls in southeastern California are concentrated in a small number of relatively restricted areas, then monitoring and safeguarding them should be easier than it would be otherwise. Occupied areas can be prioritized for conservation efforts.

Although our study was not designed specifically to identify or test conservation actions, our results have some implications for conserving burrowing owls. In Palo Verde Valley, like the much larger population in Imperial Valley, burrowing owls are highly dependent on banks of irrigation canals and other water-conveyance structures for nesting. The most important actions for safeguarding the population in Palo Verde Valley would center on maintaining the existing character of these human-made structures so that they retain their attractiveness for nesting, and managing roads and canals to minimize destruction of burrows, particularly during the breeding season. In Imperial Valley, activities associated with maintenance of roads inadvertently destroyed nests, causing direct mortality of nestlings and adults, and possibly spurring dispersal of surviving adults (Caitlin and Rosenberg, 2006).

Unlike burrowing owls in Palo Verde Valley, those we detected in the western Mojave Desert generally were not associated with water-conveyance structures, which are less common in the region. Rather, breeding sites in the western Mojave Desert that we located were concentrated in or along edges of scrublands (creosotebush *Larrea tridentata*, saltbush *Atriplex*, and desert scrub), on the periphery of urban areas, and in active or fallow agricultural fields. Conservation measures for populations in the western Mojave Desert should be focused more on maintaining and enhancing quality of desert-grassland areas and reducing introduced sources of mortality on the periphery of residential and agricultural areas. Our results demonstrate that desert regions of southeastern California comprise a significant portion of the statewide population of burrowing owls.

We thank the National Fish and Wildlife Foundation, California Department of Fish and Game, Pacific Gas and Electric Company, and an anonymous donor for funding. E. Burkett at California Department of Fish and Game supported this project in numerous ways, D. DeSante at the Institute for Bird Populations provided advice and shared knowledge, and the Esri Conservation Program provided help with software. We thank R. Young and R. Higson for providing information and logistic help, T. Ryan for coordinating surveyors, and L. William Zigmund for translating the abstract into Spanish. K. Francl, D. Rosenberg, and L. Trulio provided helpful comments on an early draft of the manuscript. We thank our field crew: M. Coolidge, I. Dancourt, C. Kaleshnik, A. LeClerc, T. McClung, A. Mohoric, R. Parsons, M. Simes, C. Villeneuve, Z. Wallace, and A. Works. This is contribution 388 of The Institute for Bird Populations.

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Response to Letter 12a

Response 12a-1

The commenter states that the Draft EIR/EA description of the setting for special status plants is inadequate and fails to establish the ecological context of the populations in the Project.

The Final EIR/EA, Chapter 3, *Biological Resources*, provides details on the species, habitat, and location setting the stage for the ecological context of the population. Additional information as is relates to the description of the species and details about the populations in the Project area are presented within the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of the Final EIR/EA.

Response 12a-2

The commenter states that the Draft EIR/EA fails to identify the potential presence of Couch's spadefoot toad and underestimates the potential for occurrence.

The Final EIR/EA acknowledges that it is difficult to be certain where this species may be present due to their long dormancies each year. Please refer to the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of the Final EIR/EA. The Couch's spadefoot toad was not observed in the Project area during surveys. Based on the literature review, database records, and field surveys the species is expected to have a low potential to occur in the Project area.

As discussed in the Final EIR/EA Chapter 3, *Biological Resources,* approximately 250 acres of the proposed solar array disturbance area is fallow (i.e., abandoned) and another approximately 404 acres consists of irrigated alfalfa. The commenter mentions that the documented occurrences of the species are located near flooded alfalfa fields and desert scrub near agricultural fields. Within the Project area, the agricultural areas have been abandoned such that native vegetation is returning, Russian thistle, Sahara mustard, and other exotic plants were observed interspersed with the native vegetation. Suitable habitat is not known to be present within the alfalfa fields as mentioned in Chapter 3, *Biological Resources*, Table 3.2.4-3 on page 3-61 of the Final EIR/EA. Because of the lack of habitat, lack of consistent water, and the closest record of occurrence located approximately three miles from the Colorado River Substation, the potential for occurrence is low.

Response 12a-3

The commenter states that Figure 3.2.4-3 fails to show burrowing owl sign that is identified and depicted in the *Western Burrowing Owl Survey Report* Appendix C3.

Figure 3.2.4-3, in Chapter 3 of the Final EIR/EA, will be updated to include the burrowing owl sign that was depicted in Appendix C3 of the Final EIR/EA. The changes to Figure 3.2.4-3 do not affect the overall conclusions of the environmental analysis relative to the significance of impacts. Please refer to page 40 the Errata in Response to Comments section of this Final EIR/EA document which reflects this revision.

Response 12a-4

The commenter identifies conflicting information regarding presence or absence of Nelson's bighorn sheep within the Project area.

This comment has been acknowledged and Table 3.2.4-3 will be updated to be consistent with other portions of the Final EIR/EA which indicate a bighorn sheep skull was located within the Project area.

Please refer to page 40 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these revisions to the text.

Response 12a-5

The commenter identifies conflicting information regarding presence or absence of the ferruginous hawk within the Project area.

Please refer to page 40 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these revisions to the text.

Response 12a-6

The commenter states that the Draft EIR/EA does not have a scientific basis to conclude that impacts to special-status plants would be less than significant simply based on implementation of BMP-13, BMP-14, BMP-15 and BMP-19.

The impacts determination is based on data collected on plant species during the database search and protocol-level special-status plant surveys conducted in the Spring of 2011 (refer to the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of this Final EIR/EA). In 2009 and 2010, supplemental field data was collected within and around the gen-tie line to further understand potential impacts to special status plant species.

In addition to the implementation of BMP-13, BMP-14, BMP-15, and BMP-19 as noted by the commenter, Mitigation Measure Biology-3 will be implemented. This includes measures to avoid and minimize impacts, to the greatest extent possible, to special-status plant species that are found to be present during the preconstruction surveys. This includes avoiding unnecessary or unauthorized trespass by workers and equipment, staging and storage of equipment and materials, refueling activities, and littering or dumping debris in areas known to contain special-status plant species that are not within the designated construction footprint.

Response 12a-7

The commenter states that the Draft EIR/EA description of the setting for special status plants is inadequate and fails to establish the ecological context of the populations in the Project.

The Final EIR/EA, Chapter 3, *Biological Resources*, provides details on the species, habitat, and location setting the stage for the ecological context of the population. Additional information as is relates to the description of the species and details about the populations in the Project area are presented within the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of the Final EIR/EA.

Response 12a-8

The commenter states that the Draft EIR/EA fails to discuss potential impacts to Couch's spadefoot toad.

The Final EIR/EA acknowledges that it is difficult to be certain where this species may be present due to their long dormancies each year. Please see the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of the Final EIR/EA. However, Couch's spadefoot toad was not observed in the Project area during surveys. Based on the literature review, database records, and field surveys the species is expected to have a low potential to occur in the Project area. The commenter states that noise from the Project construction has the potential to mimic rainfall, causing the species to seek refuge in highly unfavorable conditions. The commenter goes on to state that the species may be present near the irrigation ponds. As outlined in Chapter 3 of Final EIR/EA, *Biological Resources*, Table 3.2.4-3 on page 3-61, the species has a low potential to occur based on the literature review, database records and field surveys. The field surveys included review of the irrigation ponds with no species found. Outlined in the Biological Best Management Practices, Chapter 4 of the Final EIR/EA, applicable BMPs would minimize potential impacts to all biological resources.

Response 12a-9

The commenter states the Draft EIR/EA fails to adequately evaluate potential impacts to burrowing owls from closure of burrows or to identify sufficient mitigation measures. The commenter goes on to state that passive relocation is a potentially significant impact that must be analyzed under CEQA.

Please see Response 12-58.

Response 12a-10

The commenter states that the Draft EIR/EA fails to describe the distribution and status of Mojave fringe-toed lizard populations in the region thus precluding the ability to evaluate the significance of Project impacts to the population along the gen-tie line corridors. The commenter goes on to state that results from other projects should be considered.

Please refer to pages 40, 41, and 42 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these revisions to the text. The Biological Resources Section 4.2.4 of the Final EIR/EA has been updated to include quantifying the direct loss of habitat and potential indirect effect to habitat adjacent to and downward (east of the southwestern-most generation site parcel).

Response 12a-11

The commenter states that the gen-tie line and access road would fragment a large population of Mojave fringe-toed lizard and would greatly increase the risk of range contraction and local extirpation. The commenter goes on to state that mitigation measures have not addressed these issues.

The Biological Resource Section 4.2.4 of the Final EIR/EA has been revised to include discussion on the potential indirect effect to habitat. Refer to Response 3-9 for additional details on this topic.

In response to the mitigation measure comment, the implementation of BMP-19 would reduce potential impacts from construction activities. Mitigation Measure Biology-1 (Monitor Construction Site for Biological Compliance) and Mitigation Measure Biology-8 (Protect Mojave fringed-toed lizard) would be implemented to reduce the potential direct and indirect impacts to the Mojave fringed-toed lizard. The listed measures above were developed in coordination with the BLM and the County to protect this species and address potential direct and indirect impacts to the Mojave fringed-toed lizard.

Response 12a-12

The commenter states that cumulative projects considered would remove or degrade a large amount of habitat for Mojave fringe-toed lizard habitat which would have severe implications on the persistence of the overall metapopulation in the Chuckwalla Valley.

The Biological Resource Section 4.2.4 of the Final EIR/EA has been revised to include discussion on the potential indirect effect to habitat. Refer to Response 3-9 for additional details on this topic.

Response 12a-13

The commenter states that Mojave fringe-toed lizard populations are known to be susceptible to adverse effects from habitat fragmentation, edge effects, and anthropogenic disturbance.

As outlined in the BBCS Appendix C4 of the Final EIR/EA, the gen-tie line shall be designed to discourage their use by raptors for perching (e.g., by use of anti-perching devices). This design would minimize avian risk and would provide the added benefit of not increasing the potential for increased predation of special-status species such as the Mojave fringe-toed lizard by not creating structures that enhance perching or nesting opportunities for ravens and other avian predators. The Biological Resources Section 4.2.4 of the Final EIR/EA has been updated to include analysis of the impacts of edge effects on Mojave fringe-toed lizards. Please refer to pages 46, 47 and 48 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 12a-14

The commenter states that the Draft EIR/EA lacks any quantitative analysis of cumulative impacts to the Mojave fringe-toed lizard and yet makes the conclusion that effects would be reduced to less than significant levels through mitigation.

Please refer to pages 48 and 49 of the Errata in Response to Comments section of this Final EIR/EA document which provides more details regarding effects to the Mojave fringe-toed lizard.

Response 12a-15

The commenter states that the Draft EIR/EA contains inaccurate statements regarding the collision risk to birds.

The same information is reported in the Final EIR/EA as the National Fish and Wildlife Forensics Laboratory 2014 paper and they do not contradict. The fatalities reported are available online for each of the projects cited in the Final EIR/EA and the National Fish and Wildlife Forensics Laboratory. The Final EIR/EA focused on the results of confirmed impacts by collision.

Response 12a-16

The commenter states that while the Project will not have evaporation ponds, the northern portion of the Project is located immediately adjacent to 2 sewage treatment ponds and 2 other ponds of unknown use which are known to attract an abundance of birds and, therefore, the Project should not discount the potential for attraction of birds to the area.

The project area has a long history of human use and disturbance with dominant land uses consisting of agricultural fields and citrus orchards, residences, Blythe Municipal Airport, Blythe Energy Center, electrical transmission lines, an interstate highway, and commercial businesses. Within this matrix of human development and disturbance some patches of open desert habitat remain in the form of creosote bush scrub and desert riparian wash. Avian species may utilize the existing sewage pond adjacent to the project and other ponds around the project area; however habituation of avian species to this existing disturbed area has reduced potential new impacts to the species with the implementation of the project. In general; projects sited in undisturbed habitat bring potential new risk for avian collision due to the projects' facilities, power lines, evaporation ponds, and roadways. Projects sited in and near disturbed habitat bring less risk of avian collision.

An Avian and Bat Protection Plan has been developed with consideration and guidance from the data and suggestions presented in the *USFWS Region 8 Interim Guidelines for the Development of a Project-*

specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities, and the Avian Power Line Action Committee's *Mitigating Bird Collisions with Power Lines: The State of Art in 1994*, *Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State if the Art in 2006*. As part of the adaptive management process outlined in the BBCS, Appendix C4 of the Final EIR/EA, BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk.

Response 12a-17

The commenter states that the Draft EIR/EA provides the unsubstantiated statement that solar projects in undisturbed habitat would be expected to host a greater number of avian species than the Project site. The commenter goes on to state that, as the point count surveys were not conducted, abundance in the Project area is unknown, but that despite this uncertainty, the Project will undoubtedly kill birds.

Little empirical data is available to determine what sites will host a greater number of avian species. However, the USFWS has confirmed that the existing site is degraded and is a less environmentally valuable site that minimize impacts to biological communities and ecological processes (UWFWS 2014 comment letter). During informal consultations with USFWS, it was requested that this Project collect migratory species data from surrounding projects, Cibola National Wildlife Refuge, the Audubon Society, among others. The goal was to look at the species, the number of species and their distribution over the years to understand the potential effects, direct and indirect, this Project might have on migratory species (refer to the *Biological Resources Technical Report* in Appendix C1 and the *Blythe Mesa Solar Project 230 kV Transmission Line Alternative Habitat Assessment Report* in Appendix C2 of this Final EIR/EA).

Conducting a point count survey would only provide a snapshot of the migratory species potentially utilizing the site and the use by these species and numbers of species would vary widely each year. The data collected for this project instead looks at migratory species recorded in the area over the past 10 years and provides a far more relevant accounting of the species that may use the project than seasonal point count surveys. The Project has collected data from three various locations, the Colorado River, the Lower Colorado River Valley - including Blythe and farther west to the Palo Verde Mesa which is where the Project site is located. The various locations provide information on the distribution of species over several years to understand the potential use of migratory species on the Project site.

Based on a review of available information, studies conducted for nearby projects, reconnaissance surveys and protocol surveys conducted as part of impacts assessment for the BMSP, no federally-listed or state listed bird species were detected at the Project site or are expected to find habitat at the Project site. Three non-listed special-status avian species or their sign were detected on site. These were the western burrowing owl, Le Conte's thrasher, and loggerhead shrike; however suitable habitat for these species occurred within the gen-tie line corridor or outside the 2,123 acres of agricultural lands proposed for the solar array site. Habitat destruction is thought to cause greater reductions in bird and other wildlife populations than any other factor, and is still the most serious long-term threat (APLIC 2006). The PV solar arrays for the project will be developed within an existing disturbed area with little avian habitat (due to previous long-term land disturbance). The implications of this are that the project site provides little habitat for bird species, and the general site selection on previously disturbed ground, proximate to freeways, airport and natural gas power plant, reduces potential impacts or risk due to collision based on the habituation of avian species to this disturbed area. The activities associated with the agricultural land limit birds from actively using the land for purposes other than foraging.

An Avian and Bat Protection Plan has been developed with consideration and guidance from the data and suggestions presented in the *USFWS Region 8 Interim Guidelines for the Development of a Project-*

specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities, and the Avian Power Line Action Committee's *Mitigating Bird Collisions with Power Lines: The State of Art in 1994, Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State if the Art in 2006*. As part of the adaptive management process outlined in the BBCS, Appendix C4 of the Final EIR/EA, BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk.

Response 12a-18

The commenter states that the Project area currently contains 6 irrigation ponds that provide accessible fresh water for wildlife and that the Draft EIR/EA does not identify the species that use the ponds or the impacts to wildlife once the ponds are filled or inaccessible by Project fencing.

The agricultural use of the Project area would cease operation and as a result the existing irrigation ponds would no longer be maintained. The Biological Resource Section 4.2.4 of the Final EIR/EA has been updated to include discussion on the irrigation ponds and potential impacts to wildlife. Please refer to page 49 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these revisions to the text.

Response 12a-19

The commenter states that the only mitigation measure for special-status plants (Biology-3) does not reduce Project impacts to a less-than-significant level.

As noted in Chapter 3, *Biological Resources*, page 3-55, no state or federally listed species were detected. With the implementation of BMP-13, BMP-14, BMP-15, BMP-19 and Mitigation Measure Biology-3 measures to avoid and minimize impacts, to the greatest extent possible, to special-status plant species that are found to be present during the preconstruction surveys will reduce impacts to less-than significant. The measures include avoiding unnecessary or unauthorized trespass by workers and equipment, staging and storage of equipment and materials, refueling activities, and littering or dumping debris in areas known to contain special-status plant species that are not within the designated construction footprint.

Response 12a-20

The commenter states that Biology-3 directs pre-construction surveys for state and federally listed plants; however, according to the Biological Resources Technical Report, no state or federally listed plants have the potential to occur in the Project area. The commenter goes on to state that pre-construction surveys should cover every plant taxon, not just special-status species, and should include documentation of plants with a Rare Plant Rank of 1 or 2.

As noted in Chapter 3, *Biological Resources*, page 3-46, the protocol-level special-status plant surveys conducted in the Spring of 2011 was a dry year and therefore the survey data was supplemented by a records search from surrounding projects that overlapped with the study area. However, in coordination with regulatory agencies, USFWS, BLM and the County it was determined that despite no state or federally listed plant species occurring in the Project area, additional pre-construction surveys shall be implemented to further avoid potential impacts to special-status species.

Refer to Chapter 3, Biological Resources Methodology Section, starting on page 3-42 for the Project's definition of special-status species. As listed in this section California Rare Plant Ranking System (CPRS)

List 1 and 2 species are considered special-status since these are the only CPRS species that meet CEQA's definition of "rare" or "endangered" (14 CCR §15380).

Response 12a-21

The commenter states that the Draft EIR/EA fails to establish any circumstances under which special-status plants *must* be avoided. The commenter goes on to state that it should be feasible to make slight modifications to the gen-tie line and associated features to reduce impacts to special-status plants.

Refer to Chapter 4, Mitigation Measure Biology-3, pages 4-142 and 4-143, the removal of special-status plant species and native vegetation shall be avoided and minimized to the maximum extent practicable. This includes preconstruction surveys conducted for State and federally listed Threatened and Endangered, Proposed, Petitioned, and Candidate plants in a 250-foot radius around all areas subject to ground-disturbing activity including, but not limited to, tower pad preparation and construction areas, solar facilities, pulling and tensioning sites, assembly yards, and areas subject to grading for new access roads. The surveys would be conducted by an authorized plant ecologist/biologist according to protocols established by the USFWS, CDFW, BLM, and CNPS. Measures include avoiding unnecessary or unauthorized trespass by workers and equipment, staging and storage of equipment and materials, refueling activities, and littering or dumping debris in areas known to contain special-status plant species. The proposed gen-tie line is paralleling existing lines and utilizing existing access roads which will further avoid potential impacts to special-status species. As noted above avoidance of special-status plant species will include staging areas.

Response 12a-22

The commenter states that the Draft EIR/EA lacks any compensatory mitigation for impacts to special-status plants. The commenter goes on to point out that the CEC concluded the Blythe Solar Power Project required compensatory mitigation.

The two special-status species of concern within the project area is the Harwood's woollystar, a CRPR 1B.2 (rare, threatened, or endangered in California and elsewhere) species and Harwood's milk-vetch (*Astragalus insularis* var. *harwoodii*), a CRPR List 2.2 species. These two species are considered special-status since they are CRPR List 1 and 2 species and meet CEQA's definition of "rare" or "endangered" (14 CCR §15380). However, they are not listed as state or federally species and therefore compensation mitigation is not a requirement under the California Endangered Species Act, Section 2081, or the Federal Endangered Species Act.

As noted above the commenter states that the CEC concluded the Blythe Solar Power Project require compensatory mitigation for special-status plants which included potential affects to the Harwood's woollystar and Harwood's milk-vetch. However, the commenter fails to mention that in addition to the two special-status species listed above the Blythe Solar Power Project also has the potential to affect 12 additional special-status plant species, including one federally listed species.

Based on the difference in the total numbers of special-status species with the potential to be impacted, 14 special-status plant species for Blythe Solar Power Project and only 2 special-status plant species for the proposed Project the need for compensatory mitigation is not warranted or required by CESA, ESA, or BLM on this project.

Response 12a-23

The commenter states that the mitigation proposed in the Draft EIR/EA are insufficient to reduce impacts to burrowing owl to a less-than-significant level.

The Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4, Burrowing Owl Protection; on page page 4-143 of the Final EIR/EA was prepared following the *2012 California Department of Fish and Wildlife [formally CDFG] Staff Report on Burrowing Owl Mitigation*.

Response 12a-24

The commenter states that the proposed process for reducing burrowing owl buffer distances has flaws and does not provide effective mitigation. The commenter goes on to state that the Draft EIR/EA provides no evidence that burrowing owl buffer distances shorter than the ones recommended by CDFW are effective; therefore, buffers consistent with CDFW guidelines should be utilized.

As noted in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4, the buffer distance was recommended by CDFW. Refer to page 9 of *2012 California Department of Fish and Wildlife [formally CDFG] Staff Report on Burrowing Owl Mitigation* document, which describes how buffer distances should be based on existing vegetation, human development, and land uses in the area. This information was included in the Burrowing Owl Monitoring and Mitigation Plan as quoted by the commenter. In addition, as outlined in the Burrowing Owl Monitoring and Mitigation Plan decisions will be made with input from pertinent regulatory agency staff in a timely manner to ensure the protection of the burrowing owl.

Response 12a-25

The commenter states that the Draft EIR/EA provides no assurances that the Applicant's "approved Biologist" would be as qualified as the experts that established the burrowing owl buffer guidelines or that the biologist would have the expertise to reduce buffers without adversely affecting burrowing owls.

As outlined in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4 of the Final EIR/EA, the "approved biologist" must be approved by the County of Riverside, CDFW, and BLM before they can conduct burrowing owl surveys or monitoring. Refer to page 17 of the Burrowing Owl Monitoring and Mitigation Plan.

Response 12a-26

The commenter states that burrowing owl buffers should not be reduced as buffer sizes are dependent upon the level of disturbance and the sensitivity of the individual owls. The commenter goes on to state that construction activities associated with the Project will cause a high level of disturbance and cites the Project's Western Burrowing Owl Mitigation Plan where it is stated that the owls are easily distressed and flushed.

As outlined in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4 of the Final EIR/EA, all level of disturbance buffers are included and will be based on location, time of year and topography. In addition, as outlined in the Burrowing Owl Monitoring and Mitigation Plan decisions will be made with input from pertinent regulatory agency staff in a timely manner to ensure the protection of the burrowing owl.

Response 12a-27

The commenter states that actions associated with screening burrows may result in adverse effects to the owls such as displacement, flushing, and decreased survivorship.

Avoidance is the primary focus of the mitigation for this project. Should the implementation of burrowing owl buffers be required and as outlined in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4 of the Final EIR/EA, decisions will be made with input from pertinent regulatory agency staff in a timely manner to ensure the protection of the burrowing owl.

Response 12a-28

The commenter states that CDFW guidelines state that reduced burrowing owl buffer distances need to be accompanied by a “broad-scale, long-term, scientifically-rigorous monitoring program” which the Draft EIR/EA does not implement.

Refer to comment 12a-27. Should the implementation of burrowing owl buffers be required and as outlined in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4 of the Final EIR/EA, decisions will be made with input from pertinent regulatory agency staff in a timely manner to ensure the protection of the burrowing owl. It should also be noted that a monitoring program is included within the Burrowing Owl Monitoring and Mitigation Plan and outlined below.

Summary of Section 3.5.3 of the Burrowing Owl Monitoring and Mitigation Plan

- Monitoring of the mitigation site and vegetation will be implemented to ensure the appropriate maintenance for the mitigation site and that persistence of the burrowing owls on site is successful and long-term (CDFW 2012). Monitoring of the site will occur four times per year for a two-year program. Two visits will be conducted during the breeding season, and the other two visits will be conducted during the non-breeding season to evaluate the burrowing owl use of the artificial burrows or other natural burrows. The approved Biologists will also document site conditions within the mitigation area(s) with photographs and a monitoring memo report that will be provided to the maintenance contractor following each visit. The monitoring memo will include specific guidance in the form of a list of necessary maintenance within the mitigation area(s).

Response 12a-29

The commenter states that the Draft EIR/EA indicates 146 acres of compensation habitat is present for burrowing owls, but fails to identify how the compensation lands will be protected in perpetuity or the mechanism that will ensure the lands are managed for burrowing owls.

Biology-4 has been updated for clarity. Please refer to page 49 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 12a-30

The commenter states that the 146 acres identified as compensatory habitat is incorrect based on the California Burrowing Owl Consortium recommendations and would not “fully mitigate” impacts to 1,970 acres of burrowing owl habitat.

The Burrowing Owl Monitoring and Mitigation Plan was prepared following the *2012 CDFW Staff Report on the Burrowing Owl Mitigation*. As noted within the *2012 CDFW Staff Report on the Burrowing Owl Mitigation*, this document replaces the Department of Fish and Game 1995 Staff Report on Burrowing Owl Mitigation.

The current CDFW guidance does not set a specific habitat compensatory ratio; however, CDFW does request that the lands be within 50-100 meters and comparable to or better than the impact area. CDFW also suggests that the mitigation lands may require habitat enhancements. The Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4, Burrowing Owl Protection, on page 4-143 of the Final EIR/EA, was prepared following the *2012 CDFW Staff Report on the Burrowing Owl Mitigation* and addresses all of the current CDFW guidelines on compensatory habitat.

To address the commenter's comment regarding the ineffectiveness of the habitat replacement, because CDFW no longer suggests a habitat ratio the California Burrowing Owl Consortium habitat ratio guidelines were used as a basis to determine the minimum amount of habitat potentially required. However, this was the minimum amount and an additional 131 acres were identified for a total of 277 acres. It should also be noted that the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measures Biology-4, will not only be consistent with the CDFW current guidelines, but will also be developed in consultation with CDFW.

Response 12a-31

The commenter states that the additional 131 acres of habitat compensation lands lack the attributes that would make them suitable for burrowing owl occupancy.

As outlined in the Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4, Burrowing Owl Protection, on page 4-143 of the Final EIR/EA, the additional 131 acres are available if needed, however, 146 acres have been identified as the preferred mitigation lands based on proximity and habitat available. The total of 277 acres of potential mitigation lands were identified as sufficient and adjacent to, or near the project site as required by the *2012 CDFW Staff Report on the Burrowing Owl Mitigation,* on page 12.

Response 12a-32

The commenter states that the Draft EIR/EA's trigger for establishing the need for compensatory habitat is incorrect as pre-construction surveys should be utilized for this purpose. The commenter goes on to state that as burrowing owls have been detected on the Project site within the past three years, per CDFW guidelines, compensatory mitigation is required regardless of the results of the pre-construction surveys.

The need for compensatory mitigation is based on the protocol surveys conducted in 2011 and 2012 and guidance from the pertinent regulatory agencies; refer to Chapter 3, *Biological Resources*. Based on the 2012 CDFG Staff Report on Burrowing Owl Mitigation guidance the pre-construction surveys are required to re-evaluate the burrowing owl populations and identify active burrowing owl burrows, estimate the current number of burrowing owl individuals or pairs on site, and determine if the burrowing owls observed on site are considered breeding pairs or migrating transient birds within the Project area. The pre-construction surveys will be used to determine the total compensatory habitat required; however, the 2011 and 2012 surveys will also be considered in determining the total.

Response 12a-33

The commenter states that the Draft EIR/EA lacks clear and measurable performance standards and contingency plans to ensure successful mitigation for burrowing owls. The commenter goes on to state that monitors would be unable to distinguish between resident owls and owls evicted from the Project site and would also be unable to determine if an evicted owl has died.

The Burrowing Owl Monitoring and Mitigation Plan has been developed to describe monitoring, reporting, and management of the burrowing owl during the construction, operation and maintenance, and decommissioning of the proposed Project, as required by the BLM, CDFG, and County of Riverside. It has been prepared following the 2012 CDFG Staff Report on Burrowing Owl Mitigation, and describes a multi-tiered approach to prevent or reduce impacts during construction and operation of the Project, and provides for adjustments in response to events as they occur, including any unexpected fatalities encountered during monitoring. While avoidance measures often focus on protecting animals by making adjustments to construction activities near occupied burrows, passively relocating individuals out of harm's way to off-site locations is sometimes the best alternative. It may be necessary to passively relocate individuals out of harm's way when they are within the portion of the Project area scheduled for construction. The current CDFW guidance does not set a specific habitat compensatory ratio; however, CDFW does request that the lands be within 50-100 meters and comparable to or better than the impact area. As outlined in the Burrowing Owl Mitigation Plan, surveys will be conducted within the proposed mitigation lands to determine the most suitable location and whether the mitigation lands require habitat enhancements, as determined by a qualified biologist in accordance with standard industry practices for determining that the biological value of the mitigation lands is equal to or better than the biological value of the impacted lands. It should also be noted that protocol surveys were conducted in 2013 with no new owls detected. The previously observed owl locations from the 2011 and 2012 protocol survey were used as reference sites, but no owls were detected, either. This indicates that burrowing owls may be extirpated from the Project site. The relocation is just one strategy to protect the species; however, decisions will be made with input from pertinent regulatory agency staff in a timely manner to ensure the protection of the burrowing owl.

Should the mitigation lands be needed surveys will be conducted on all adjacent lands to ensure the mitigation lands are within the same habitat that supports the burrowing owls currently within the Project area. The 2012 CDFG guidelines will be followed to identify the location within the 146 acres to install the artificial burrows. Installation of the artificial burrows shall occur after identification of the specific relocation sites and prior to ground disturbance of heavy equipment staging. The results of the proposed relocation, including photographs and details of the vegetation and topography where the artificial burrows are proposed, will be provided to the CDFW and County of Riverside for review and approval.

Monitoring of the mitigation site and vegetation will be implemented to ensure the appropriate maintenance for the mitigation site and that persistence of the burrowing owls on site is successful and long-term (CDFW 2012). Monitoring of the site will occur four times per year for a two-year program. An adaptive management program will be implemented to help handle any unanticipated circumstances that may arise, such as measures should an owl fatality occur. Adaptive management decisions will be made with input from pertinent regulatory agency staff in a timely manner to ensure the protection of the burrowing owl.

Response 12a-34

The commenter states that one year of maintenance of artificial burrows for burrowing owls is insufficient. Biology-4 has been updated for clarity, see text below. Also, please refer to pages 48 and 49 of the Errata in Response to Comments section of this Final EIR/EA which reflects these changes to the text.

As required in the Burrowing Owl Monitoring and Mitigation Plan, maintenance of artificial burrows shall occur three to four times during the year immediately following relocation. However because monitoring of the site requires a two-year program, the maintenance of the artificial burrow has also been amended to include a two-year program. Maintenance will include weed management, trash removal, semi-annual and annual artificial burrow cleaning and maintenance, and management of vegetation height and density (especially in immediate proximity to burrows). Please refer to pages 50 and 51 of the Errata in Response to Comments section of this Final EIR/EA document which reflects the change from a one-year maintenance program to a two-year maintenance program.

Response 12a-35

The commenter states that there would be permanent loss of desert tortoise habitat which is not quantified. The commenter goes on to state that compensatory mitigation is required under the Northern and Easter Colorado Desert Coordinated Management (NECO) Plan.

As noted in Chapter 4, *Biological Resources*, in a memorandum dated November 14, 2012, the USFWS stated that the proposed Project (Alternative 1) is "not likely to incidentally take or otherwise adversely affect desert tortoise" (FWS-ERIV-12B0299-12I0497). This is based not only on existing data for the area (habitat and species records), but also on the assumption that the Applicant will comply with a number of avoidance measures that are included in the USFWS memo and listed in Mitigation Measure BIO-2.

Biology-2 Desert Tortoise Protection

(1) **Qualified Biologist:** In the following measures, a "qualified biologist" is defined as a person with appropriate education, training, and experience to conduct tortoise surveys, monitor project activities, provide worker education programs, and supervise or perform other implementing actions. The person must demonstrate an acceptable knowledge of tortoise biology, desert tortoise impact minimization techniques, habitat requirements, sign identification techniques, and survey procedures. Evidence of such knowledge may include work as a compliance monitor on a project in desert tortoise habitat, work on desert tortoise trend plot or transect surveys, conducting surveys for desert tortoise, or other research or field work on desert tortoise. Attendance at a training course endorsed by the agencies (e.g., Desert Tortoise Council tortoise training workshop) is a supporting qualification.

A qualified biologist will be on-site during all construction. The qualified biologist shall conduct a pre-construction clearance survey of the Project area, watch for tortoises wandering into the construction areas, check under vehicles, and examine excavations and other potential pitfalls for entrapped animals. The qualified biologist will be responsible for overseeing compliance with desert tortoise protective measures and for coordination with the Field Contact Representative (FCR) (described below). The qualified biologist shall have the authority to halt all Project activities that are in violation of these measures or that may result in the take of a tortoise. The qualified biologist shall have a copy of this letter when work is being conducted on the site. The qualified biologist is not authorized to handle or relocate desert tortoises as part of this project.

(2) **Preconstruction Clearance Survey**: The qualified biologist shall conduct a preconstruction clearance survey of the Project area. Transects for clearance surveys will be spaced 15 feet apart. Clearance will be considered complete after two successive surveys have been conducted without finding any desert tortoises. Clearance surveys must be conducted during the active season for desert tortoises (April through May or September through October). The qualified biologist is not authorized to handle or relocate desert tortoises as part of this project. If a tortoise or tortoise burrow is located during clearance surveys, the USFWS will be contacted for direction on how to proceed.

(3) **Field Contact Representative:** The Project Applicant will designate a FCR who will be responsible for overseeing compliance with desert tortoise protective measures and for coordination with the USFWS. The FCR will have the authority to halt all Project activities that are not in compliance with the measures in this letter. The FCR will have a

copy of this letter when work is being conducted on the site. The FCR may be an agent for the company, the site manager, any other Project employee, a biological monitor, or other contracted biologist. Any incident occurring during the Project activities that is considered by the qualified biologist to be in non-compliance with these measures will be documented immediately by the qualified biologist. The FCR will ensure that appropriate corrective action is taken. Corrective actions will be documented by the qualified biologist. The following incidents will require immediate cessation of the Project activities causing the incident: (1) location of a desert tortoise within the exclusion fencing; (2) imminent threat of injury or death to a desert tortoise; (3) unauthorized handling of a desert tortoise, regardless of intent; (4) operation of construction equipment or vehicles outside a project area cleared of desert tortoise, except on designated roads; and (5) conducting any construction activity without a biological monitor where one is required.

(4) **Worker Training:** Prior to the onset of construction activities, a desert tortoise education program will be presented by the FCR or qualified biologist to all personnel who will be present on work areas within the Project area. Following the onset of construction, any new employee will be required to formally complete the tortoise education program prior to working on-site. At a minimum, the tortoise education program will cover the following topics:

- A detailed description of the desert tortoise, including color photographs;
- The distribution and general behavior of the desert tortoise;
- Sensitivity of the species to human activities;
- The protection the desert tortoise receives under the Act, including prohibitions and penalties incurred for violation of the Act;
- The protective measures being implemented to conserve the desert tortoise during construction activities; and
- Procedures and a point of contact if a desert tortoise is observed on-site.

(5) **Site Fencing:** Desert tortoise exclusion fencing will be installed around the Project area. The fence will adhere to USFWS design guidelines, available at: http://www.fws.gov/venturaispecies _information/protocols guidelines/docs/dtlDT_ Exclusion-Fence_2005.pdf. The qualified biologist will conduct a clearance survey before the tortoise fence is enclosed to ensure no tortoises are on the Project area. If a tortoise is found, all construction activity will halt and the USFWS contacted for direction on how to proceed. Once installed, exclusion fencing will be inspected at least monthly and following all rain events, and corrective action taken if needed to maintain the integrity of the tortoise barrier.

Fencing around the Project area will include a desert tortoise exclusion gate. This gate will remain closed at all times, except when vehicles are entering or leaving the Project area. If it is deemed necessary to leave the gate open for extended periods of time (e.g., during high traffic periods), the gate may be left open as long as a qualified biologist is present to monitor for tortoise activity in the vicinity. Sites with potential hazards to desert tortoise (e.g., auger holes, steep-sided depressions) that are outside of the desert tortoise exclusion fencing will be fenced by installing exclusionary fencing, or not left unfilled overnight.

(6) **Refuse Disposal:** All trash and food items shall be promptly contained within closed, raven-proof containers. These will be regularly removed from the Project area to reduce the attractiveness of the area to common ravens and other desert predators. The FCR will be responsible for ensuring that trash is removed regularly from the site such that containers do not overflow, and that the trash containers are kept securely closed when not in use.

(7) **Tortoises under vehicles:** The underneath of vehicles parked outside of desert tortoise exclusion fencing will be inspected immediately prior to the vehicle being moved. If a tortoise is found beneath a vehicle, the vehicle will not be moved until the desert tortoise leaves of its own accord.

(8) **Tortoises on roads:** If a tortoise is observed on or near the road accessing the Project area, vehicular traffic will stop and the tortoise will be allowed to move off the road on its own.

(9) **Tortoise Observations:** No handling of desert tortoise or burrow excavation is allowed as part of the proposed action. If a tortoise is observed outside of exclusion fencing, construction will stop and the tortoise allowed to move out of the area on its own. If a tortoise or tortoise burrow is observed within the exclusion fencing, all construction will stop, and the USFWS contacted for direction on how to proceed.

The following activities are not authorized and will require immediate cessation of the construction activities causing the incident: (1) location of a desert tortoise within the exclusion fencing; (2) imminent threat of injury or death to a desert tortoise; (3) unauthorized handling of a desert tortoise, regardless of intent; (4) operation of construction equipment or vehicles outside a project area cleared of desert tortoise, except on designated roads; and (5) conducting any construction activity without a biological monitor where one is required.

(10) **Dead or Injured Specimens:** Upon locating a dead or injured tortoise, the Applicant or agent is to immediately notify the Palm Springs Fish and Wildlife Office by telephone within three days of the finding. Written notification must be made within five days of the finding, both to the appropriate USFWS field office and to the USFWS' Division of Law Enforcement. The information provided must include the date and time of the finding or incident (if known), location of the carcass or injured animal, a photograph, cause of death, if known, and other pertinent information.

Should Alternative 4 be chosen, additional mitigation measures will be developed in coordination and consultations with BLM, CDFW and USFWS, since Alternative 4 is likely to impact desert tortoise based on habitat and species records.

Under NECO Plan the proposed alternative Objective e requires that all existing Desert Tortoise Category I, II or III, outside of the Desert Wildlife Management Area (DWMA) boundaries be converted to and managed as Category III habitat. The BMSP is outside of the proposed DWMA boundaries but within the Category I. Therefore according to the NECO Plan the area of the gen-tie lines that cross into Category I will be managed as Category III habitat since it is outside the DWMA boundaries. Refer to Table 2-1 Summary of Issues and Proposed Plan Amendments to the CDCA Plan – Amendment 2 Description – "Change desert tortoise CAT II and CAT III to all CAT I inside DWMA, change all CAT I and CAT II outside DWMAs to CAT III" (BLM 2002). Areas within the DWMA require compensation; however, Category III habitats are less stringently protected through compensation and based on occupied habitat

(Desert Tortoise Compensation Team, 1999 and BLM 2002). Based on species records, surveys, and habitat the desert tortoise is unlikely to occur within the BMSP proposed Project (Alternative 1). As described above in MM BIO-2 a preconstruction clearance survey of the Project area will be conducted. Transects for clearance surveys will be spaced 15 feet apart. Clearance will be considered complete after two successive surveys have been conducted without finding any desert tortoises. Clearance surveys must be conducted during the active season for desert tortoises (April through May or September through October). The qualified biologist is not authorized to handle or relocate desert tortoises as part of this project. If a tortoise or tortoise burrow is located during clearance surveys, the USFWS will be contacted for direction on how to proceed and the BLM will be contacted for direction on compensation required for occupied habitat within Category III.

Response 12a-36

The commenter states that impacts to the desert tortoise remain potentially significant as the Draft EIR/EA does not require a Raven Management Plan nor does it require the Applicant to make a financial contribution to the USFWS's regional raven management plan.

As outlined in the BBCS Appendix C4 of the Final EIR/EA, the gen-tie line shall be designed to discourage their use by raptors and ravens for perching (e.g., by use of anti-perching devices). This design would minimize avian risk and would provide the added benefit of not increasing the potential for increased predation of special-statue species such as the desert tortoise by not creating structures that enhance perching or nesting opportunities for ravens and other tortoise predators.

The USFWS have provided specific guidance on the protection measures for potential impacts to the desert tortoise. The County will continue to work with USFWS to ensure the protection of the desert tortoise.

Response 12a-37

The commenter states that requirements as pertains to compensatory mitigation for impacts to stabilized or partially stabilized desert dune habitat are too vague to ensure effective mitigation to less-than-significant level for Mojave fringe-toed lizard. The commenter further states that the vegetation communities map does not depict stabilized or partially stabilized desert dune habitat resulting in it being unclear how the compensatory mitigation requirement would be calculated and how the proposed measure would mitigate direct impacts to Mojave fringe-toed lizard.

The Biological Resources Section 4.2.4 of the Final EIR/EA has been updated to include quantifying information regarding direct loss of habitat and potential indirect effects to habitat adjacent to and downwind of the Project area in an effort to provide details requested by the commenter. This additional information also includes details of how the mitigation measures would reduce these impacts. Please refer to pages 51 through 53 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 12a-38

The commenter states that the Draft EIR/EA fails to provide any evidence that there are suitable mitigation sites for Mojave fringe-toed lizards within the Chuckwalla Valley. The commenter goes on to state that if sites are not available in the Chuckwalla Valley, the fate of the Chuckwalla Valley population needs to be analyzed and justification for the value that potential mitigation sites elsewhere would have to the overall conservation of the species.

The Lead Agency is actively working with the BLM to identify potential mitigation sites for the Mojave fringe-toed lizards.

Response 12a-39

The commenter states that the Draft EIR/EA has not identified a specific amount for the Mojave fringe-toed lizard mitigation fee and a mechanism for ensuring the fee is used for Mojave fringe-toed lizard habitat acquisition.

The Lead Agency is actively working with the BLM to identify potential mitigation sites and associated mitigation fees for the Mojave fringe-toed lizard.

Response 12a-40

The commenter states that the Draft EIR/EA does not establish success standard for the proposed Mojave fringe-toed lizard mitigation measures or a mechanism to ensure those standards are met. The commenter goes on to state that an authority should be designated as responsible for approving the Applicant's habitat compensation proposal.

The Biological Resources Section 4.2.4 of the Final EIR/EA has been updated to include the details of the habitat compensation. Refer to Response 12a-38 and Response 12a-39 for additional details on this topic.

Response 12a-41

The commenter states that additional special-status wildlife and plant species have the potential to occur and are known to occur within the Project area and that the Draft EIR/EA's statement that habitat-based mitigation for desert tortoise and western burrowing owl will provide mitigation for these non-listed species lacks credibility because the Draft EIR/EA does not require habitat-based mitigation for desert tortoise, mitigation for burrowing is dependent upon pre-construction surveys, and the Draft EIR/EA does not provide evidence that the proposed compensation lands would benefit other special-status species affected by the Project.

See Response 12a-32 for information regarding the burrowing owl mitigation and Response 12a-36 for information on the desert tortoise mitigation. The Mojave fringe-toed lizard is the only other species that will require habitat compensation mitigation. Refer to Response 12a-38 and 12a-40 for details on this topic. No additional habitat mitigation is required for potential impact to additional non-listed species.

Response 12a-42

The commenter states that the adaptive management strategy in the BBCS has little value in mitigation Project impacts to birds and bats. The commenter goes on to state that the fatality thresholds that *may* trigger additional mitigation are at unacceptable levels that would equate to 1,940 native birds, 145.5 raptors, or 1,455 bats per year.

This BBCS has been written with consideration to and guidance from the data and suggestions presented in the U.S. Fish and Wildlife Service's (USFWS) *Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities*, and the Avian Power Line Action Committee's (APLIC) *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. As described in the BBCS Appendix C of the Final EIR/EA, the identification of fatality thresholds to trigger mitigation is a process developed through agency coordination and mutual agreement. The USFWS, BLM and County of Riverside have actively reviewed and commented on the BBCS presented in Appendix C of the Final EIR/EA. The thresholds listed in the BBCS do not equate to the levels mentioned above. The thresholds as outlined in the BBCS that will trigger adaptation and mitigation measures are as follows:

1) more than four total native bird fatalities/MW/year,
2) more than 0.3 raptor fatalities/MW/year,
3) more than one golden eagles across entire project,
4) more than one active raptor nest constructed on generating equipment,
5) more than three bat fatalities/MW/year, or
6) more than ten active non-raptor nests requiring removal

If events are demonstrated to exceed any of the identified thresholds in the BBCS, and upon consultation with USFWS, adaptation may be triggered. Adaptation will include investigation, evaluation of the factors associated with the fatalities, exploration of engineering solutions, consideration of available avoidance and minimization measures, and likely implementation of one or more appropriate avoidance and minimization measure.

Response 12a-43

The commenter states that fatality monitoring of birds and bats would be limited to incidental detections using unscientific methods which would result in virtually zero possibility that adaptive management would be triggered.

As described in BBCS Appendix C4 of the Final EIR/EA the applicant is committed to incorporating adaptive management principles into the BBCS. To facilitate the adaptive management process, BMSP will submit timely reports to USFWS and CDFW summarizing results of operational monitoring and the wildlife reporting system. Fatality thresholds will be used to determine when adaptation is required. When a threshold is surpassed, BMSP will evaluate the species, timing, and locations of fatalities and consult with USFWS to determine if additional avoidance or minimization measures are appropriate. If thresholds are surpassed again, compensatory plan measures will be triggered, along with additional avoidance and minimization measures. As part of the adaptive management process, the thresholds may be adjusted if new information is gained regarding the number of solar facility fatalities necessary to significantly impact bird or bat population trends and the extent to which solar facility fatalities are compensated by density-dependent demographic factors (e.g., lower natural mortality or higher productivity). An initial set of avoidance and minimization, are proposed to be implemented if thresholds are surpassed; measures may be replaced with measures of similar scope and cost if more effective measures become available and are deemed appropriate to the specific circumstances surrounding the fatality patterns identified at the Project site.

Because of the low risk potential for the site, this BBCS does not direct the assignment of a full-time operational Project biologist. BMSP will implement a wildlife reporting system to document bird and bat fatalities and to monitor for significant fatality events. The site manager will lead the program. Site personnel will be trained to follow the wildlife reporting system procedures and complete the wildlife reporting form. Post-construction monitoring will be conducted by facility operators and field engineers during normally scheduled activities.

Response 12a-44

The commenter states that the Applicant has committed to only three years of post-construction fatality monitoring which may fail to detect species that occur at low densities. The commenter goes on to identify measures proposed by the CEC in the Supplemental Staff Assessment for the Calico Solar

Project, Klem's article "Preventing Bird-Window Collisions", and Avian Mortality at Solar Energy Facilities in South California: A Preliminary Analysis.

This BBCS has been written with consideration to and guidance from the data and suggestions presented in the U.S. Fish and Wildlife Service's (USFWS) *Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities*, and the Avian Power Line Action Committee's (APLIC) *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines,* and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. As described in the BBCS Appendix C4 of the Final EIR/EA, the three year post-construction was developed in coordination with the USFWS, BLM and County of Riverside.

As coordination continues with the pertinent regulatory agencies the method of post-construction fatality monitoring may be reviewed, modified and updated. As part of the adaptive management process outlined in Appendix C4 of the Final EIR/EA, BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk.

Letter 12b: Matt Hagemann and Anders Sutherland

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August 1, 2014

Meghan A. Quinn
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Subject: Comments on the Blythe Mesa Solar Project, Blythe, California

Dear Ms. Quinn:

We have reviewed the June 2014 Draft Environmental Impact Report/Environmental Assessment (DEIR/EA) for the Blythe Mesa Solar Project (Project) which would generate 485 megawatts of electricity from photovoltaic panels installed on 3,587 acres. The Project, described as Alternative 1 in the DEIR/EA, also includes:

- An 8.4-mile generation interconnection (gen-tie) line along a 73-acre corridor;
- Interior collection power lines;
- Up to three on-site substations (each approximately 90,000 square feet);
- Up to two operation and maintenance (O&M) buildings (approximately 3,500 square feet each);
- Associated communication facilities and site infrastructure; and
- Two primary off-site access roads and several interior access roads.

Our comments address inadequacies in the analysis of impacts from Hazardous Waste, Hydrology and Water Quality, and Air Quality. The DEIR/EA fails to include a thorough analysis of potential hazards that would result from disturbance of soils within the 5.6 square-mile area of the Project site and the associated gen-tie line. The DEIR/EA also fails to properly assess risks that would result from emissions of toxic air contaminants and criteria air pollutants during construction. Preparation of a revised DEIR/EA is necessary to analyze these impacts and to mitigate them as necessary.

Hazards and Hazardous Waste

No Phase I ESA was Prepared for the Project Area

The DEIR/EA states (p. 4-204):

> Potential existing hazards were assessed based on information contained in the Phase I DataMap Area Study prepared for the parcels comprising the Project area.

This statement is misleading. The DEIR/EA does not include a Phase I Environmental Site Assessment (ESA) for the Project Site. The DEIR/EA includes only an Environmental Data Resources, Inc. (EDR) "Data Map Area Study," attached as Appendix F. The EDR Data Map Area Study is a computerized records search of hazardous waste sites in and around the Project area (excluding the gen-tie line corridor).

In no way does the EDR Data Map Area Study constitute a Phase I ESA which is routinely conducted to support the analysis of project impacts in the Hazards and Hazardous Waste analysis in Environmental Impact Reports prepared pursuant to CEQA. The EDR Data Map Area Study clearly states that that the report cannot be relied upon for a determination of risk by including this disclaimer (Appendix F, p. 4):

> Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction or forecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. 12b-1

Developers prepare Phase I ESAs for inclusion with CEQA documents to identify hazardous waste issues that may pose a risk to the public, workers, or the environment and which may require further investigation, including environmental sampling and cleanup. For example, Phase I ESAs were completed for all three adjacent large-scale solar projects, including the McCoy project (2011), the Rio Mesa project (2011) and the Blythe Solar Power project (2009).

By failing to conduct a Phase I ESA for the Project site, including the gen-tie line, the DEIR/EA ignores a process that is routinely followed under CEQA proceedings to determine impacts from hazards and hazardous waste. Without a Phase I ESA, conclusions reached in the DEIR/EA about risks from environmental conditions are unreliable. A revised DEIR/EA should be prepared to include an analysis of hazardous conditions that may exist at the Project site made on the basis of a Phase I ESA and a Phase II ESA, if necessary, which includes the collection and analysis of soil and water samples.

The Phase I for the revised DEIR/EA should be conducted according to industry practices. Protocol for performing a Phase I ESA have been established by the US EPA and the American Society for Testing and Materials Standards (ASTM)[1] and include the following steps, in addition to the computerized mapping conducted for the Project site in the EDR Data Map Area Study:

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[1] http://www.astm.org/Standards/E1527.htm

- an inspection;
- interviews with people knowledgeable about the property; and
- recommendations for further actions to address potential hazards.

Phase I ESAs conclude with the identification of any “recognized environmental conditions” (RECs) and recommendations to address such conditions. A REC is the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property.[2] If RECs are identified, then a Phase II ESA is generally conducted, to include the collection of soil, soil vapor and groundwater samples to identify the extent of any contamination and the need for cleanup to reduce exposure potential to the public. Results of sampling that is conducted under the Phase II ESA should be included in the revised DEIR/EA along with an analysis that compares sample results to Soil sampling to regulatory human health screening levels (such as Environmental Screening Levels and California Human Health Screening Levels) and discussed in a revised DEIR/EA. If concentrations exceed screening levels, mitigation methods to minimize exposure to construction workers and nearby residents must be implemented, including mandatory issuance of respirators, onsite dust monitoring, and fenceline dust monitoring. 12b-1

The failure to conduct a Phase I ESA for the Project disregards an environmental due-diligence process that is routine for CEQA and NEPA documentation. A revised DEIR/EA should be prepared to properly disclose hazards and hazardous materials conditions on the basis of a Phase I ESA for the entire 3,587 acre Project site, to include a 73-acre corridor of the 8.4-mile gen-tie line that extends beyond the solar array boundary. If the Phase I ESA identifies any recognized environmental conditions, a Phase II ESA to include the collection and analysis of samples for chemical analysis should be conducted. If hazardous conditions are found, all appropriate mitigation measures should be identified to prevent the exposure of workers and neighbors to conditions that would present health risks during construction and operation of the Project.

Hazards Pose Potential Risks to Workers and Neighboring Residents

The DEIR/EA fails to identify two important and very real potential hazards: (1) residual pesticides that may remain in soil from extensive agricultural operations in the Project area; and (2) ordinance and munitions that may be present from operations conducted at what was the Blythe Army Airfield (now Blythe Airport) during World War II. No mitigation is identified in the DEIR/EA that would address these potential hazards. 12b-2

Residual Pesticides

Project site soils may contain residual pesticides, including DDT, from the application of pesticides used in agricultural production. The DEIR/EA states (p. 3-21): 12b-3

[2] Ibid.

The predominant crop on Palo Verde Mesa is citrus (refer to the Biological Resources Technical Report in Appendix C1). Approximately 24 percent of the solar facility site was previously disturbed by agricultural or military activities.

Farming in the area of the project was initiated in the 1970s, and 1,319 acres of Project land has been previously irrigated (p. 3-21). Use of the land for agriculture in the 1970s indicates a potential for organochlorine pesticides to have been used within Project boundaries. Organochlorine pesticides, such as DDT, DDE, and chlordane, were used in the US from the 1940s[3] until they were banned in the 1970s. The presence of DDT in soils as a result of pesticide application in the area of the Project is indicated by the listing of the Palo Verde Outfall Drain, located 18 miles south, as impaired by DDT under Section 303(d) of the Clean Water Act (p. 3-130).

The U.S. EPA has determined DDT and DDE, a breakdown product, to be probable human carcinogens.[4] DDT is also known to affect the nervous system.[5] Exposure to DDT can result in headaches, nausea, and convulsions[6] as well as damage to the liver and nervous and reproductive system impairments.[7] Chlordane has also been classified as a probable human carcinogen by the U.S. EPA and exposure can result in neurological effects such as headaches, irritability, dizziness, and nausea.[8]

Despite being banned for about 40 years, organochlorine pesticides can persist in soil for hundreds of years.[9] The Department of Toxic Substances Control (DTSC) states: 12b-3

> DDT is ubiquitous to California soil due to heavy agricultural usage prior to cancellation in 1972. Therefore, agricultural land which is currently being developed or considered for new uses … frequently contains DDT.[10]

The only description of pesticide use and the potential for residual pesticide contamination to exist in Project site soils is as follows (DEIR/EA, p. 4-206):

> Portions of the proposed Project area are in agricultural production. As a result, there is a potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater. Should there be chemically impacted soils (i.e., fuels, pesticides, herbicides) be present *[sic]* in the Project area, the risk of exposure to human health is not believed to be a significant concern (refer to Environmental Data Resources, Inc. [EDR] report in Appendix F of this Draft EIR/EA). The construction of the proposed Project would

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[3] U.S. EPA, DDT – A Brief History and Status. http://www.epa.gov/pesticides/factsheets/chemicals/ddt-brief-history-status.htm
[4] *See* U.S. EPA, DDT. http://www.epa.gov/pbt/pubs/ddt.htm; and U.S. EPA, DDE. http://www.epa.gov/ttnatw01/hlthef/dde.html
[5] ToxFAQs, *DDT, DDE, DDD*, http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=80&tid=20
[6] U.S. EPA, DDE. http://www.epa.gov/ttnatw01/hlthef/dde.html
[7] U.S. EPA, DDT. http://www.epa.gov/pbt/pubs/ddt.htm
[8] U.S. EPA, Chlordane. http://www.epa.gov/ttnatw01/hlthef/chlordan.html
[9] *Ibid.*, p. 3
[10] Office of the Science Advisor, DDT in Soil: Guidance for the Assessment of Health Risks to Humans. http://www.dtsc.ca.gov/AssessingRisk/upload/chap8.pdf, p. 11

require minimal grading for the foundations of the substations and O&M buildings; therefore, it is anticipated that workers' exposure to impacted soils would be at low-level concentrations.

This description of the potential for residual "low-level concentrations" of pesticides in soil is wholly inadequate and misleading. It is inadequate because: (1) there is no analysis of actual pesticide use for agricultural lands within the Project boundary – concentrations of pesticides in soil may be in fact quite high; (2) there has been no sampling to indicate if soils are "chemically impacted" and therefore, there is no way to know when and where those soils may be contacted by construction crews and risks that would result from dermal contact or inhalation; and (3) risks to human health are dismissed as "not believed to be a significant concern" without any analysis. On the last point, the DEIR/EA is particularly misleading because of the reference to the EDR Data Map Area Study which includes no analysis of "risk of exposure to human health" as claimed. The misguided attempt by the DEIR/EA to point to the EDR Data Map Area Study as informative on health risk only proves the point that a Phase I ESA is necessary, as made above, to determine if any environmental conditions exist that may need further investigation. 12b-3

The DEIR/EA also fails to recognize a City of Blythe policy that requires a Phase I ESA, and a follow-up Phase II ESA if necessary, on lands formerly used for agricultural operations. The City's General Plan 2025 states:

> Results have indicated that near surface soils often contain trace residue of pesticides used on the fields from decades of agricultural use. The presence and concentration of near surface pesticides can only be accurately characterized by site-specific sampling, testing and assessment of exposure risk to future inhabitants. Two potential outcomes may occur based on the findings: 1) no further action recommended with respect to potential residual pesticides in near surface soils; or, 2) additional action through further testing and mitigation may be required. As a result it has become the City's policy to require a Phase I ESA for any land development project in the City on land that has historically been used in agricultural or industrial operations and follow up Phase II Assessments when the Phase 1 ESA indicates the possibility of historic hazardous material usage at the site of a proposed project. The goal of this policy is to insure that potential public health and safety issues are addressed and mitigated.[11] 12b-4

This policy would apply to the 14 parcels of land for the solar array that are located within the City of Blythe (p. 1-3).

Construction workers involved in grubbing, pile installation, trenching and grading, activities all envisioned in the DEIR/EA (p. 2-12), would be subject to health risks from pesticide-contaminated soils, if present. People in adjacent residences, one as close as 260 feet and nine within 1,000 feet, would also be potentially at risk. The Mesa Verde Park is also nearby -- within 2,200 feet of the Project (p. 3-38). Preventing human exposure under these two scenarios is precisely why the City of Blythe policy was crafted; however, the DEIR/EA was apparently prepared without any knowledge of the policy because it was not mentioned. Fugitive dust control measures, to comply with Mojave Desert Air Quality

[11] http://ca-blythe.civicplus.com/documents/13/32/34/3_9%20Public%20Safety%20and%20Hazards(Jan_07).pdf

Management District (MDAQMD) Rule 403, are identified in the DIER but these measures may not be effective for the protection of human health from contaminants which may be found in soil and sorbed to dust particles. Therefore, the dust control measures cannot be considered adequate mitigation.

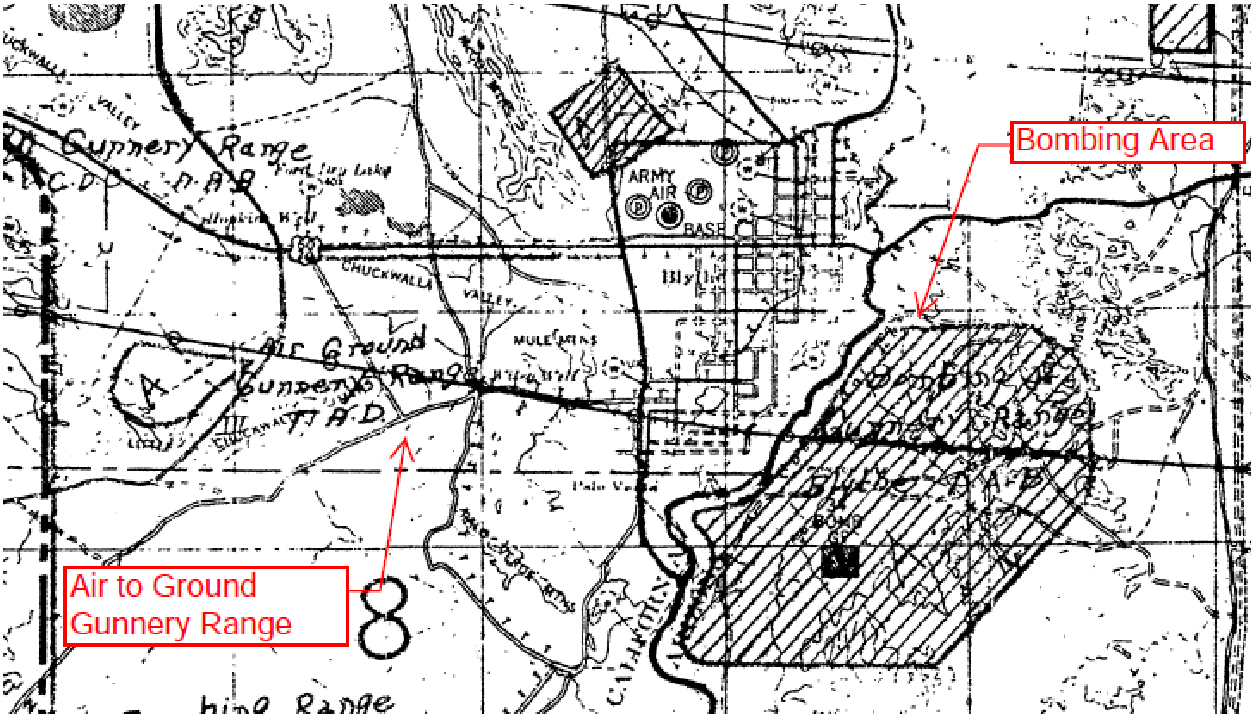
Consistent with policy in the Blythe General Plan, a revised DEIR/EA should be prepared, to include a Phase I ESA, which evaluates the potential for pesticides to be found at the Project site. Any indication of the presence of potentially hazardous conditions to construction workers or to nearby residents during construction should be evaluated in a Phase II Environmental Site Assessment, which include soil sampling. If pesticides are identified as a concern, the soil sampling should be undertaken at Project site in accordance with California Department of Toxics Substances Control (DTSC) guidelines for sampling former agricultural lands.[12] Sampling results should be compared to California regulatory human health screening levels, to determine potential risks to public health. If results exceed screening levels, appropriate mitigation to protect worker health and the health of nearby residents should be identified in a revised DEIR/EA to reduce the potential for dermal contact with contaminated soils and dust inhalation, including respiratory protection and protective equipment (including gloves and protective suits). 12b-4

Former Military Activities

The Project is located adjacent to the Blythe Airport which was formerly known as the Blythe Army Airfield. The Blythe Army Airfield (BAAF) is categorized as a Formerly Used Defense Site (FUDs) and was used during World War II from 1942 to 1944 for pilot and crew training for the Second Air Force heavy bombardment crew. In 1943, the base housed 7,500 personnel, 75 heavy bombers, and utilized 650 buildings.[13] Because a Phase I was not conducted, hazards from the activities at BAAF were not identified in the DEIR/EA. The computer-generated EDR Data Map Area Study also failed to identify BAAF as a FUDs site adjacent to the Project site.

A practice bombing range associated with BAAF underlies an area adjacent to the Project. A World War II-vintage map identifies a "Firing and Bombing Area" just east of the of the Project boundary (Attachment 1). Although mapped to be outside the Project area, errant bombs dropped by inexperienced trainees may be present within Project boundaries. Additionally, an "Air to Ground Gunnery Range" generally underlies an area that is proposed for a 73-acre portion of the 4.8 mile gen-tie line corridor that extends west of the solar arrays. 12b-5

[12] http://www.dtsc.ca.gov/Schools/upload/Ag-Guidance-Rev-3-August-7-2008-2.pdf
[13] http://deserttrainingcenter.com/Blythe%20Army%20Airfield.htm



The DEIR/EA fails to identify activities at BAAF as potentially posing a risk to construction crews who may come in contact with unexploded ordnance (UXO) and munitions and explosives of concern (MEC) related to the practice bombs and the ordnance used at the air to ground gunnery range. Records about specific practice bombing activities and gunnery training in these areas are not available, but use of explosives and other chemicals in the practice bombs may pose chemical and explosion hazards to construction workers and future site personnel. Bullets, which may contain lead, and other munitions used in the air to ground gunnery range, including incendiary devices, may also pose a hazard to construction crews who may disturb soil in that area when installing the gen-tie line.

The only discussion of the BAAF is in the context of cultural resources (Section 3.2.5) which does include this note: 12b-5

> A portion of the BAAB [Blythe Army Airbase] (approx. 383 acres) extends into the Project APE [Area of Potential Effects], including one standing utility building; remains of demolished warehouses, barracks, and hospital; other infrastructure (fire hydrants, manholes); and three clusters of refuse.

No discussion of hazards that may exist from activities at BAAF is included in the DEIR/EA. Potential contaminants associated with that part of the BAAF that is within the Project APE, as identified above, should also be evaluated in Phase I ESA to be included in a DEIR/EA. The need for a Phase I to evaluate UXO and related concerns is demonstrated by the fact that a REC was identified for UXO at a solar project to the west of the Project. A Phase I conducted for the Rice Solar Project identified UXO used in conjunction with the Rice Army Airfield to be a REC.[14] Further evaluation of the UXO was recommended.

To ensure the safety of construction workers and site personnel involved in the operation of the Project, an evaluation of military operations should be conducted in a Phase I ESA along with any necessary soil sampling in a Phase II ESA. A UXO survey should also be conducted by trained personnel and included in a revised DEIR/EA. The need to conduct such investigations was demonstrated at the neighboring Blythe Solar Power Project (BSPP), located just west of Blythe. During construction of the BSPP, seven UXO-related findings were reported to the California Energy Commission.[15] 12b-5

Other Potential Hazards

The DEIR/EA fails to identify other potential hazards across the vast area of the Project site that are typically associated with large scale desert solar projects, including waste dumps, debris piles, burn pits, abandoned buildings, spills, storage tanks, drums, and illegal drug labs. These types of features, if unregulated, will not show up on a computer generated EDR Data Map Area Study and are best identified through a thorough field inspection. A field inspection is a required component of a Phase I ESA but as noted, a Phase I ESA has not been conducted for the Project. 12b-6

A revised DEIR/EA should be prepared to include a field inspection, per standard practice under a Phase I ESA, to identify hazardous conditions. The field inspection should take into account the large area of the Project and plan for adequate time in the field for reconnaissance.

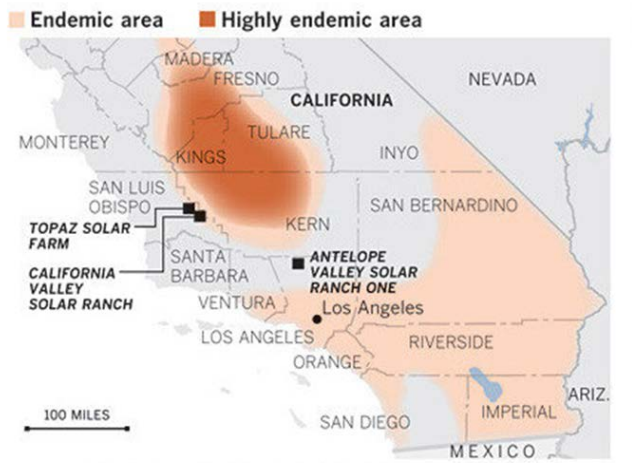
Valley Fever Potential was Inadequately Evaluated and Mitigated

The DEIR/EA includes only a very brief analysis of Valley Fever, and fails to provide for effective mitigation to prevent a potential increase of contracting Valley Fever from Project Construction. Also known by the scientific name coccidioidomycosis, Valley Fever is an infectious disease caused by inhaling the spores of a soil-dwelling fungus. According to the County of Riverside Department of Public Health, Valley Fever is known to occur in the eastern part of the county[16] and the area near Blythe has been mapped as endemic for Valley Fever. 12b-7

[14] http://www.energy.ca.gov/sitingcases/ricesolar/documents/applicant/afc/Volume_2/RSEP_Appendix_5.14A_URS%20Ph%201%20ESA.pdf

[15] Hagemann comments on the McCoy Solar Energy Project, August 22, 2012, p. 9.

[16] http://www.rivcohealthdata.org/home/images/DOWNLOADS/PUBLICATIONS/MONTHLY_BULLETIN/2012/2012-08%20%7C%20Impact%20of%20Valley%20Fever%20in%20Riverside%20County,%202006-2010.pdf



Sources: California Dept. of Public Health, California Correctional Health Care Services.
Graphics reporting by JULIE SHEER

A revised DEIR/EA should be prepared to evaluate the potential for an increased incidence of Valley Fever to result from Project construction, operation and decommissioning. The DEIR/EA should also evaluate mitigation measures specific to reducing the occurrence of Valley Fever in workers and the public.

Valley Fever is caused by inhaling the spores of a soil-dwelling fungus, *Coccidioides immitis.*[17] The spores become airborne when infected soils are disturbed during construction activities, agricultural 12b-7
operations, dust storms, or during earthquakes. On October 19, 2012, an article was published explaining that between 1990 and 2008, more than 3,000 people died in the United States from Valley Fever with about half in California.[18] In recent years, reported Valley Fever cases in southwestern US states have increased dramatically.[19]

No known cure exists for the disease and there is no vaccine.[20] Common symptoms of Valley Fever include fatigue, fever, cough, headaches, breathing difficulties, rash, muscle aches, and joint pain. Advanced symptoms are marked by chronic pneumonia, meningitis, skin lesions and bone or joint infections. Pneumonia stemming from Valley Fever becomes evident 13 weeks after infection.[21]

[17] http://www.cdc.gov/fungal/diseases/coccidioidomycosis/definition.html
[18] Jennifer Y. Huang, Benjamin Bristow, Shira Shafir, and Frank Sorvillo, Coccidioidomycosis-associated Deaths, United States, 1990–2008; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3559166/
[19] Center for Disease Control; Fungal Pneumonia: A Silent Epidemic, Coccidioidomycosis (Valley Fever); http://www.cdc.gov/fungal/pdf/cocci-fact-sheet-sw-us-508c.pdf
[20] http://www.cdc.gov/fungal/diseases/coccidioidomycosis/risk-prevention.html.
[21] *See, e.g.*, Lisa Valdivia, David Nix, Mark Wright, Elizabeth Lindberg, Timothy Fagan, Donald Lieberman, Prien Stoffer, Neil M. Ampel, and John N. Galgiani, Coccidioidomycosis as a Common Cause of Community-acquired Pneumonia, Emerging Infectious Diseases, v. 12, no. 6, June 2006; http://europepmc.org/articles/PMC3373055.

Project construction, operation and decommissioning will generate dust which is one of the primary routes of exposure for contracting Valley Fever.[22] The nearest sensitive receptor, is located 260 feet from the project site (p. 3 – 38). One of the most at-risk populations include construction workers[23]. A scientific article on occupational exposures to Valley Fever notes that "[l]abor groups where occupation involves close contact with the soil are at greater risk, especially if the work involves dusty digging operations."[24] One study reported that at study sites, "generally 50% of the individuals who were exposed to the dust or were excavating dirt at the sites were infected."[25]

12b-7

The disease is debilitating and prevents those who have contracted Valley Fever from working.[26] The longest period of disability from occupational exposure in California is to construction workers, with 62% of the reported cases resulting in over 60 days of lost work.[27] Another study estimated the average hospital stay for each (non-construction work) case of coccidioidomycosis at 35 days.[28]

The potentially exposed population is much larger than construction workers on or adjacent to the Project site because dust generated during Project construction will carry the very small spores – 0.002-0.005 millimeters in diameter – into other areas, potentially exposing large non-Project-related populations.[29,30]

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[22] Rafael Laniado-Laborin, Expanding Understanding of Epidemiology of Coccidioidomycosis in the Western Hemisphere, Ann. N.Y. Acad. Sci., v. 111, 2007, pp. 20-22; Frederick S. Fisher, Mark W. Bultman, Suzanne M. Johnson, Demosthenes Pappagianis, and Erik Zaborsky, Coccidioides Niches and Habitat Parameters in the Southwestern United States, a Matter of Scale, Ann. N.Y. Acad. Sci., No. 1111, 2007, pp. 47-72 ("All of the examined soil locations are noteworthy as generally 50% of the individuals who were exposed to the dust or were excavating dirt at the sites were infected."); http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detail.

[23] Lawrence L. Schmelzer and R. Tabershaw, Exposure Factors in Occupational Coccidioidomycosis, Am. J. Public Health Nations Health, v. 58, no. 1, 1968, pp. 107-113, Table 3; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1

[24] *Ibid*, p. 110.

[25] Frederick S. Fisher, Mark W. Bultman, Suzanne M. Johnson, Demosthenes Pappagianis, and Erik Zaborsky, Coccidioides Niches and Habitat Parameters in the Southwestern United States, a Matter of Scale, Ann. N.Y. Acad. Sci., No. 1111, 2007, pp. 47-72; http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detail.

[26] Frank E. Swatek, Ecology of *Coccidioides Immitis*, Mycopathologia et Mycologia Applicata, V. 40, Nos. 1-2, pp. 3-12, 1970.

[27] Schmelzer and Tabershaw, 1968, Table 4 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1,

[28] Demosthenes Pappagianis and Hans Einstein, Tempest from Tehachapi Takes Toll or Coccidioides Conveyed Aloft and Afar, West J. Med., v. 129, Dec. 1978, pp. 527-530; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1238466/pdf/westjmed00256-0079.pdf.

[29] Schmelzer and Tabershaw, 1968, p. 110; Pappagianis and Einstein, 1978 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1,

[30] Pappagianis and Einstein, 1978, p. 527 ("The northern areas were not directly affected by the ground level windstorm that had struck Kern County but the dust was lifted to several thousand feet elevation and, borne on high currents, the soil and arthrospores along with some moisture were gently deposited on sidewalks and automobiles as "a mud storm" that vexed the residents of much of California." The storm originating in Kern

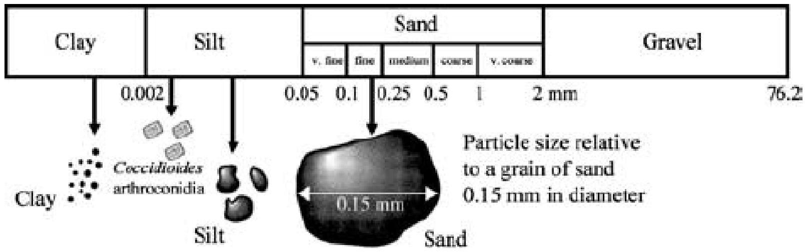

Figure 4: Size of cocci spores compared to soil particles (in mm)
(from: Fisher et al., 2007, Fig. 3)

Valley Fever spores have been documented to travel as much as 500 miles[31] and, thus, dust raised during construction could potentially expose a large number of people hundreds of miles away.

In the past few years, several incidences of severe dust storms and reported cases of Valley Fever occurred during construction of photovoltaic energy projects. The construction of the First Solar Antelope Valley Solar Ranch One in Kern County was halted in April 2013 due to the company's failure to bring the facility in compliance with ambient air quality standards.[32] Dust from the project, in general, has led to complaints of respiratory distress by local residents and a concern of Valley Fever, as well as increased reports of Dry Land Distemper in horses.[33] 12b-7

At two photovoltaic solar energy projects in San Luis Obispo County, Topaz Solar Farm and California Valley Solar Ranch, 28 construction workers contracted Valley Fever.[34] One worker digging into the soil inhaled dust and subsequently became ill. A blood sample obtained from the worker confirmed Valley Fever.[35]

The current drought conditions in California, declared a State of Emergency by Governor Brown on January 17, 2013,[36] may increase the occurrence of Valley Fever cases[37]. During drought years, the

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County, for example, had major impacts in the San Francisco Bay Area and Sacramento) http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detail.

[31] David Filip and Sharon Filip, Valley Fever Epidemic, Golden Phoenix Books, 2008, p. 24.

[32] Herman K. Trabish, GreenTech Media, Construction Halted at First Solar's 230 MW Antelope Valley Site, April 22, 2013; http://www.greentechmedia.com/articles/read/Construction-Halted-At-First-Solars-230-MW-Antelope-Valley-Site.

[33] *Ibid.*

[34] Julie Cart, Los Angeles Times, 28 Solar Workers Sickened by Valley Fever in San Luis Obispo County May 01, 2013; available at http://articles.latimes.com/2013/may/01/local/la-me-ln-valley-fever-solar-sites-20130501.

[35] *Ibid*.

[36] State of California, Office of Governor Edmund G. Brown, Governor Brown Declares Drought State of Emergency, January 17, 2014; http://gov.ca.gov/news.php?id=18368 .

[37] Gosia Wozniacka, Associated Press, Fever Hits Thousands in Parched West Farm Region, May 5, 2013, citing Prof. John Galgiani, Director of the Valley Fever Center for Excellence at the University of Arizona; http://abcnews.go.com/m/story?id=19113795.

number of organisms competing with *Coccidioides ssp.* is thought to decrease while the fungus remains alive but dormant. When rain does occur, the spores germinate and multiply because of a decreased number of competing organisms.
Prison inmates may be disproportionately more vulnerable to Valley Fever. Valley Fever has been blamed for 62 deaths among California prison inmates statewide. Annually, 200 prisoners are hospitalized 5,000 days for treatment of Valley Fever conditions at an estimated care cost of about $23.4 million. African-American and Filipino inmates are particularly susceptible to Valley Fever, along with prisoners with weakened immune systems.[38] The Chuckawalla Valley State Prison and the Ironwood State Prison are located about 10 miles west of the western extent of the Project's solar array. Valley Fever spores, potentially disturbed by Project construction, may cause an increased incidence in the disease at the prisons, an impact not considered in the DEIR/EA. 12b-7

Mitigation for Valley Fever is discussed only briefly in the DEIR/EA and the measures that are identified would not be effective in preventing the incidence of the disease. The DEIR/EA states (p. 4-215):

> A dust abatement plan as required by the MDAQMD would minimize the spread of fungal spores, thereby reducing potential for contracting Valley Fever during construction

The DEIR/EA proposes only standard dust mitigation measures which may be marginally effective in reducing the incidence of Project-related Valley Fever. The dust abatement plan required by MDAQMD Rule 403 does not consider suppression methods that would be effective for controlling and minimizing exposure to Valley Fever spores, which are considerably different from the measure considered in a dust abatement plan. 12b-8

Conventional dust control measures that target PM10 and visible dust are not generally effective at controlling Valley Fever.[39] Valley Fever spores are 1 to 3 microns in diameter[40], and can be far smaller than particles of dust, which measure 2.5 to 100 microns in diameter. A particle 50 microns in diameter is considered to be the smallest particle visible to the eye. Therefore, because *Coccidioides ssp.* spores are generally smaller than dust, they have the potential to spread much farther in air than dust, without detection by human eyesight. The spores, whose size is well below what is detectable by human vision, may be present in air that appears clear and dust free.

Airborne spores with low settling rates can remain aloft for long periods and be carried hundreds of miles from their point of origin. Implementation of standard dust control measures will likely not provide sufficient protection for both site workers and the general public.

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[38] http://www.pe.com/articles/valley-676206-prisons-fever.html
[39] *See, e.g.*, Cummings and others, 2010, p. 509; Schneider et al., 1997, p. 908 ("Primary prevention strategies (*e.g.*, dust-control measures) for coccidioidomycosis in endemic areas have limited effectiveness.").
[40] http://www.engr.psu.edu/iec/abe/database/fCoccil.htm

Several agencies and scientific studies have developed precautions to protect workers and the public from Valley Fever. The California Departments of Public Health and Industrial Relations recommend the following measures to protect workers and the public:[41]

1. Determine if the worksite is in an area where Valley Fever is consistently present. Check with your local health department to determine whether cases have been known to occur in the proximity of your work area.
2. Train workers and supervisors on the location of Valley Fever endemic areas, how to recognize symptoms of illness … and ways to minimize exposure. Encourage workers to report respiratory symptoms that last more than a week to a crew leader, foreman, or supervisor.
3. Limit workers' exposure to outdoor dust in disease-endemic areas. For example, suspend work during heavy wind or dust storms and minimize amount of soil disturbed.
4. When soil will be disturbed by heavy equipment or vehicles, wet the soil before disturbing it and continuously wet it while digging to keep dust levels down.
5. Heavy equipment, trucks, and other vehicles generate heavy dust. Provide vehicles with enclosed, air-conditioned cabs and make sure workers keep the windows closed. Heavy equipment cabs should be equipped with high efficiency particulate air (HEPA) filters. Two-way radios can be used for communication so that the windows can remain closed but allow communication with other workers.
6. Consult the local Air Pollution Control District regarding effective measures to control dust during construction. Measures may include seeding and using soil binders or paving and laying building pads as soon as possible after grading.
7. When digging a trench or fire line or performing other soil-disturbing tasks, position workers upwind when possible. 12b-8
8. Place overnight camps, especially sleeping quarters and dining halls, away from sources of dust such as roadways.
9. When exposure to dust is unavoidable, provide NIOSH-approved respiratory protection with particulate filters rated as N95, N99, N100, P100, or HEPA. Household materials such as washcloths, bandanas, and handkerchiefs do not protect workers from breathing in dust and spores.

   Respirators for employees must be used within a Cal/OSHA compliant respiratory protection program that covers all respirator wearers and includes medical clearance to wear a respirator, fit testing, training, and procedures for cleaning and maintaining respirators.

   Different classes of respirators provide different levels of protection according to their Assigned Protection Factor (see table below). Powered air-purifying respirators have a battery-powered

[41] California Department of Public Health and California Department of Industrial Relations, Hazard Evaluation System & Information Service, Preventing Work-Related Coccidioidomycosis (Valley Fever), June 2013; available at http://www.cdph.ca.gov/programs/hesis/Documents/CocciFact.pdf.

blower that pulls air in through filters to clean it before delivering it to the wearer's breathing zone. PAPRs will provide a high level of worker protection, with an APF of 25 or 1000 depending on the model. When PAPRs are not available, provide a well-fitted NIOSH-approved full-face or half-mask respirator with particulate filters.

Fit-tested half-mask or filtering facepiece respirators are expected to reduce exposure by 90% while still allowing about 10% faceseal leakage which can result in an unacceptable risk of infection when digging where Valley Fever spores are present.

Respiratory Protection for Reducing Dust and Spore Exposure

	Respirator Type (worn with particulate filters)	**Assigned Protection Factor (APF)**	**Expected Reduction of Exposure to Dust and Spores (%)**
	No respirator	None	0
Increasing Protection ↓	Half-mask respirator (elastomeric or filtering facepiece)	10	90
	Powered air-purifying respirator with loose-fitting face covering	25	96
	Full-face respirator	50	98
	Some powered air-purifying respirators are designed to offer higher protection (check with manufacturer)	1000	99.9

12b-8

The Kern County Public Health Services Department recommends:[42]

1. Practice general prevention measures.
2. Determine if the work site is in a high risk Valley Fever area (contact the Kern County Public Health Services Department).
3. Obtain a health assessment prior to being exposed to Valley Fever.
4. Use non-susceptible workers.
5. Use machinery and vehicles with enclosed cabs and use air conditioning.
6. Use dust masks appropriate for the activity performed.
7. Remove dusty clothing and store in plastic bags until washed.

Two other studies have developed additional recommendations to minimize the incidence of Valley Fever. The U.S. Geological Survey (USGS) has developed recommendations to protect geological field workers in endemic areas.[43] An occupational study of Valley Fever in California workers also developed

[42] Kern County Public Health Services Department, What Is Valley Fever, Prevention; http://kerncountyvalleyfever.com/what-is-valley-fever/prevention/.

[43] Fisher et al. 2000. http://www.researchgate.net/publication/6461426_Coccidioides_niches_and_habitat_parameters_in_the_southwestern_United_States_a_matter_of_scale/file/72e7e51c9b9f058a45.pdf?origin=publication_detai.

recommendations to protect those working and living in endemic areas.[44] These two sources identified the following measures, in addition to those identified by the County's Public Health Department, to minimize exposure to Valley Fever:

1. Pretest soils to determine if each work location is within an endemic area.
2. Implement a vigorous program of medical surveillance.
3. Implement aggressive enforcement of respiratory use where exposures from manual digging are involved.
4. Test all potential employees for previous infection to identify the immune population and assign immune workers to operations involving known heavy exposures.
5. Hire resident labor whenever available, particularly for heavy dust exposure work. 12b-8
6. All workers in endemic areas should use dust masks to protect against inhalation of particles as small as 0.4 microns. Mustaches or beards may prevent a mask from making an airtight seal against the fact and thus should be discouraged.
7. Establish a medical program, including skin tests on all new employees, retesting of susceptible employees, prompt treatment of respiratory illness in susceptible employees; periodic medical examination or interview to discover a history of low grade or subclinical infection, including repeated skin testing of susceptible employees.

None of these measures, as recommended by county, state and federal agencies, were considered for the Project in the DEIR/EA. These measures are feasible to implement and would substantially reduce significant public health impacts. A revised DEIR/EA should be prepared to more thoroughly consider Valley Fever impacts from Project construction and to consider a full range of mitigation measures.

Hydrology and Water Quality

Construction may Further Impair Water Quality

The DEIR/EA states:

> Ground disturbance related to construction of the Project could potentially degrade water quality through the inadvertent release of residual pesticides from former agricultural lands (p. 4-232) 12b-9

The release of residual pesticides from construction could further degrade water quality in the region of the Project. Within the Project region, one water body is listed as impaired on the Clean Water Act Section 303(d) list. The Palo Verde Outfall Drain and Lagoon are listed as impaired by DDT (p. 3-130). The US EPA has stated a Total Maximum Daily Load (TMDL) is needed to reduce loading of DDT to the Palo Verde Outfall Drain.[45] A TMDL limits the amount of contamination that would be discharged to an impaired water body.

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[44] Schmelzer and Tabershaw, 1968, pp. 111 – 113 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1228046/?page=1,.

[45]http://iaspub.epa.gov/tmdl_waters10/attains_waterbody.control?p_list_id=CAR7154000019990205131951&p_cycle=&p_report_type=

Surface water flow from the Project area to the Palo Verde Outfall Drain is described in an appendix to the DEIR as follows:

> Precipitation in the form of sheet flow typically flows overland toward the edge of the Mesa. In areas used for agriculture, flow may be diverted by earthen berms or irrigation ditches. Sheet flow eventually reaches the edge of the Mesa and flows into the canal and drain system of the Palo Verde Valley south of 10th Street. This system eventually returns water to the Colorado River via the Outfall Drain, approximately 18 miles south of the Project. (Appendix C5, Review of Federal Waters, p. 7).

A revised DEIR/EA should recognize the need for a Palo Verde Drain DDT TMDL and the impact Project 12b-9
construction may have on the impaired water quality in the Drain and on the Colorado River, to which the Drain is tributary.

Mitigation specific to the reduction of potential DDT contributions to the Palo Verde Drain Watershed should be identified in a revised DEIR/EA. Best management practices identified in the DEIR/EA (p. 4-235) to "minimize impacts to water quality" (BMP-1, BMP-2, BMP-9, BMP-13, BMP-14, and BMP-15) are not specific to organochlorine pesticides and may not be effective in reducing the discharge of contaminants such as DDT. Mitigation measures to consider in a revised DEIR/EA may need to include a limitation or avoidance of ground disturbing activities in areas where DDT and other organochlorine pesticides were historically applied in in areas where sampling, as recommended under a Phase II ESA, would identify residual concentrations of pesticides.

Air Quality

The Project, according to our review, poses two potentially significant impacts to air quality: (1) generation of PM10 emissions during construction above the threshold; and (2) emissions of diesel particulate matter during construction would pose health risks to nearby residents. A revised DEIR should be prepared to address these impacts and to provide for mitigation as appropriate.

Scientific Resources Associated (SRA) prepared an Air Quality and Global Climate Change Technical
Report (AQTR) to address air quality issues that are anticipated to arise from Project construction, 12b-10
operation, and decommissioning, which was provided as Appendix B to the DEIR/EA. We identified several methodological inaccuracies within the Report that inappropriately altered the determination of significance to below the applicable thresholds with regards to daily fugitive particulate matter (PM10) emissions and off-site residential exposure to diesel particulate matter (DPM) during Project construction. Our examination and reassessment of Project construction fugitive dust and DPM emissions concluded that the air quality impacts could exceed CEQA thresholds of significance and a revised DEIR is necessary to properly characterize environmental concerns associated with Project implementation.

Fugitive Dust

The climate of the Project's regional setting is highly conducive to generation of fugitive dust. As noted 12b-11
in the DEIR/EA, "the climate in the Blythe area is categorized as a high desert climate, with dry, hot

summers and cool winters." The mean temperature for Blythe is 71.6°F, and the mean annual precipitation is 3.8 inches (p. 3-31). Desert climates are characterized by arid conditions and relatively low precipitation, and do not have tall vegetation to reduce the influence of winds on dust generation at surface level. These factors provide the most susceptible environment for dust to become airborne through ground disturbance and traffic activities associated with Project construction.

Table 7 on page 43 of the AQTR presents daily and annual estimates of criteria air pollutants ("CAPs") emissions associated with BMSP construction. Daily fugitive dust generation is estimated to be 41.82 pounds per day (lb/day), with the total PM emissions quantified at 50.47 lb/day including DPM. The AQTR concludes that there will be no significant air quality impact because this value is below the 82 lb/day Mojave Desert Air Quality Management District (MDAQMD) threshold for daily PM emissions. This assumption is unfounded based on an inaccurate application of control efficiency across all construction-related fugitive dust sources.

The 41.82 lb/day fugitive dust estimate hinges on a model that used an unprecedentedly high fugitive dust emission control efficiency estimate of 75% attributed solely to watering three times daily (Appendix B, AQTR, p. 41). SRA quantified emissions of fugitive dust associated with Project construction by universally applying the 75% control efficiency to all construction activity sites, access roads, and unpaved roads, as evidenced in Table A-11a of the AQTR. It is unclear how the daily estimate of 41.82 lb/day was derived in Table A-11a, considering that the total 41.82 lb/day of fugitive dust from all construction activity sites is not equal to the sum of daily emissions calculated for Access Roads, Grading, Excavation/Trenching, Material Unloading/Loading, and travel on Unpaved/Paved roads. A revised iteration of the AQTR should utilize CalEEMod to succinctly present the methodologies for estimating fugitive dust emissions. 12b-11

The AQTR inappropriately asserted that the control efficiency could be applied to the entirety of the construction site for fugitive dust emission control. The 75% fugitive dust control efficiency estimate is taken from a 1999 document prepared by the Midwest Research Institute (MRI).[46] The 75% control efficiency value was estimated from a case study of a Clark County, NV Air Quality Implementation Plan for construction projects. In this case study, methodologies were used to estimate emissions from three types of emissions sources: construction activities, track-out, and wind erosion. Construction activities included grading, trenching, crushing, screening, on-site vehicle traffic, blasting, and demolition. The MRI report referenced a 1988 study, "Control of Open Fugitive Dust Sources," which documented that the default control efficiency for all three of these emission sources was 50%.[47] The 75% fugitive dust control efficiency specifically applied to the "track-out" emission source, referring to on-site vehicles toting dust off-site via paved roads. This specific activity represents only a small portion of the total fugitive dust emission sources at the BMSP construction site and should not be applied to all intended work.

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[46] Estimating Particulate Matter Emissions from Construction Operations, Final Report. Midwest Research Group. September 30, 1999. *nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100KK1W.TXT*
[47] *Ibid*, at 4-15.

The DEIR/EA identifies that preparation activities at the BMSP site will include "wrecking, excavation, grading, clearing of land, and solid waste disposal operations," as well as "scraping, backfilling, and compacting" prior to commencement of construction (p. 4-20). None of these activities were accounted for in the MRI-recommended control efficiency for vehicle track-out of fugitive dust. Based on our review, an estimate of fugitive dust control of 50% is a more appropriate for fugitive dust control for the Project construction site based on the evaluation provided in the MRI study.

The DEIR/EA and the AQTR estimated that approximately 41.82 pounds of fugitive PM10 would be generated each day during the construction period. This value reflects a 75% control efficiency based on the inappropriate assumptions discussed above. Applying the more reasonable site-wide estimate of 50% control efficiency, the daily anticipated fugitive emissions would double to 83.64 pounds per day, exceeding the MDAQMD threshold of 82 pounds/day would be exceeded. 12b-11

A revised DEIR/EA should be prepared to provide for an estimate of air quality impacts from fugitive dust emissions that is based on a realistic estimate of dust control emissions. If the revised DEIR/EA confirms our findings, and shows an exceedance of MDAQMD the air quality threshold for PM10, mitigation should be identified that would reduce the impact to less than significant. A comprehensive Fugitive Dust Abatement Plan, as referenced in BMP-3, should be prepared for inclusion in the revised DEIR/EA to demonstrate how PM10 generation from construction activities can be mitigated to below the threshold.

Screening Health Risk Assessment for Diesel Particulate Matter

The AQTR failed to adequately address impacts to nearby sensitive receptors from DPM emissions associated with construction equipment and vehicle travel. The AQTR claims that a health risk assessment, prepared as a component of the report, provides a "worst case analysis of the potential for TAC impacts to sensitive receptors." (Appendix B, AQTR, p. 46) This statement is unfounded because the screening health risk assessment in the AQTR did not consider DPM exposures to children who inhabit nearby residences, and who are more susceptible to inhalation toxicity than adults. The Office of Environmental Health Hazard Assessment recommends the use of Age Sensitivity Factors (ASFs) to characterize the heightened susceptibility of children to air pollution in health risk assessments.[48] The guidance is implemented by multiplying the estimated carcinogenic exposure to air pollutants by ten for the first two years of life, and by three for the subsequent years until the age of sixteen. It is not evident that this methodology was utilized in the AQTR prepared by SRA for the BMSP. 12b-12

We attempted to reconstruct the screening health risk assessment in accordance with the worst-case assumptions outlined by SRA. Alterations to the methodology were necessary based on improvements to the modeling software. The SCREEN3 model used by SRA was officially replaced by AERSCREEN in

[48] Technical Document for Exposure Assessment and Stochastic Analysis, FINAL, Chapter 11. Office of Environmental Health Hazard Assessment. August, 2012. http://oehha.ca.gov/air/hot_spots/tsd082712.html

2011, in accordance with EPA recommendations.[49] AERSCREEN is the screening level version of AERMOD, which has been federally promulgated as the preferred regulatory model since 2006 due to enhanced capabilities with regards to near field dispersion and simulated plume rise. In a revised AQTR, we suggest that SRA assess the off-site air quality impacts generated by BMSP construction using the most updated and applicable screening level dispersion model available.

Following the worse-case methodology set forth by SRA, we assumed that all DPM emissions would be released from within the BMSP construction site boundary and input the SRA emission rate of 0.32795 grams per second (g/s) over the course of the three year construction period into the AERSCREEN model. A volume source was selected based on the SRA modeling, as the shape of the BMSP construction site is geometrically complex. The AERSCREEN software outputs maximum single-hour concentrations of modeled air pollutants assuming worse-case scenario meteorology throughout one year. OEHHA guidance recommends that the single-hour concentration be multiplied by a scaling factor of 0.1 in AERSCREEN to represent an estimate of the maximum reasonable annualized concentration of the air pollutant.[50] 12b-12

The DEIR identified that the nearest sensitive receptor - a residence - is approximately 260 feet (80 meters) from the project boundary. The maximum one-hour concentration predicted by AERSCREEN for a volume source with an average release height of three meters was 1.22 $\mu g/m^3$, which scales to an annualized concentration of 0.122 $\mu g/m^3$. Considering a three-year childhood exposure between the ages of one and four, we calculated an excess cancer risk during BMSP construction to be 17.1 in one million, as shown in the table below. Our evaluation demonstrates that when considering the worst-case exposure scenario, the potential exists for air quality impacts to exceed the applicable 10 in a million MDAQMD threshold. These results refute the cursory assessment prepared by SRA, and we recommend that the methodologies be revised in an updated iteration of the AQTR that more accurately addresses potential off-site air quality impacts from BMSP construction.

[49] Memorandum: AERSCREEN Released as the EPA Recommended Screening Model. United States Environmental Protection Agency Air Quality Modeling Group. April 11, 2011. http://www.epa.gov/ttn/scram/guidance/clarification/20110411_AERSCREEN_Release_Memo.pdf

[50] Technical Document for Exposure Assessment and Stochastic Analysis, FINAL, Chapter 2. Office of Environmental Health Hazard Assessment. August, 2012. http://oehha.ca.gov/air/hot_spots/tsd082712.html

Parameter	Description	Units	Child (1-2 yrs)	Child (2-4 yrs)
CPF	Cancer Potency Factor	1/(mg/kg-day)	1.1	1.1
Cair	Concentration	ug/m3	0.1222	0.122
DBR	Daily breathing rate	L/kg-day	581	581
EF	Exposure Frequency	days/year	350	350
ED	Exposure Duration	years	1	2
AT	Averaging Time	days	25550	25550
	Inhaled Dose		9.7E-07	1.9E-06
ASF	Age Sensitivity Factor	-	10	3
	Cancer Risk	**1.71E-05**	**1.07E-05**	**6.41E-06**

Sincerely,

Matt Hagemann, P.G., C.Hg.

Anders Sutherland

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Matthew F. Hagemann, P.G., C.Hg., QSD, QSP

Geologic and Hydrogeologic Characterization
Industrial Stormwater Compliance
Investigation and Remediation Strategies
Litigation Support and Testifying Expert
CEQA Review

Education:

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.
B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

Professional Certification:

California Professional Geologist
California Certified Hydrogeologist
Qualified SSWPP Developer and Practitioner

Professional Experience:

Matt has 25 years of experience in environmental policy, assessment and remediation. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) while also working with permit holders to improve hydrogeologic characterization and water quality monitoring.

Matt has worked closely with U.S. EPA legal counsel and the technical staff of several states in the application and enforcement of RCRA, Safe Drinking Water Act and Clean Water Act regulations. Matt has trained the technical staff in the States of California, Hawaii, Nevada, Arizona and the Territory of Guam in the conduct of investigations, groundwater fundamentals, and sampling techniques.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – present;
- Senior Environmental Analyst, Komex H2O Science, Inc (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

Senior Regulatory and Litigation Support Analyst:

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of numerous environmental impact reports under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, greenhouse gas emissions and geologic hazards.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Stormwater analysis, sampling and best management practice evaluation at industrial facilities.
- Manager of a project to provide technical assistance to a comunity adjacent to a former Naval shipyard under a grant from the U.S. EPA.
- Technical assistance and litigation support for vapor intrusion concerns.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.
- Expert witness on two cases involving MTBE litigation.
- Expert witness and litigation support on the impact of air toxins and hazards at a school.
- Expert witness in litigation at a former plywood plant.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.
- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.

- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

Executive Director:

As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the dischrge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

Hydrogeology:

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

Policy:

Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

Geology:

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

Teaching:

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt currently teaches Physical Geology (lecture and lab) to students at Golden West College in Huntington Beach, California.

Invited Testimony, Reports, Papers and Presentations:

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

Hagemann, M.F., 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

Hagemann, M.F., 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

Hagemann, M.F., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

Hagemann, M.F., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

Hagemann, M.F., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

Hagemann, M.F., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

Hagemann, M.F., 2002. An Estimate of the Cost to Address MTBE Contamination in Groundwater (and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

Hagemann, M.F., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

Hagemann, M.F., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

Hagemann, M.F., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

Hagemann, M.F., and VanMouwerik, M., 1999. Potential Water Quality Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F**. 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

Hagemann, M.F., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

Hagemann, M.F., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

Hagemann, M.F., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

Hagemann, M.F., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

Hagemann, M. F., Fukanaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

Hagemann, M.F., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

Hagemann, M.F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

Hagemann, M.F., 1993. U.S. EPA Policy on the Technical Impracticability of the Cleanup of DNAPL-contaminated Groundwater. California Groundwater Resources Association Meeting.

Hagemann, M.F., 1992. Dense Nonaqueous Phase Liquid Contamination of Groundwater: An Ounce of Prevention... Proceedings, Association of Engineering Geologists Annual Meeting, v. 35.

<u>Other Experience:</u>

Selected as subject matter expert for the California Professional Geologist licensing examination, 2009-2011.

ANDERS SUTHERLAND

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EDUCATION

UNIVERSITY OF CALIFORNIA, LOS ANGELES **B.S. ATMOSPHERIC, OCEANIC, & ENVIRONMENTAL SCIENCES** ***JUNE 2010***

PROJECT EXPERIENCE

SOIL WATER AIR PROTECTION ENTERPRISE ***SANTA MONICA, CA***

AIR QUALITY SPECIALIST, PROJECT DEVELOPMENT STAFF *MARCH 2009 - JUNE 2013*

PROJECT MANAGER: VOC EMISSIONS AT UNCONVENTIONAL NATURAL GAS FACILITIES ***SEPT 2011 - JUNE 2013***

- Coordinated air dispersion modeling of VOC emissions from thirty-five natural gas processing facilities using AERMOD.
- Evaluated locally cumulative modeled concentrations with respect to regulatory thresholds and peer-reviewed literature.
- Reviewed and organized emissions inventory data and emission factor development studies to define model source terms.
- Composed text of affidavits and organized supporting materials for use as Expert testimony in environmental litigation.
- Participated in meetings with clients to discuss project strategy and identify solutions to achieve short and long term goals.

SENIOR ANALYST: VOCS AND SO_2 IN AMBIENT AIR SURROUNDING A PETROLEUM REFINERY ***NOV 2010 - JUNE 2013***

- Analyzed air monitoring data from numerous stations during facility emission events to examine effectiveness of network.
- Produced tables, charts, and graphs to exhibit the relative contribution of petroleum refinery emissions to local air quality.
- Combined analyses of air monitoring data, emissions modeling, and peer-reviewed literature in Expert Witness reports.
- Addressed time-dependent requests of client to conduct statistical analyses of air monitoring and emissions inventory data.
- Examined regulatory studies on the chemistry of ozone formation to characterize air quality impacts from industrial flares.

SENIOR ANALYST: BAAQMD LAND USE REDEVELOPMENTS SCREENING & MODELING ***JAN 2011 - DEC 2011***

- Calculated roadway, permitted source, and cumulative impacts for risk and hazard analyses at proposed land use projects.
- Prepared presentations containing figures and tables comparing results of particulate matter analyses to CEQA thresholds.
- Composed summary texts of Risk and Hazard Screening Analyses conducted for several land use redevelopment projects.
- Utilized BAAQMD methodologies for surface streets screening analyses to interpolate impacts between receptor distances.

SENIOR ANALYST: ODOROUS COMPOUNDS EMANATING FROM A SMOLDERING LANDFILL ***APRIL 2013 - JUNE 2013***

- Conducted ambient air and landfill gas sampling using sorbent tubes and SUMMA canisters for an array of analytes.
- Prepared portions of Quality Assurance Project Plan and Sampling and Analysis Plan submitted to the Missouri DNR.
- Calculated dioxin TCDD Toxic Equivalency Values from air monitoring data results obtained during field work activities.
- Reviewed previously conducted air sampling events to determine potential contaminants of concern and odor thresholds.

PUBLICATIONS

Contributing author: Feng, L., Wu, C., Tam, L., **Sutherland, A.J.**, Clark, J.J., Rosenfeld, P.E. Dioxin furan blood lipid and attic dust concentrations in populations living near four wood treatment facilities in the United States. *Journal of Environmental Health*. 2011 Jan-Feb; 73(6): 34-46.

Contributing author: Gonzalez, J., Feng, L., **Sutherland, A.**, Waller, C., Sok, H., Hesse, R., Rosenfeld, P.E. PCBs and dioxins/furans in attic dust collected near former PCB production and secondary copper facilities in Sauget, IL. *Procedia Environmental Sciences* 4 (2011): 113-125.

Contributing author: Chen, J.A., Zapata, A.R., **Sutherland, A.J.**, Molmen, D.R., Chow, B.S., Wu, L.E., Rosenfeld, P.E., Hesse, R.C. Sulfur dioxide and volatile organic compound exposure to a community in Texas City, Texas evaluated using AERMOD and empirical monitoring data. *American Journal of Environmental Science* 8(6) 2012: 622-632.

SWAPE Footnote #15

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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August 22, 2012

Rachael E. Koss
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Subject: Comments on the McCoy Solar Energy Project

Dear Ms. Koss:

We have reviewed the May 2012 Draft Environmental Impact Statement ("DEIS") for the McCoy Solar Energy Project ("Project"). The Project proposes to construct a 750-megawatt solar generation facility on approximately 8,000 acres of land 13 miles northwest of the City of Blythe in Riverside County, California. Project components include:

- A 230-kilovolt gen-tie line;
- A 230-kilovolt switchyard;
- Two telecommunications line;
- A distribution line; and
- An access road to the Project site (DEIS, p.2-4).

We have reviewed the DEIS for issues associated with hydrology and water quality and hazards and hazardous materials. We conclude that the DEIS does not adequately disclose and evaluate potentially significant impacts from Project construction on workers. A revised DEIS must be prepared to thoroughly disclose, analyze, and mitigate impacts from Project construction.

Hydrology and Water Quality

Impacts to Environment from Flooding of Project Site are not Adequately Disclosed

The DEIS states that following Project construction "erosion would occur in a manner consistent with existing conditions relating to wind and flash flooding" (DEIS, p. 4.7-8). The DEIS goes on to describe that "on-site inundation of the solar arrays during flood periods is anticipated as a matter of Project design" (DEIS, p. 4.20-9). Significantly, the DEIS does not consider that erosion from flooding may destabilize and topple PV panel arrays and may cause evaporation ponds to overtop and release wastewater. If PV panels are upended and broken, toxic compounds may be released and may cause impacts to waterways. The DEIS fails to disclose the potential for flood-caused contaminant releases and release of toxic compounds and wastewater.

PV panels containing cadmium telluride (CdTe) are being considered as a possible technology for the Project (DEIS, p. 4.9-6). The DEIS admits that CdTe is a hazardous substance but does not disclose the potential impacts of CdTe releases in the event of panel breakage. Instead, it simply states that "if the modules were damaged, CdTe would not mobilize from the glass into the environment in any plausible Project conditions" (*Ibid.*). This is in contrast with recent research that shows that cadmium from broken panels can leach into the environment. A 2012 study found that cadmium, from broken panels, can leach into groundwater at concentrations that exceed Environmental Screening Levels[1], which have been established for "protection against leaching and subsequent impacts to groundwater".[2]

The DEIS does not consider the possibility of panel breakage and subsequent CdTe releases due to flooding. Broken panels can expose the CdTe that is locked inside which can wash into adjacent waterways. A December 2011 report prepared for the Project site states that approximately 1% of the peak water flow from a 100-year flood event will flow to the McCoy Wash which eventually flows into the Colorado River via a system of man-made drains and canals.[3] Therefore, panels that break during flooding may release cadmium, at concentrations exceeding ESLs, into waters that will flow to the McCoy Wash and the Colorado River.

The potential for flooding was illustrated recently at the Genesis Solar Energy Project which is under construction approximately 12 miles to the west of the Project. The flood, which occurred over a 2-day period on July 30 and July 31, 2012 resulted from six inches of rain.[4] The rainfall, which was paired with high winds, damaged almost 200 parabolic trough mirrors resulting in damages of $3 million. The storm was characterized as a 100-year flood by company representatives.[5] Our review of this storm, using data from the Precipitation Frequency Data Server from the National Oceanic and Atmospheric Administration (NOAA) shows that 6 inches of rain over a 2-day period corresponds to a 500-year flood[6] (instead of a 100-year flood). Therefore, the DEIS's mitigation measures of providing evaporation ponds that can accommodate a 25-year storm event (DEIS, p. 4.20-18) and placing buildings 2 feet above the anticipated flood flows from a 100-year storm event (DEIS, p. 4.20-19) are inadequate.

If PV panels containing CdTe are used for the Project and flooding was to occur, there will be potentially significant releases of CdTe to adjacent waterways. Because the Applicant has not determined which

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[1] Fate and Transport Evaluations of Potential Leaching Risks from Cadmium Telluride Photovoltaics (2012). Environmental Toxicology and Chemistry, Vol. 31, No. 7

[2] Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. http://www.swrcb.ca.gov/sanfranciscobay/water_issues/available_documents/ESL_May_2008.pdf

[3] McCoy Project Site. Jurisdictional Delineation Report for Regulated Waters of the State of California, Riverside County, California. December 2011

[4] http://www.earthtechling.com/2012/08/big-desert-solar-project-hit-by-wind-flood/

[5] *Ibid.*

[6] http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca

type of panel will be used for the Project, impacts from panel breakage that may occur due to flooding and any subsequent releases of CdTe must be disclosed, evaluated, and mitigated.

The location of the Project on a broad alluvial fan surface in a piedmont[7] will place infrastructure in the path of distributary ephemeral stream channels which characteristically fill and overtop to accommodate infrequent rainfall events. Desert piedmonts are characterized by ephemeral flow networks that convey high-velocity flows through a complex array of unstable channels which shift positions during flooding. Predicting floods in these settings is difficult because of limited amounts of measured data on flow frequency and hydraulics.[8] According to recent research, "conventional concepts of floodplain management (i.e., as related to perennial streams) do not transfer" to alluvial fan settings and "flood-hazard management […] is a particularly challenging task."[9]

Erosion during flood events in this piedmont setting will potentially destabilize PV panels and cause them to topple, fall, and break. The flooding will also potentially inundate the evaporation ponds which could lead to erosion and failure of the pond's embankments.

The DEIS offers measures to mitigate flood hazards, stating:

> On-site inundation of the solar arrays during flood periods is anticipated as a matter of Project design. However, some of the proposed facilities on-site would require protection from flooding. For instance, unless suitably protected from flooding, the proposed on-site buildings could become inundated during a heavy storm event. Additionally, the proposed evaporation pond could become inundated. Implementation of Mitigation Measure WATER-4, which would require that all on-site buildings, maintenance areas, designated parking lots, and associated facilities be constructed at an elevation of at least 2 feet above the highest anticipated flood flows during a 100-year event, would reduce such risks. Implementation of Mitigation Measure WATER-5 would ensure that workers and employees are protected in the event of a flood (DEIS, p. 4.20-19)

Mitigation measure WATER-4 requires:

> The proposed evaporation pond shall include berms of levees that reach at least 2 feet above the highest anticipated flood flows during a 100-year storm event, or at least 2 feet above the highest adjacent ground, whichever is greater, in order to protect the evaporation pond from incident flooding events and ensure that the ponds are not inundated by flood flows (DEIS, p. 4.20-19).

Mitigation measure WATER-4 assumes that protection from a 100-year flood will suffice for buildings and the evaporation ponds. Mitigation Measure WATER-2 provides only that evaporation ponds shall be

[7] A piedmont is a typically broad, generally low-relief area extending from the base of a mountain range toward the center or axis of a valley. The valley axis may host an axial stream, river, or wash; or a lake or playa.
[8] http://www.nbmg.unr.edu/pubs/r/r53/index.html
[9] http://www.nbmg.unr.edu/pubs/r/r53/index.html

sized to accommodate operational discharges plus a 25-year storm event, with no less than 1 foot of freeboard.

These measures would clearly not be adequate in the event a storm, of the magnitude that occurred at the Genesis Solar Power Project site, were to occur on the proposed Project site. The rainfall event at the Genesis Solar Power Project shows that flooding that is not anticipated can occur in the desert where estimating the likelihood of a flood events is notoriously difficult as discussed above.

Flooding of the magnitude observed on July 30-31, 2012 at the Genesis Solar Power Project site would have the potential to cause widespread damage to PV panel arrays and evaporation ponds, impacts not analyzed in the DEIS. A revised DEIS should be prepared to include a flood hazard assessment that recognizes the alluvial fan setting of the Project site location. It should also identify areas most prone to flooding so that placement of infrastructure, most importantly PV panels and evaporation ponds, are not placed in high-hazard areas. The revised DEIS should also evaluate the potential for panel breakage in the event of a flood and the potential for discharge of cadmium to adjacent waterways. A revised DEIS is also necessary to assess impacts from overtopping of evaporation ponds and resultant release of wastewater.

Project may Violate Water Quality Standards and Waste Discharge Requirements

The DEIS assumes the need for eight acres of evaporation ponds for discharge from the water treatment system. Discharge of wastewater to the evaporation ponds would require a Waste Discharge Requirement permit from the Regional Water Quality Control Board ("RWQCB"), a requirement not adequately addressed in the DEIS. A permit may also be required for any fill placement (during road construction, for example) or placement of PV panel supports across ephemeral drainages at the Project site, a condition that is unanticipated in the DEIS. Evaluation of the permit requirements is necessary to ensure full compliance with the requirements of the Porter-Cologne Water Quality Control Act and the California Water Code. Evaluation is also necessary to demonstrate that the Project will not cause or contribute to an exceedence of water quality standards established for surface water and groundwater under the Basin Plan.[10] A revised DEIS should be prepared to include permitting documents to show that compliance can be achieved and to show that wastewater discharge will not cause adverse impacts to wildlife and fill placement will not degrade Waters of the State.

Discharge of Wastewater

Treatment would be necessary to demineralize water used for panel washing. Operation of the two planned PV units would require use of up to 44 acre-feet per year of treated water for PV panel cleaning and dust control (DEIS, p. 2-20).

The DEIS states that solids produced from precipitation of minerals in wastewater (from reverse osmosis or demineralization systems) would likely to be classified as Class II non-hazardous industrial waste

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[10] Water Quality Control Plan Colorado River Basin – Region 7. http://www.waterboards.ca.gov/coloradoriver/publications_forms/publications/docs/basinplan_2006.pdf

(DEIS, p. 2-22). According to the DEIS, the evaporation ponds would require permit approval from the Colorado RWQCB and/or the California Department of Public Health (DEIS, p. 3.20-21).

The DEIS goes on to say:

> If evaporation ponds are needed, a Water Discharge Requirement (WDR) permit would be obtained from the Colorado River RWQCB, which is expected to require the preparation of a Water Quality Monitoring and Response Plan that includes monitoring of the Project pond liner to detect leaks, as well as groundwater monitoring (DEIS, p. 2-22).

The DEIS makes conflicting statements about the need for evaporation ponds, stating on the one hand that the need for ponds is assumed in the DEIS, and then stating that Waste Discharge Requirement permit would be obtained "if" ponds are needed. Nevertheless, because the DEIS assumes the need for evaporation ponds, the DEIS should assume the need for approval of a Report of Waste Discharge (ROWD) from the Colorado River RWQCB. The approval process involves submittal of: (a) of a Notice of Intent (NOI) to comply with the terms and conditions of the General Waste Discharge Requirements or a Report of Waste Discharge (ROWD) pursuant to California Water Code §13260; (b) a fee; (c) a Project map; (d) evidence of CEQA compliance; and (e) a monitoring plan.

Other solar projects that required evaporation ponds have included draft ROWDs in the planning documents. For example, the applicant for the Beacon Solar project in Kern County prepared a ROWD and submitted it during the planning process for Regional Board Review in 2009.[11]

A ROWD is also necessary to evaluate flood impacts. The DEIS states that proposed evaporation ponds could become inundated (DEIS, p. 4.20-9) but does not describe if ponds could be overtopped and release wastewater thereby causing impacts to McCoy Wash and other receiving water bodies. Because of this oversight, no mitigation is provided in the event that ponds are breached. A ROWD should address the potential for flooding of the evaporation ponds and provide mitigation to ensure wastes are not discharged in the event of a flood.

A revised DEIS should be prepared to include a draft ROWD. A ROWD is essential for public review of potential impacts on water resources and biological resources which may include bird kills and attractive nuisance issues. The ROWD should include documentation about wastewater pond construction (including design specifications, sizing (including flood event considerations) and, evaluation of the need for leak detection), provisions for monitoring and reporting water quality and biological impacts (including bird mortality), and an evaluation of the need for groundwater monitoring.

<u>Construction in Ephemeral Drainages</u>

A ROWD is also necessary for the discharge of waste resulting from placement of fill or construction activities within numerous ephemeral drainages that are considered Waters of the State, according to the California Water Code. The DEIS does not address this requirement and provides no analysis of the need for a ROWD.

[11] Attachment 6, Report of Waste Discharge, Beacon Solar Energy Project. June 2009.

Preliminary jurisdictional evaluations of Waters of the State have been completed in support of the Project (DEIS, p. 3.20-20). The evaluation identified 185 acres of Waters of the State that will be impacted by Project construction, including desert dry wash woodlands, vegetated ephemeral streams and unvegetated ephemeral dry washes (DEIS, p. 4.3-6).

The placement of fill across ephemeral drainages considered Waters of the State has led to the preparation of ROWDs for other solar projects. For example, in San Luis Obispo County, the Central Coast RWQCB required a ROWD and issued Waste Discharge Requirements in 2012 for the California Valley Solar Ranch project.[12] The Waste Discharge Requirements for the California Valley Solar Ranch project were based on the finding that construction would impact 0.02 acres of ephemeral drainages. For comparison, the McCoy Project DEIS estimates that the project would impact 185 acres to State jurisdictional waters.

Pursuant to Section 13260(a) of the California Water Code, a revised DEIS should be prepared to include a ROWD that would identify the project's impacts to jurisdictional waters from construction of roads or placement of PV panel supports in waterways.

Hazards and Hazardous Materials

<u>Hazards Associated with Former Military Site are not Evaluated Adequately</u>

The Blythe Airport is four miles south the Project site. The Blythe Airport and its surroundings were occupied and used by the U.S. Army for bombing practice and gunnery ranges during World War II. The area of the airport and the practice ranges are known as the Blythe Army Airfield Formerly Used Defense Site (FUDs). The Blythe Army Airfield ("Blythe AAF") was used for heavy bomber pilot and crew training for the Second Air Force heavy bombardment crew from 1942 to 1944. In 1943, the base housed 7,500 personnel, 75 heavy bombers, and utilized 650 buildings.[13]

We have mapped the FUDs boundary and associated features including firing ranges and a practice bombing area (Figure 1, Attachment A). As shown in the figure, areas where bullets were scattered from target practice (known as "safety fans") are located approximately 4000 feet south of the Project site footprint. Tie lines for power transmission cut across both safety fans. The practice bombing range underlies a majority of the Project area.

<u>Firing Ranges and Safety Fans</u>

A Poorman gunnery range, skeet range, and jeep type target range, all with ammunition storage, were constructed and used by Army personnel.[14] Poorman ranges were used at bases across the U.S. for training in aerial gunnery. Turrets used for training generally utilized twin-mounted .50 caliber machine

[12] California Regional Water Quality Control Board Central Coast Region. Individual Waste Discharge Requirements Order No. R3-2012-0006 for California Valley Solar Ranch Discharges of Fill Material for Waters of the State, San Luis Obispo County, California. February 2012.

[13] http://deserttrainingcenter.com/Blythe%20Army%20Airfield.htm

[14] Blythe Army Airfield, Findings and Determination of Eligibility, Site Summary Sheet, Project Summary Sheet and Risk Assessment Procedure, DERP-FUDS Site No. J09CA024500

guns. The safety fan associated with the Poorman Range at the Blythe AAF is shown in Figure 1 to extend more than five miles to underlie the eastern and western generator tie line alignments being considered for power transmission lines.

Jeep Ranges were used to simulate moving targets for trainees using .30 and .50 caliber machine guns. The Jeeps were guided on tracks behind an earthen bunker with the target extending above the berm.[15] Figure 1 shows the Jeep Range to underlie the eastern generator tie line alignment and an access road.

Firing and Bombing Area

A World War II vintage map identifies a "Firing and Bombing Area" northwest of the Blythe AAF and within the Project boundary. The area of the Firing and Bombing Area was annotated on the map with the notation "used during daylight hours, Blythe Air Base."[16] Although records about specific practice bombing activities are not available, practice bombing activities at similar ranges included the use of practice bombs fitted with black powder, spotting charges, or smoke charges.[17] The use of the spotting charges aided in the scoring of the accuracy of the bombardier trainees. This use is confirmed by a 1999 Archive Search Report for the Blythe AAF which found that "large quantities of black powder spotting charges (for practice bombs) and high explosive bombs were stored on the base."[18]

High explosive bombs at Blythe AAF were also identified in the Archive Search Report which suggests that these bombs were also used for practice bombing. Bomb fragments associated with high explosives were found at bombing ranges associated with Blythe AAF in Arizona.[19] Other evidence indicates use of 250-pound general purpose high explosive bombs.[20] Another related Archive Search Report identified the use of M38A2 practice bombs at Blythe AAF.[21] The M38A2 was a 100-pound sand-filled bomb fitted with an M1A1 spotting charge. The M1A1 spotting charge contains three pounds of black powder with an inertia-type fuse containing a shotgun primer.[22]

The Potential for Exposure to Hazardous Materials has not been Adequately Evaluated

The safety fans for the Poorman and Jeep Ranges that extend beneath the project transmission line routes may be areas where spent .30 and .50 caliber bullets are found during project construction. Bullets, upon striking soil, impart metal fragments to the soil matrix. The bullets and impacted soil may

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[15] http://www.bomberlegends.com/pdf/BL_Mag_v2-2-GunneryTrain.pdf

[16] U.S. Army Corps of Engineers. Defense Environmental Restoration Program for Formerly Used Defense Sites. Military Munitions Response Program. Final Archives Search Report for the former Laguna Area Northern Maneuver Area Northern Portion. La Paz, Maricopa, and Yavapai Counties, Arizona Project Number J09AZ043902. March 1999. p. 304 of 385.

[17] U.S. Army Corps of Engineers. Defense Environmental Restoration Program for Formerly Used Defense Sites. Ordnance and Explosives. Archive Search Report Findings for the former Borrego Hotel (Target Area and Emergency Landing Field). Borrego Springs, California. Project No. J09CA701104. March 1997.

[18] *Ibid.*, p. 29

[19] *Ibid.*, p. 35

[20] *Ibid.*, p. 20

[21] *Ibid.*, p. 15

[22] http://www.swf.usace.army.mil/pubdata/fuds/5points/specs/spotting.PDF

contain lead and other metals, including copper, zinc, tungsten, arsenic, antimony, and nickel, at concentrations that would pose a risk to workers excavating soil.[23] Lead has been found in association with .50 caliber rounds at a former jeep range at Nellis AFB in California.[24] Sampling for lead and other metals has been conducted at other former jeep ranges.[25]

The DEIS does not identify the presence of former ranges and does not recognize the potential for contamination to be associated with bullets that are likely to be found in the areas of the safety fans. No sampling for soil contamination associated with the safety fans has been conducted to date. Workers involved in excavation activities along the transmission line alignments may be exposed to soil and dust that would contain hazardous concentrations of lead.

Additionally, the potential for pyrotechnic, incendiary, or tracer ammunition use at the Poorman and Jeep Ranges was not evaluated in the DEIS. Pyrotechnic and incendiary magazines are identified in the map of Blythe AAF[26] and therefore pyrotechnic and incendiary devices were presumably used during training activities associated with the Poorman and Jeep ranges. Additionally, the Corps of Engineers, in a 1999 assessment of Blythe AAF, identified "munition (containers) containing White Phosphorus (WP) or other pyrophoric material (i.e. spontaneously flammable)" [27] providing further evidence of the use of pyrotechnics. Incendiaries are also classified as pyrotechnic munitions. Compounds of concern used in pyrotechnic munitions include perchlorates used as oxidizers.[28] Perchlorates are known to inhibit thyroid function[29] and are a risk to human health, primarily through ingestion of drinking water, although inhalation of soil dust is a known route of exposure.[30] Areas where pyrotechnic devices were detonated may present a health risk to construction workers in areas of transmission line construction.

Worker safety and public heath may be significantly at risk without soil sampling in the areas of the Project underlain by the former Poorman and Jeep Ranges. Soil sampling should be undertaken to include the metals associated with the projectiles used in the firing ranges and to include components of the pyrotechnics, including perchlorates.

Unexploded Ordnance may Pose Risks to Workers

The former Firing and Bombing Area, which underlies much of the Project footprint, represents an area where unexploded ordnance (UXO) may be present in the form of practice bombs and incendiary devices. In addition to the explosion hazard represented by UXO, toxic chemicals may be found in soil associated with the practice bombs and incendiary devices.

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[23] http://www.itrcweb.org/Documents/SMART-2.pdf, p. 3
[24] http://uxoinfo.com/blogcfc/client/enclosures/Nellis_SmallArmsCom_ASR.pdf
[25] See for example, http://www.azdeq.gov/environ/waste/sps/download/state/031010fs1.pdf, http://www.propfirst.com/BellaVista/PinecastleRange.pdf, and http://www.itrcweb.org/Documents/SMART-2.pdf
[26] Boundary Sketch, Blythe Army Airfield, September 1943
[27] Blythe Army Airfield, Findings and Determination of Eligibility, Site Summary Sheet, Project Summary Sheet and Risk Assessment Procedure, DERP-FUDS Site No. J09CA024500
[28] http://www.dtsc.ca.gov/LawsRegsPolicies/Regs/upload/HWMP_WS_dPerch-Sec9.pdf
[29] http://www.itrcweb.org/Documents/PERC-1.pdf
[30] http://oehha.ca.gov/risk/pdf/120409Perchlorate.pdf

UXO has been documented in association with the neighboring Blythe Solar Power Project (BSPP), located within less than 500 feet south of the Project site. During construction of the BSPP, seven separate UXO-related material findings have been reported. These incidents are documented in Monthly Compliance Reports and associated attachments, which were prepared by the applicant and submitted to the California Energy Commission. We obtained these reports and have created a map to show where UXO have been found (Figure 2, Attachment B). These findings are also described in the table below.

MEC/UXO Related Materials Findings at the Blythe Solar Power Project				
#	Date	Location (UTM, Zone 11S)	Findings	Area Surveyed
1	May 18, 2009	706674 E, 3728543 N	M1B1 Practice Landmine	400 x 400 foot grid
2	May 18, 2009	706976 E, 3728549 N	M1B1 Practice Landmine	400 x 400 foot grid
3	March 22, 2010	706678 E, 3725029 N	Pressure Plate for Practice Landmine	N/A*
4	April 6, 2010	708394 E, 3721881 N	Pressure Plate for Practice Landmine	N/A*
5	May 20, 2011	708475 E, 3722249 N	M1B1 Practice Landmine	200 x 200 foot grid
6	July 14, 2011	0706672 E, 3728568 N	M1B1 Practice Landmine	400 x 400 foot grid
7	July 20, 2011	0706918 E, 3728580 N	M1B1 Practice Landmine	400 x 400 foot grid

N/A: unable to obtain this data

UXO-related materials were found during site surveys performed by BSPP personnel. As the table shows, the surveys where the seven UXO-related materials were found only cover a tiny fraction of the entire BSPP site. If the entire BSPP site were thoroughly evaluated, numerous additional UXO-related materials and debris findings would likely be found.

The only mention of the potential for hazardous materials and UXO to be present on the Project site or associated transmission lines is as follows:

> Because of the area's former use for military training, there is potential for discarded military munitions, other explosives, and unexploded ordnance (collectively, UXO) to be encountered. The BLM has conducted investigations at several of the known camps, but has not completed a UXO survey of the entire training ground. As with most current or former military installations, there is a possibility of UXO. Reportedly, several UXO discoveries have been made in the immediate vicinity of the site. Information obtained from cultural resource studies in the area and construction efforts at the BSPP indicate that UXOs have been identified in the area with increasing frequency near the McCoy Wash (Tetra Tech, 2011) (DEIS, p. 3.22-4).

The DEIS omits any specific reference to the safety fans that underlie the transmission lines and the practice bombing area that underlies the Project footprint. The DEIS fails to document the findings of UXO made during field work for BSPP. Because of these omissions, the DEIS fails to convey that, almost assuredly, hazardous materials and unexploded ordinance will be found in areas where earthwork will take place, putting workers at risk, unless first evaluated.

Instead, the DEIS states

> The CERCLA requires that, before transferring lands from the military, the military service must search for and remove munitions and UXO to accommodate reasonably anticipated future land uses (DEIS, p. 3.22-4).

We know of no plans by the military, specifically, the Army Corps of Engineers, to assess these risks. Any plans by the military to assess UXO risks prior to ground disturbance should be disclosed in a revised DEIS.

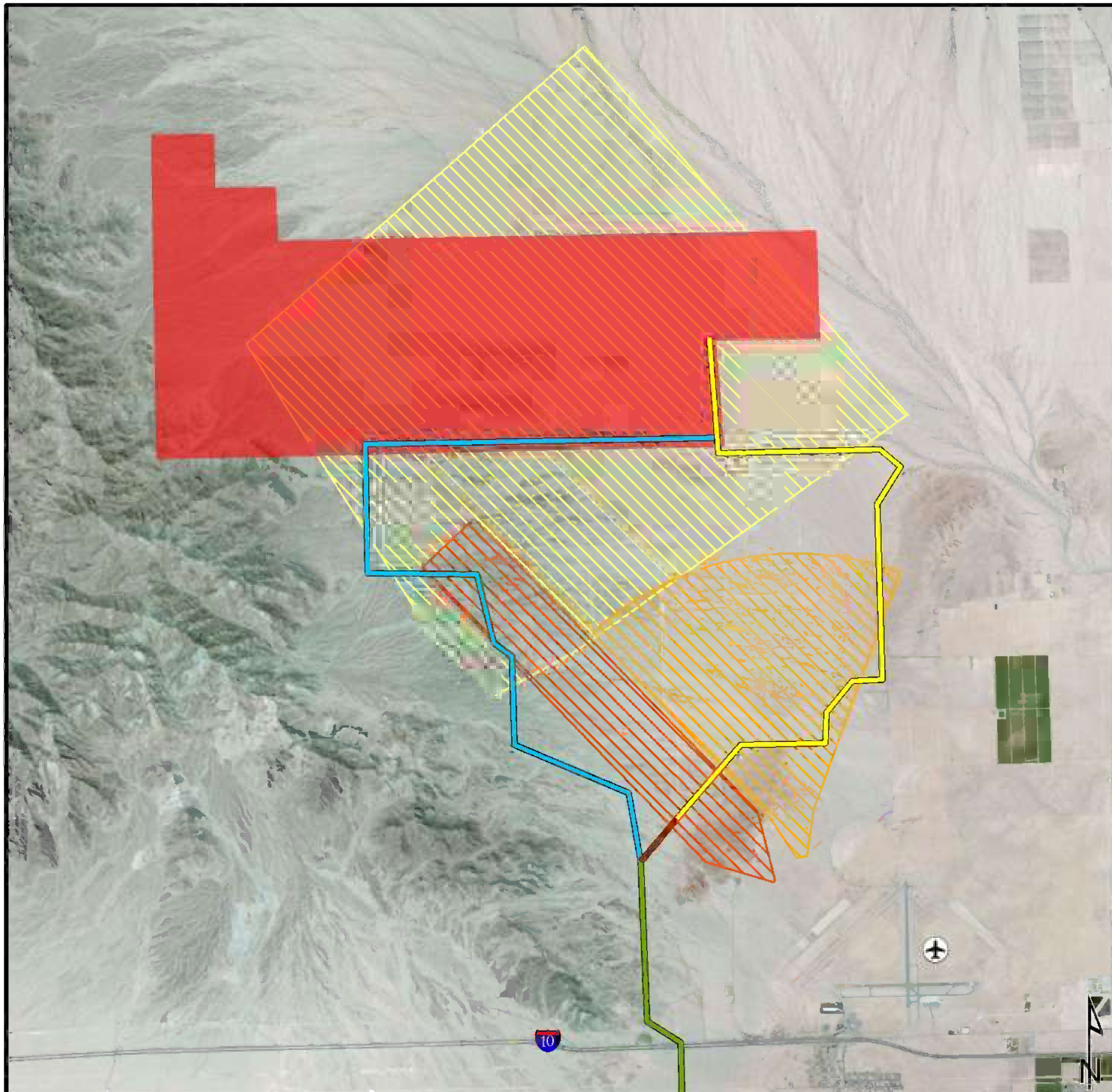
The DEIS should be revised to include full disclosure of the military uses of the Project are and the transmission lines, including target ranges and practice bombing ranges. Disclosure should include types of ammunition and ordnance that would likely have been used and the locations where the materials were expended, as well as contaminants and explosive hazards that would be associated with their use. The DEIS should also include plans for evaluation of UXO and soil contamination hazards prior to construction. The BLM has issued guidance for UXO evaluation[31] which should be used to prepare plans for UXO evaluation and findings, to be included in the revised DEIS. Plans implemented for the Solar Millennium project should also be considered, particularly the provisions for supervision by a UXO specialist and submittal of monthly reports of UXO findings.

Sincerely,

Matt Hagemann, P.G., C.Hg.

[31] U.S. Department of the Interior. Bureau of Land Management. Military Munitions and Explosives of Concern: A Handbook for Federal Land Managers, with Emphasis of Unexploded Ordnance. February 2006.

ATTACHMENT A



LEGEND

- McCoy Project Site[a]
- East Generator Tie Line Corridor and 24' Access Road[a]
- East Generator Tie Line Corridor[a]
- West Generator Tie Line Corridor (Alternate)[a]
- CRS Tie Line Corridor[a]
- Bombing Range: Used for Daylight Hours[b]
- Poor Man Small Arms Range[c]
- Jeep Small Arms Range[c]

NOTES

1. All locations are approximate.
2. Aerial imagery obtained from ESRI Aerials Map Service.

SOURCES

a. Tetra Tech, 2011. Site Vicinity Map. McCoy Solar Energy Project, Riverside County, California. January 19, 2011.

b. US Army Corps of Engineers, 1999. Defense Environmental Restoration Program for Formerly Used Defense Sites - Military Munitions Response Program - Final Archives Search Report for the Former Laguna Maneuver Area Northern Portion - La Paz, Maricopa, and Yavapai Counties Arizona. Project Number J09AZ043902. California/Arizona Maneuver Area, Third Edition - 29E 4. March 3, 1999.

c. Installation and CTT Maps, 2003. FUDs and Range Boundaries. Blythe Army Airfield, FUDs Property No. J09CA024502. Blythe, California, Riverside County.

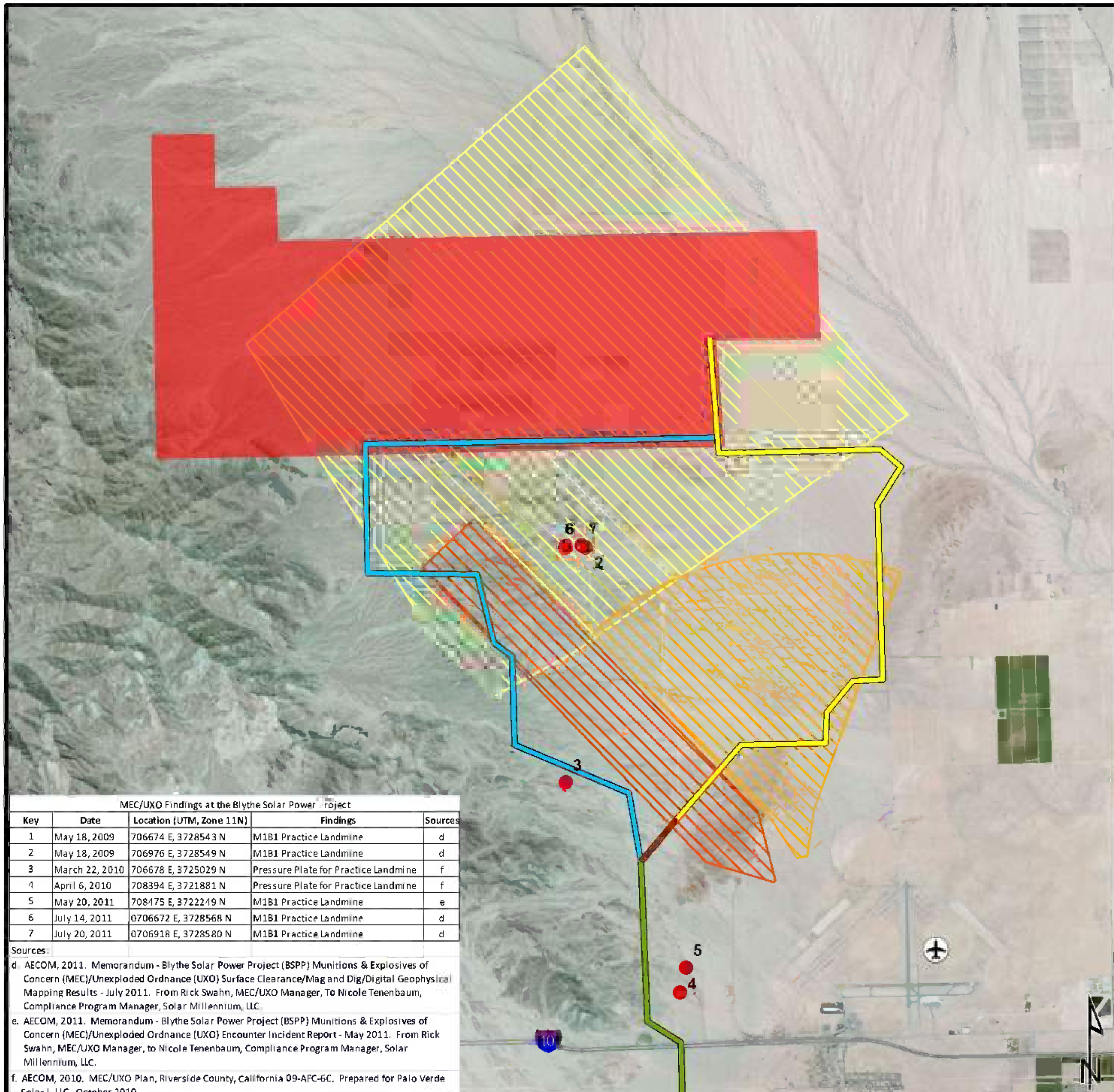
0 0.35 0.7 1.4 Miles

Project:
NextEra McCoy Solar Energy Project
Riverside County, California

Title:
Project Site Overview
Bombing Area and Small Arms Ranges

	Project No.: 523	Drawn By: JAC	Figure: 1
SWAPE	Approved: MFH	Date: 08.21.2012	

ATTACHMENT B



MEC/UXO Findings at the Blythe Solar Power Project

Key	Date	Location (UTM, Zone 11N)	Findings	Sources
1	May 18, 2009	706674 E, 3728543 N	M1B1 Practice Landmine	d
2	May 18, 2009	706976 E, 3728549 N	M1B1 Practice Landmine	d
3	March 22, 2010	706678 E, 3725029 N	Pressure Plate for Practice Landmine	f
4	April 6, 2010	708394 E, 3721881 N	Pressure Plate for Practice Landmine	f
5	May 20, 2011	708475 E, 3722249 N	M1B1 Practice Landmine	e
6	July 14, 2011	0706672 E, 3728568 N	M1B1 Practice Landmine	d
7	July 20, 2011	0706918 E, 3728580 N	M1B1 Practice Landmine	d

Sources:

d. AECOM, 2011. Memorandum - Blythe Solar Power Project (BSPP) Munitions & Explosives of Concern (MEC)/Unexploded Ordnance (UXO) Surface Clearance/Mag and Dig/Digital Geophysical Mapping Results - July 2011. From Rick Swahn, MEC/UXO Manager, To Nicole Tenenbaum, Compliance Program Manager, Solar Millennium, LLC.

e. AECOM, 2011. Memorandum - Blythe Solar Power Project (BSPP) Munitions & Explosives of Concern (MEC)/Unexploded Ordnance (UXO) Encounter Incident Report - May 2011. From Rick Swahn, MEC/UXO Manager, to Nicole Tenenbaum, Compliance Program Manager, Solar Millennium, LLC.

f. AECOM, 2010. MEC/UXO Plan, Riverside County, California 09-AFC-6C. Prepared for Palo Verde Solar I, LLC. October 2010.

LEGEND

- McCoy Project Site[a]
- East Generator Tie Line Corridor and 24' Access Road[a]
- East Generator Tie Line Corridor[a]
- West Generator Tie Line Corridor (Alternate)[a]
- CRS Tie Line Corridor[a]
- Bombing Range: Used for Daylight Hours[b]
- Poor Man Small Arms Range[c]
- Jeep Small Arms Range[c]
- MEC/UXO Findings

NOTES

1. All locations are approximate.
2. Aerial imagery obtained from ESRI Aerials Map Service.

SOURCES

a. Tetra Tech, 2011. Site Vicinity Map. McCoy Solar Energy Project, Riverside County, California. January 19, 2011.

b. US Army Corps of Engineers, 1999. Defense Environmental Restoration Program for Formarly Used Defense Sites - Military Munitions Response Program - Final Archives Search Report for the Former Laguna Maneuver Area Northern Portion - La Paz, Maricopa, and Yavapai Counties Arizona. Project Number J09AZ043902. California/Arizona Maneuver Area, Third Edition - 29E 4. March 3, 1999.

c. Installation and CTT Maps, 2003. FUDs and Range Boundaries. Blythe Army Airfield, FUDs Property No. J09CA024502. Blythe, California, Riverside County.

0 0.35 0.7 1.4 Miles

Project:
NextEra McCoy Solar Energy Project
Riverside County, California

Title:
Project Site Overview
Bombing Area and Small Arms Ranges
MEC/UXO Findings

SWAPE	Project No.: 523	Drawn By: JAC	Figure: 2
	Approved: MFH	Date: 08.21.2012	

SWAPE Technical Consultation, Data Analysis and Litigation Support for the Environment

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Education:

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.
B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

Professional Certification:

California Professional Geologist
California Certified Hydrogeologist
Qualified SWPPP Developer and Practitioner

Professional Experience:

Matt has 25 years of experience in environmental policy, assessment and remediation. He spent nine years with the U.S. EPA in the RCRA and Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater from perchlorate and MTBE. While with EPA, Matt also served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. He led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) while also working with permit holders to improve hydrogeologic characterization and water quality monitoring.

Matt has worked closely with U.S. EPA legal counsel and the technical staff of several states in the application and enforcement of RCRA, Safe Drinking Water Act and Clean Water Act regulations. Matt has trained the technical staff in the States of California, Hawaii, Nevada, Arizona and the Territory of Guam in the conduct of investigations, groundwater fundamentals, and sampling techniques.

Positions Matt has held include:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Geology Instructor, Golden West College, 2010 – present;
- Senior Environmental Analyst, Komex H2O Science, Inc (2000 -- 2003);

- Executive Director, Orange Coast Watch (2001 – 2004);
- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);
- Geologist, U.S. Forest Service (1986 – 1998); and
- Geologist, Dames & Moore (1984 – 1986).

Partner, SWAPE:

With SWAPE, Matt's responsibilities have included:

- Lead analyst and testifying expert in the review of numerous environmental impact reports under CEQA that identify significant issues with regard to hazardous waste, water resources, water quality, air quality, greenhouse gas emissions and geologic hazards.
- Stormwater analysis, sampling and best management practice evaluation at industrial facilities.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Technical assistance and litigation support for vapor intrusion concerns.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.
- Expert witness on two cases involving MTBE litigation.
- Expert witness and litigation support on the impact of air toxins and hazards at a school.
- Expert witness in litigation at a former plywood plant.

With Komex H2O Science Inc., Matt's duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.
- Expert witness testimony in a case of oil production-related contamination in Mississippi.
- Lead author for a multi-volume remedial investigation report for an operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.
- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

Executive Director:

As Executive Director with Orange Coast Watch, Matt led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, Matt prepared issue papers in the areas of treatment and disinfection of wastewater and control of the dischrge of grease to sewer systems. Matt actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Matt worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

Hydrogeology:

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, Matt led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities were as follows:

- Led efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiated a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identified emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, Matt developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. He used analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, Matt worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for his contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. He prepared geologic reports, conducted public hearings, and responded to public comments from residents who were very concerned about the impact of designation.

- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Matt served as a hydrogeologist with the RCRA Hazardous Waste program. Duties were as follows:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
- Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, Matt directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following tasks:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.
- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

Policy:

Served senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advised the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaped EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improved the technical training of EPA's scientific and engineering staff.
- Earned an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Established national protocol for the peer review of scientific documents.

Geology:

With the U.S. Forest Service, Matt led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities were as follows:

- Mapped geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinated his research with community members who were concerned with natural resource protection.
- Characterized the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, Matt led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large hazardous waste site in eastern Oregon. Duties included the following:

- Supervised year-long effort for soil and groundwater sampling.
- Conducted aquifer tests.
- Investigated active faults beneath sites proposed for hazardous waste disposal.

Teaching:

From 1990 to 1998, Matt taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.

Matt currently teaches Physical Geology (lecture and lab) to students at Golden West College in Huntington Beach, California.

Invited Testimony, Reports, Papers and Presentations:

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

Hagemann, M.F., 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Coloradao.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

Hagemann, M.F., 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to the Ground Water and Environmental Law Conference, National Groundwater Association.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal repesentatives, Parker, AZ.

Hagemann, M.F., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

Hagemann, M.F., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

Hagemann, M.F., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

Hagemann, M.F., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

Hagemann, M.F., 2002. An Estimate of the Cost to Address MTBE Contamination in Groundwater (and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

Hagemann, M.F., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

Hagemann, M.F., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

Hagemann, M.F., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

Hagemann, M.F., and VanMouwerik, M., 1999. Potential Water Quality Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F**. 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

Hagemann, M.F., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

Hagemann, M.F., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

Hagemann, M.F., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

Hagemann, M.F., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

Hagemann, M. F., Fukanaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

Hagemann, M.F., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

Hagemann, M.F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

Hagemann, M.F., 1993. U.S. EPA Policy on the Technical Impracticability of the Cleanup of DNAPL-contaminated Groundwater. California Groundwater Resources Association Meeting.

Hagemann, M.F., 1992. Dense Nonaqueous Phase Liquid Contamination of Groundwater: An Ounce of Prevention... Proceedings, Association of Engineering Geologists Annual Meeting, v. 35.

Other Experience:

Selected as subject matter expert for the California Professional Geologist licensing examination, 2009-2011.

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ESTIMATING PARTICULATE MATTER EMISSIONS FROM CONSTRUCTION OPERATIONS

FINAL REPORT

Prepared for:

Emission Factor and Inventory Group
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Prepared by:

Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110

Under Subcontract to:

Eastern Research Group, Inc.
1600 Perimeter Park
P.O. Box 2010
Morrisville, North Carolina 27560

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Preface

This report was prepared by Midwest Research Institute (MRI) for the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards under Purchase Order No. EFIG-0068 from Eastern Research Group (ERG). Mr. Garry Brooks was the Work Assignment Leader for ERG. This work was performed under EPA Prime Contract No. 68-D7-0068 with ERG.

The report summarizes the methods that have been used to develop inventories of fugitive dust and exhaust particulate matter (PM) emissions from construction activities, identifies surrogate data sources for PM emission calculations, and proposes a preferred methodology to estimate county level emissions. Mrs. Mary Ann Grelinger was the MRI Project Leader for this assignment. Dr. Chatten Cowherd and Dr. Greg Muleski served as technical consultants on this project. This report was prepared by Mrs. Grelinger, Ms. Courtney Kies, and Dr. Cowherd.

MIDWEST RESEARCH INSTITUTE

Chatten Cowherd for

Chatten Cowherd, Jr., Ph.D.
Principal Advisor

Approved:

Thomas J. Grant

for Roy Neulicht
Program Manager
Technical Support Contact

September 15, 1999

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Section 1. Introduction

This report was prepared as part of a study to develop an improved method for estimating particulate matter (PM) emissions from construction operations.

A new methodology is needed to improve emission estimates on a national county-by-county basis for the National Emission Trends (NET) inventory. Construction operations can substantially impact local air quality from suspended dust, equipment exhaust, and burning emissions. The majority of PM emissions originates from sources that suspend dust from soil and construction materials, especially from equipment travel. PM emissions are released into ambient air from the following construction activities:

- Equipment movement on unpaved surfaces (suspended dust and exhaust emissions)
- Earthmoving (cut and fill operations, and excavation activities)
- Material transfer operations, including loading/unloading activities
- Material alterations, including drilling, crushing, screening, cutting, blasting, and surface cleaning activities
- Portable plant crushing and screening
- Track-out of dirt to nearby paved roads for subsequent dust resuspension by traffic
- Land clearing, including demolition/burning of existing structures and vegetative residues
- Wind erosion of soil exposed by construction activities

The activities performed in this study included:

- Identification of readily available national and regional information sources that can be used to prepare an inventory of PM emissions from construction activity
- Identification of categories of construction that can be expected to have different emission characteristics (e.g., highway, commercial, housing)
- Characterization of factors that impact construction emissions (e.g., meteorological parameters, regional differences in construction, soil types, economic conditions)
- Development of a methodology to estimate county-level emissions of fugitive dust from construction activities

This report is organized as follows. Section 2 provides information on the calculation of PM_{10} and $PM_{2.5}$ components of fugitive dust and exhaust emissions generated during construction operations. Section 3 identifies the categories of construction that are believed to have different dust emitting characteristics and levels of activity and in turn produce different amounts of PM emissions. Section 4 presents existing methodologies used to calculate PM_{10} emissions from construction activities. Section 5 presents an assessment of the California methodology and the NET methodology, recommended changes to the Trends procedure, an updated methodology for calculating emissions for the county-level on a national basis, and a review of the data sources needed to develop such an inventory.

Section 2.
PM Emissions from Construction Activities

Particulate matter emissions from construction activities are produced from equipment exhaust (primarily from diesel-fueled engines), equipment travel and activity on unpaved surfaces, on-site material handling operations (e.g., temporary on-site crushing/screening), and track-out of dirt onto adjacent paved roads with subsequent resuspension by traffic. Equipment exhaust emissions consist of finer, combustion aerosols, while fugitive dust emissions consist mostly of coarser crustal particles.

Conditions that influence construction PM emissions include equipment type, size, and travel speed; engine type, size, and load; soil type and moisture content; and wind conditions. For example, exhaust emissions are high when excavating soil and engines are under load; fugitive dust emissions are high when dry surface dust is disturbed and suspended by construction equipment travel.

A wide variety of equipment classes, sizes, and engine types are used in construction activities. Construction equipment includes motor graders, trucks, scrapers, and other equipment types. General construction equipment is outlined in Table 2-1.

Table 2-1. Types of Construction Equipment

Motor graders	Trucks	Scrapers
Loaders (track- and wheel-type)	Tractors (track- and wheel-type)	Excavators (track- and wheel-type)
Road wideners	Compactors (pneumatic and vibratory)	Road reclaimers/ Soil stabilizers
Windrow elevators	Cold planers	Power shovels

2.1 Information Sources—Construction Activity Levels

Many data sources are available that provide construction statistics for the national, regional, state, and county levels. This study identified information sources that can be used to develop a county-by-county inventory of PM emissions associated with construction activities. The available information sources determine the form of methodology that is used to develop the inventory.

Due to variations in the type of data that local governmental agencies can provide (construction permits and/or compiled local construction data), methods for determining construction activity levels differ by area. Many areas have high quality measures of construction activity levels resulting from local government requirements for construction permitting; however, only lower quality (less resolved) data may be available for other areas.

Two widely used references for national construction statistics are the F.W. Dodge Reports published by McGraw Hill, Inc. and the U.S. Bureau of Census, Construction Statistics Division. The F.W. Dodge Group publishes the monthly Dodge Construction Potentials Bulletin, and the Dodge Local Construction Potentials Bulletin providing the dollar value spent on various types of construction and also the number of buildings constructed. Annual reports and other supporting databases are also available from F.W. Dodge. All information is provided for a fee. The U.S. Bureau of Census publishes yearly the Statistical Abstract of the United States. This publication includes statistics on various aspects of construction. The Census of Construction Industries Division produces monthly statistics on construction activities including the number of housing starts. Most information from the F.W. Dodge group and the U.S. Census Bureau is available on a state basis.

Transportation statistics are published yearly by the Federal Highway Administration (FHWA) in *Highway Statistics*. The publication includes roadway characteristics and extent along with other roadway statistics. The data provided by the FHWA is useful in determining the new miles of roadway constructed on a yearly basis.

2.2 Information Sources—Construction Emission Factors

Two chapters of the U.S. EPA handbook, "Compilation of Air Emission Factors" [AP-42][1] apply to particulate matter emissions from construction activities. Chapter 7 relates to emissions from the mineral products industry, including construction aggregate processing and crushed stone processing. Chapter 13 contains relevant emission factors for prescribed burning, unpaved road traffic, aggregate handling and storage piles, industrial wind erosion, abrasive blasting, and explosives detonation. Section 13.2.3, "Heavy Construction Operations," contains PM emission factors specifically for emissions from heavy construction. Exhaust emissions contains emission factors from diesel-fueled construction equipment are separately estimated using EPA's NONROAD model.

2.3 Emission Calculations

Emissions from construction operations are related to three phases of a project. Demolition and debris removal includes removal of old structures or brush collection and transport/burning. Site preparation involves cut-and-fill, grading, and compaction activities (i.e., all earthmoving operations). General construction includes material handling operations for construction of structures and roads. Under some local PM estimation methodologies, construction equipment activity is allocated to road construction, building construction, and miscellaneous land-moving operations. Emissions are calculated for specific periods and time intervals. Inventories can be developed for annual, seasonal, monthly, and for worst-case, twenty-four hour periods.

Estimates of PM_{10} and $PM_{2.5}$[a] emissions from construction activities are developed using emission factors, activity level (source extent) data[b], and control efficiencies (if applicable). Historically, the primary emission factor for construction activities has been:

$$e = 1.2 \text{ tons/acre/month of activity}$$

This factor was based on early (i.e., 1970's) upwind/downwind tests of construction site impacts on ambient particulate levels. It refers to total suspended particulate (TSP) matter emissions represented by particles no greater than 30 μm in aerodynamic diameter.

Additional emission factors for earthmoving and other activities associated with construction operations can be borrowed from other AP-42 chapters, but certain differences exist between construction operation emissions and emissions from other fugitive dust sources. These additional factors were derived from field testing using the MRI exposure (plume) profiling method that determines the downwind transport of PM flux. Consequently, these emission factors combine exhaust with fugitive dust emissions. PM emission factors for fugitive dust are available in AP-42 Chapters 7 and 13 and are related to soil silt and moisture contents.

Emission factors for PM from construction equipment exhaust are available in the NONROAD model produced by EPA, Office of Mobile Sources (OMS), and are related to engine type, size, and load. The EPA OMS has developed a second draft of the NONROAD Emission Inventory Model. The NONROAD model calculates emissions of criteria and HAP pollutants, including PM emissions.

Control efficiency data for construction equipment engines is built into the NONROAD model for future diesel engine rules that will affect PM emissions. Control efficiencies for fugitive dust are published in AP-42 and are primarily related to watering or chemical suppression of surface soils at construction sites.

2.4 Factors Influencing Construction Emissions

The factors that influence construction emissions represent meteorological parameters, regional construction differences (e.g., basement/no basement for residential housing), soil types, and economic growth. Construction activity is related to climate, terrain, and economic conditions. For example, residential foundations differ between northern and southern states in the U.S. (e.g., fewer basements are excavated in southern states). Regional terrain and soil variations are also important (e.g., highway construction in mountains, or rocky vs. silty soils).

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[a] PM_{10} and $PM_{2.5}$ refer to particulate matter no greater than 10 μm and 2.5 μm in aerodynamic diameter, respectively.

[b] In most cases emissions are proportional to activity level.

Regional economic cycles in the construction industry impact construction PM emission inventories. The factors that will cause the highest activity levels for construction are low real interest rates, increasing economic growth, and some need for housing and commercial structures (population growth is a strong predictor of need). A prediction of future emissions must rely on economic and demographic forecasts for the inventoried area.

Construction activity also varies temporally according to meteorology (rainfall stops work), climate (unfavorable winter conditions impact work schedules), soil characterization (compacted, rocky areas slow construction), workforce availability (labor disputes halt construction), and economic conditions (effective demand).

Effective demand is defined as the combination of need for structures and roads, and affordable resources (capital). Several socioeconomic forces affect the need for construction, and are likely to impact regions and sub-regions unequally. Residential construction is driven by localized population growth, low interest rates, and the quality of current housing; on the other hand industrial construction is driven largely by economic growth. In turn, highway construction is frequently driven by new residential and commercial/industrial construction.

Section 3.
Categories of Construction

Construction activities can be distinguished by three classes: (1) road construction, (2) residential construction, and (3) nonresidential construction. Each is discussed below to show the variations in emission producing activities.

3.1 Road Construction

Road construction includes the building of new roadways from all the functional classes. The FHWA divides roads by purpose, lane width, number of lanes, surface type, location (including urban, rural, state), and other roadway characteristics. The characteristics of roadways vary depending on the type of roadway being constructed.

The road characteristics along with the new miles of roadway built on an annual basis are used to determine the land area that is affected by construction for the type of road being built. The three primary functional classes, arterials, collectors, and local roads, vary in width, lanes, and may have further variations depending on whether the road is located in an urban or rural area. Four divisions of roadways were made by functional class and demographic type in order to group the roads by similar characteristics.

3.2 Residential Construction

The construction of houses and apartment buildings is included as a separate category than other building construction primarily because of the statistics available for residential construction. Statistics are available for the number of housing units constructed and also the value of the construction.

Another variation is the level of activity that occurs at a residential construction site as compared to other forms of building construction. Housing construction does not normally require a large amount of earthmoving and occurs during a shorter time period, producing less emissions per unit area than would be seen at a nonresidential construction site. Apartment building construction lasts longer than housing construction.

3.3 Nonresidential Construction

Office buildings, warehouses, manufacturing facilities, schools, public works, and hospitals are all included in nonresidential construction. Construction on nonresidential sites is normally more involved and lasts longer than housing construction. It varies in the amount of earthmoving that takes place but most nonresidential construction impacts a similar amount of land on a per dollar basis.

3.4 Other Construction

Almost all construction activity can be included in either road, residential, or nonresidential construction. Public projects in which a large amount of earthmoving and building activity occurs (e.g., an expansive project such as a stadium or airport), should be considered separately and emissions should be estimated using detailed construction data from the engineering plans.

Section 4.
Existing Methodologies for Estimating Construction Emissions

Many methodologies have been developed to calculate PM emissions from construction activity. The basic limitations to developing a construction emissions methodology are how to estimate the level of activity that occurs at a construction site and what emission factor is appropriate to use to calculate PM emissions.

Two basic approaches are used in collecting data for the development of emission inventories: (a) "top down" methodology; and (b) "bottom up" methodology. The "top down" method uses national and state data resources to estimate activity levels that are multiplied by general emission factors to calculate emissions for a large region. The calculated emissions are then apportioned to more resolved areas, such as county and sub-county levels using surrogate activity level data, such as population or affected land area. The "top down" method for estimating construction operation emissions uses a single-valued, composite emission factor of 1.2 tons TSP/acre/month, multiplied by estimated acres of construction (derived from construction cost data) and an average duration for construction. The "top down" method is cost-effective, but does not usually provide an accurate reflection of emissions when broken down into the county and subcounty levels.

The "bottom up" methodology may use multiple emission factors (for specific construction phases and activities) and local activity data to calculate emissions. Local data includes equipment population levels, construction permit information, and specific factors that affect construction activity for that area, including construction equipment usage. "Bottom up" methods more accurately reflect the actual construction emissions than is represented using a "top down" method, but are labor-intensive and costly. A "bottom up" emission inventory is preferred for spatial and temporal allocation needed by modeling applications.

Existing methodologies for estimating PM emissions from construction activities are described below and are mostly "top down" methods. Their advantages and limitations are also explained.

4.1 Methodology 1: General "Top-Down" Emission Inventory

Most "top down" emission inventories of PM emissions from construction activities have utilized the current composite AP-42 emission factor as follows:

$$EF_{PM\text{-}k} = k \times EF_{TSP}$$

where: k = fraction of TSP that is PM-k
EF = emission factor, 1.2 tons TSP/acre/month

This emission factor requires only that the activity level (acres of construction and duration of the construction activity) be known for each type of construction. If construction activities are controlled, a fractional control efficiency is utilized:

$$\text{PM-k emissions} = EF_{PM\text{-}k} \text{ x acres of construction x months of activity x } (1 - CE)$$

where: CE = fractional control efficiency

The acres of construction are determined, usually from a published relationship of construction cost to acres disturbed. PM-k emissions are calculated by multiplying the TSP emission factor of 1.2 tons/acre/month by the PM-k/TSP ratio, the total acres disturbed by the construction activity and the months of activity. A control efficiency may be applied to reduce emissions.

For example, the PM_{10} emissions inventory for the Southern California Air Quality Management District's (SCAQMD) 1991 and subsequent 1994 Air Quality Management Plan used a PM_{10} emission factor of 0.31 tons/acre/month. This factor was based on the TSP emission factor of 1.2 tons/acre/month, a PM_{10} /TSP ratio of 0.52 (SCAQMD, 1991 and 1994), and a 50% emission reduction to account for watering as a dust control measure.[2]

The ratios of PM_{10} /TSP and $PM_{2.5}/PM_{10}$ are important because of their use to project PM_{10} and $PM_{2.5}$ emissions from TSP estimates. A typical ratio of 0.30 is used for PM_{10} /TSP. The *Criteria Document for Particulate Matter* (USEPA, 1996)[3] indicates a ratio for $PM_{2.5}/PM_{10}$ of approximately 0.15 for construction sites in Fresno, California. Other laboratory and field tests have indicated ratios of crustal $PM_{2.5}$ to PM_{10} in the range of 0.05 to 0.20, and are documented by Cowherd and Kuykendal.[4] They recommended a $PM_{2.5}/PM_{10}$ ratio of 0.15 for construction operations because of the typical dominance of unpaved road emissions.

The information on the acres of land disturbed by construction activity can be obtained from local government agencies and regional planning councils. Building permits usually specify the area of land and/or the cost of the construction. Permits are typically issued by city or county governments and require different levels of activity information.

The duration for an individual construction activity is likely to be identified in the building permit. An average duration can also be estimated using the MRI-developed values of 6 months for residential, 11 months for nonresidential, and 18 months for non-building construction.[5] Construction activity information can also be obtained from two major national sources, the U.S. Bureau of Census and from the McGraw-Hill Construction Information Group's *Dodge Construction Analysis System*, an on-line service that provides monthly-updated construction data for a fee.

The disturbed area can be determined by using the cost of the construction activity and published conversion factors for several construction types. This simple method uses the aggregated cost of construction in an area which is available from the U.S. Bureau of Census, Construction Statistics Division or from the U.S. Census Bureau's annual publication, *Privately Owned Construction Authorized by Building Permits*. The dollars-to-acres conversion factors are presented in Table 4-1 and are from the MRI report, *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites.*[5]

Table 4-1. Construction Dollars-To-Acres Conversion Factors (MRI, 1974)[5]

SIC code	SIC description	Factor (acres/$\$10^6$)
1521	General Contractors-Single-Family Houses	5
1522	General Contractors-Residential Buildings, Other Than Single-Family	5
1531	Commercial, Institutional, Manufacturing, and Industrial Buildings	5
1541	General Contractors- Industrial Buildings and Warehouses	5
1542	General Contractors- Nonresidential Buildings, Other than Industrial Buildings	5
1611	Highway and Street Construction, Except Elevated Highways	25
1622	Bridge, Tunnel, and Elevated Highway Construction	25
1623	Water, Sewer, Pipeline, and Communications and Power Line Construction	5
1629	Heavy Construction; Non-building Structures Construction	150

Reference: Cowherd, Chatten, Christine Guenther, and Dennis Wallace. *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites*. EPA-450/3-74-085, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1974.

Acres under construction, if obtained from construction cost data, are usually temporally resolvable only to a monthly level. It is possible to extrapolate to a daily emission estimate by dividing either annual or monthly emission estimates by the appropriate number of workdays in a month.

Table 4-2 identifies the original data resources used by MRI for the estimation of construction activity variables to support the methodology developed in 1974 for estimating county-by-county construction activity levels and emissions. Annual TSP emissions were estimated by MRI by determining the average construction duration (in months) for each type of construction and multiplying by the monthly emission estimate.

Table 4-2. Estimation of Construction Emissions—National Inventory by MRI

Variable	Data resource
Statewide dollars spent on construction	U.S. Bureau of Census, *Census of Construction 1972.*
Dollars-to-acres conversion factors	Developed by MRI using *Census of Construction 1972.*
County acres under construction	U.S. Bureau of Census, *Census of Construction 1972,* construction employment data.
Average duration of construction	Developed by MRI economists; 6 months for residential, 11 months for nonresidential, and 18 months for nonbuilding construction.

Reference: Cowherd, Chatten, Christine Guenther, and Dennis Wallace. *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites.* EPA-450/3-74-085, U.S. Environmental Protection Agency, Research Triangle Park, NC, November 1974.

Summary. Using a composite emission factor of 1.2 tons TSP/acre/month is believed to overestimate PM_{10} emissions from construction activities. The emission factor assumes all construction produces emissions at the same level on a per acre basis. The indicator for the level of activity that occurs at construction sites, dollar value of construction, is a good indicator of activity but conversion factors may not be accurate for converting dollar value to acres for all types of construction. The emission factor and the conversion factors were developed in 1974 and require changes to reflect current construction activity and economic factors.

4.2 Methodology 2: NET Inventory

E.H. Pechan and Associates based the National Emission Trends (NET) inventory methodology on the general methodology developed by MRI in 1974 for a national inventory to estimate construction PM_{10} emissions. The activity level is acres under construction and is estimated using construction expenditures by SIC code. The NET methodology is described below, and differences from the MRI method (described in Section 4.1) are identified.

Section 4.8.2.7.1, "Construction Activities," of the *National Air Pollution Emission Trends Procedures Document for 1900-1996*[6] gives the calculation methodologies for PM_{10} emissions from construction activities for the years 1985 through 1996 and includes $PM_{2.5}$ emissions for 1990 through 1996. In a manner patterned after Methodology 1, emissions were calculated from the AP-42 composite emission factor, an estimate of the acres of land under construction, and the average duration of construction activity. The acres of land under construction were estimated from the dollars spent on construction.

The 1985 through 1989 emission calculation procedure incorporated the general AP-42 emission factor for determining PM_{10} emissions for construction activities during that time period:

$$E = T \times \$ \times f \times m \times P$$

where E = PM_{10} emissions
T = TSP emission factor (1.2 tons/acre)
\$ = Dollars spent on construction (\$ million)
F = Factor for converting dollars spent on construction to acres of construction (varies by types of construction, acres/\$ million)
M = Months of activity (varies by type of construction)
P = Dimensionless PM_{10}/TSP ratio (0.22)

The 1990 through 1995 emission calculation procedure used the same basic equation but also accounts for a control efficiency level and calculates both PM_{10} and $PM_{2.5}$ emissions:

$$E = P \times \$ \times f \times m \times (1\text{-}CE)$$

where E = PM emissions
P = PM emission factor (tons/acre of construction/month of activity) ($PM_{10} = 0.11$; $PM_{2.5} = 0.022$)
\$ = Dollars spent on construction (\$ million)
F = Factor for converting dollars spent on construction to acres of construction (varies by type of construction, acres/\$ million)
M = Months of activity (varies by type of construction)
CE = Fractional control efficiency

Estimates for the dollars spent on various types of construction by EPA region for 1987 were obtained from the Census Bureau. The fraction of the total U.S. dollars spent in 1987 for each region for each construction type was calculated. Since the values from the Census Bureau are only available every five years, the Census dollars spent for the United States for construction were normalized using estimates of the dollars spent on construction for the United States as estimated by the F.W. Dodge Corporation for other years. This normalized Census value was distributed by region and construction type using the previously calculated fractions.

Construction acres were calculated using the proportionality developed by MRI between the number of acres and the dollars spent on that type of construction.[5] This information (proportioned to constant dollars using the method developed by Heisler)[7] was utilized along with total construction receipts to determine the total number of acres affected by each type of construction type. Estimates of the duration (in months) for each type construction were derived by MRI, from its 1974 report.[5]

The PM_{10}/TSP ratio for construction activities was derived from MRI research studies. Pechan used PM_{10}/TSP ratios for 19 test sites for three different construction activities presented in Table 9, "Net Particle Concentrations and Ratios" from the MRI Report "Gap Filling PM_{10} Emission Factors for Selected Open Area Dust Sources."[8] This report suggests averaging the ratios for the construction activity of interest. Since Pechan was looking at total construction emissions, the average PM_{10}/TSP ratios for all test sites were calculated and used for the

PM_{10}/TSP ratio. The PM_{10} emission factor 0.11 tons/acre/month is from the Best Available Control Method (BACM) Report, *Improvement of Specific Emission Factors*.[9] A particle size adjustment of 0.2 was used to convert PM_{10} to $PM_{2.5}$ emissions, after a review of $PM_{2.5}/PM_{10}$ ratios between EPA, Pechan, and MRI.[6] For the 1995 and 1996 NET inventories, the control efficiencies used for PM_{10} and $PM_{2.5}$ were 62.5 and 37.5 percent, respectively. No detail was provided on the rationale for the control efficiencies. [Note: MRI has reviewed past test data and found that the efficiency of watering, as a dust control method, is not related to the particle size fraction (i.e., the control efficiency should be the same for both PM_{10} and for $PM_{2.5}$).]

For the 1996 NET inventory, construction fugitive dust emissions were calculated from the composite TSP emission factor prepared by MRI for EPA, with default EPA correction parameters and 1996 Bureau of Census data. Controls were applied.[10] The total emissions are then allocated to the county level by county construction payrolls to develop a county-level inventory. Table 4-3 summarizes the Pechan methodology to develop NET emissions from construction activity.

Table 4-3. Estimation of Construction Emissions—EPA National Emission Trends Analysis by E.H. Pechan and Associates

Variable	Data resource
Statewide dollars spent on construction	U.S. Bureau of the Census, *Census of Construction Industries*, 1987, and F.W. Dodge/McGraw Hill, Inc. construction data (published annually).
Dollars-to-acres conversion factors	Midwest Research Institute, *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites*, November 1974.
Average duration of construction	Midwest Research Institute, *Emissions Inventory of Agricultural Tilling, Unpaved Roads and Airstrips, and Construction Sites*, November 1974.

Reference: Barnard, William R., Allan Dean, and Patricia M. Carlson. *Evaluation of Fugitive Dust Emission Data, Draft Report*, E.H. Pechan & Associates, October 11, 1992.

Summary. The NET Inventory uses a "top-down" methodology and uses dollar value of construction as an indicator of activity level. The dollar value is found for nine EPA regions, and then emissions are allocated to the county level using county construction employment payrolls. The allocation does not give a good estimate for the actual county construction emissions because total emissions for the nine regions are divided among over 3,000 counties. The dollars-to-acres conversion factors based on 1972 dollars have been changed to reflect current dollar value and give a better estimate of acres disturbed. The 1996 NET Inventory uses an updated emission factor for construction activity and provides a better estimate of total PM_{10} emissions.

4.3 Methodology 3: California Emission Inventory Procedure

The methodology used in the *Emission Inventory Procedural Manual, Volume III, Methods for Assessing Area Source Emissions*[11] by the California Air Resources Board (CARB) is similar to the NET methodology, but calculates residential acreage by unit rather than cost and estimates for cost and number of units are from county sources.

The California manual's Section 7.7, "Building Construction Dust" presents a methodology for calculating construction emissions from fugitive dust using the same emission factor as used in the NET method plus a worst-case emission factor for heavy construction areas. The emission factors used are from a 1996 MRI report[9] in which an emission factor was developed using field test observations from eight construction sites in Las Vegas and California. The factors account for both exhaust emissions and fugitive dust emissions and do not account for any control measures, as is standard for all AP-42 construction emission factors.

Because acres under construction are not readily available for a geographic region, it must be estimated from either the value of construction or the units under construction. The CARB methodology uses an acreage per dollar conversion factor and an acreage per unit conversion factor to estimate total acres under construction. Residential construction acres are estimated on an acres/unit basis with single-unit residential construction having a factor of 1/5 acre/unit in rural areas and 1/7 acre/unit in urban areas. The factor for multi-unit residential construction is estimated at 1/20 acre/living unit. Commercial construction is estimated to affect 3.7 acres for every $1 million valuation. Likewise, industrial construction has a factor of 4.0 acres/$1 million valuation, and institutional construction a factor of 4.4 acres/$1 million valuation. The California methodology assumes that the emission factor includes the effects of typical control measures[11] even though the MRI report lists the factors as uncontrolled.[9] The procedure manual assumes a 50% control efficiency and recommends doubling the factor for areas in which watering is not used to control fugitive dust. Table 4-4 provides the estimates for the activity variables used in the California methodology.

Table 4-4. Estimation of Construction Emissions—California Methodology

Variable	Data resource
Residential construction acres	Uses default for acres/residential unit: 1/7 acre for single-unit residences in urban areas, 1/5 acre for single-unit residences in rural areas, and 1/20 acre/unit for multi-unit residences.
Nonresidential construction acres	Uses default values for acres/$1 million of construction. The factors for commercial, industrial, and institutional are 3.7, 4.0, and 4.4 acres/$1 million, respectively.
Construction duration	Uses default value of 6 months for single or multiple residential units and 11 months for commercial, industrial, and institutional construction.

Reference: Countess, Richard and Susan. PM_{10} Fugitive Dust Integration Project. South Coast AQMD Contract 96091, July 1996.

The California emission inventory includes a second section for calculating emissions from road construction. Section 7.8, "Road Construction Dust," uses the same emission factors from the BACM Report but uses different activity level indicators to find acreage disturbed. Road construction is divided into freeways, state highways, and city and county roads. The area affected is calculated from the miles of road built and the number of lanes, lane width, and shoulder width. The number of lanes, width per lane, and shoulder width are estimated for each type of roadway and from these estimates an area per mile factor is determined. The values determined in the California procedure are 12.1 acres per mile for freeways, 9.2 acres per mile for highways, and 7.8 acres per mile for city and county roads. All road construction is assumed to last 18 months.

The CARB uses a new computerized model, OFFROAD, to develop emission inventories of PM from construction equipment exhaust activities.

Summary. The CARB methodology uses housing units as an indicator of activity level for residential construction and dollar value for nonresidential construction. The dividing of the construction types and the conversion factors used in the California methodology give a higher level of accuracy to the estimate for the acres of land disturbed by construction. The CARB methodology indicates that the emissions calculated are for fugitive dust only and the OFFROAD model is used to estimate the construction equipment exhaust component. However, the emission factors used in the California methodology were derived from site testing, which includes both exhaust and fugitive dust. Thus the total PM emissions calculated by CARB for construction may be too high if both the Area Source Methodology and the OFFROAD model are used.

4.4 Methodology 4: National Particulate Inventory—Phase I

A national, county-level emission inventory of primary particulate (PM_{10} and $PM_{2.5}$) was prepared by E.H. Pechan and Associates under direction of EPA's Office of Policy, Planning, and Evaluation (OPPE). The National Particulate Inventory (NPI) projected emissions to the Year 2005 and utilized a methodology based largely on the methods used to develop the 1990 Interim Inventory, the NET inventory, and the 1985 NAPAP inventory.[12] Details of the methods were documented in a report to OPPE[13] and summarized in a paper presented at the 1997 A&WMA annual meeting.[12]

The methodology to estimate emissions from construction activities used the composite TSP factor of 1.2 tons/acre/month combined with ratios of PM_{10}/TSP and $PM_{2.5}$/PM_{10}. The ratios were stated to be derived from averages measured for three different construction activities at 19 sites.[12]

The activity level associated with the TSP factor is acres of land affected by the construction activities. Activity level data for development of the NPI, in acres, were obtained for states in each EPA Region from construction cost in the regional states. Construction cost date was used to find acres disturbed by using the same methodology as the NET Inventory.

State level emissions were allocated to county levels using construction payrolls from the *County Business Patterns* database, which provides county, state, and national level business data for 1977 to 1995. Statistics include number of establishments, payroll (annual and quarter), number of employees, and number of establishments by size class for 2-digit SIC industry groupings. The construction payroll data are collected annually by the Bureau of the Census.

Summary. The National Particulate Inventory follows the same methodology as the NET inventory and uses interim inventories to make future projections up to the Year 2005 for the emissions produced by construction activity.

4.5 Methodology 5: Regional Emission Inventories

The AP-42 Section 13.2.3, "Heavy Construction," provides emission factors for estimating site-specific construction emissions for specific construction phases (demolition, site preparation, etc.). This effort requires knowledge of the type and duration of construction phases that occur at each individual site. Examples of regional emission inventories of construction activities are presented below, as originally prepared for the MRI 1993 report, *Activity Levels of PM_{10} Area Source Categories Methodology Assessment and Improvement.*[14] These approaches demonstrate the use of local sources of construction activity level data.

4.5.1 San Joaquin Valley (SJV)

Activity levels could not be evaluated from the emission inventory report to the San Joaquin Valley Unified Air Pollution Control District PM_{10} Nonattainment Area Plan, prepared by Aerovironment, Inc., Monrovia, California, November 1991. The documentation of activity levels was not included in the report. Section 3 of the report presents results from a 1990 emission inventory, citing that calculations were performed by the CARB. Appendix A of that report presents the data from the CARB-developed emission inventory for the San Joaquin Valley. Appendix C of the report presents the only description of methodology, saying "the documentation of CARB methodology used for emissions inventory calculations was inadvertently omitted from the appendices attached to the 1991 PM_{10} Attainment Plan and accompanying this document. ARB has determined appropriate procedures for calculating each emissions inventory category." The SJV activity levels estimates are shown in Table 4-5.

Table 4-5. Estimation of Construction Emissions—SJV Methodology

Variable	Data resource
Areas under construction	CARB methodology was specified, but data sources not indicated.

Reference: San Joaquin Valley Unified Air Pollution Control District PM_{10} Nonattainment Area Plan, Aerovironment, Inc., Monrovia, CA, November 1991.

4.5.2 South Coast Air Quality Management District (SCAQMD)

The SCAQMD used the composite AP-42 TSP emission factor for construction activities in southern California. Activity data were presented in an MRI document[15] that determined total disturbed acres using the CARB methodology. Section 7-3, "Building Construction," presents ratios of construction units or valuation to acres of construction for residential, commercial, industrial, and institutional categories.

The number of construction units and value of construction were determined from the U.S. Census Bureau's annual publication, *Privately-Owned Construction Authorized by Building Permits*. It should be noted that U.S. Census Bureau data applies only to private construction. Public construction works such as a city convention center, airport, or similar public works are not included. The SCAQMD methodology is summarized in Table 4-6.

Table 4-6. Estimation of Construction Emissions—SCAQMD Methodology

Variable	Data resource
Units constructed and Value of construction	U.S. Census Bureau, *Privately Owned Construction Authorized by Building Permits* (an annual publication).
Acres under construction	CARB Area Source Methodology, Section 7-3 Building Construction; ratios of units or valuation to acres under construction.
Construction duration	Used CARB defaults for months of construction.

Reference: Phil J. Englehart and Gregory E. Muleski. *Open Fugitive Dust PM_{10} Control Strategies Study*, Midwest Research Institute: Kansas City, MO, October 12, 1990.

Data are available for SIC 47457-residential; 47365-commercial; 47373-industrial; and 54551-institutional construction.

A revised and more comprehensive emission inventory of SCAQMD construction sources was prepared by Richard and Susan Countess in their 1996 report, *PM-10 Fugitive Dust Integration Project*.[2] This report presented two useful tables for preparation of emission inventories. Table 4-7 shows a breakdown of construction activities and recommended that individual AP-42 emission factors be used when the required activity levels are known—rather than using the composite AP-42 TSP emission factor of 1.2 tons/acre/month. The recommended emission factors account for silt and moisture content, average wind speed, average vehicle speed, the number of vehicles, and climate.

Table 4-7. AP-42 Recommended PM_{10} Emission Factors for Construction Operations

Phase	Activity	AP-42 recommended emission factor reference	PM_{10} emission factor[1] (uncontrolled emissions)	Units
1. Demolition and debris removal	2. Demolition of buildings and natural obstacles			
	Mechanical dismemberment	NA	NA	
	Implosion of structure	NA	NA	
	Drilling/blasting soil	Drilling Factor in Table 11.9-4	1.3	lb/hole
	General land clearing	Dozer Equation (overburden) in Tables 11.9-1 and 11.9-2	$0.75\ (s)^{1.5}/(M)^{1.4}$	lb/hr
	3. Loading and unloading of debris into trucks	Material Handling Factor in Sec. 13.2.2	$0.0011(U/5)^{1.3}/(M/2)^{1.4}$	lb/ton
	4. Truck transport of debris			
	3a. Unpaved road travel	Unpaved Road emission factor in Sec. 13.2.2	$2.1(s/12)(S/30)(W/3)^{0.7}(w/4)^{0.5}(365\text{-}p/365)$	lb/VMT
	3b. Paved road travel	Paved Road emission factor in Sec. 13.2.2	$0.016(sL/2)^{0.65}(W/3)^{1.5}$	lb/VMT
2. Site Preparation	1. Bulldozing	Dozer Equation in Tables 11.9-1 and 11.9-2	$0.75(s)^{1.5}/(M)^{1.4}$	lb/hr
	2. Scrapers unloading topsoil	Scraper unloading factor in Table 11.9-4	0.04	lb/ton
	3. Scrapers in travel	Scraper (travel mode) expression in Tables 11.9-1 and 11.9-2	$0.0000037(s)^{1.4}/(M)^{2.5}$	lb/VMT
	4. Scrapers removing topsoil	5.7 kg/vehicle kilometer traveled (VKT)	20.2	lb/VMT
	5. Loading/unloading trucks	Material Handling Factor in Sec. 13.2.2	$0.0011(U/5)^{1.3}/(M/2)^{1.4}$	lb/ton
	6. Compacting	Dozer Equation in Tables 11.9-1 and 11.9-2	$0.75(s)^{1.5}/(M)^{1.4}$	lb/hr
	7. Motor grading	Grading Equation in Tables 11.9-1 and 11.9-2	$0.031(S)^2$	lb/VMT
3. General Construction	1a. Travel on unpaved roads	Unpaved Road emission factor in Sec. 13.2.2	$2.1(s/12)(S/30)(W/3)^{0.7}(w/4)^{0.5}(365\text{-}p/365)$	lb/VMT
	1b. Travel on paved roads	Paved Road emission factor in Sec. 13.2.2	$0.0126(sL/2)^{0.65}(W/3)^{1.5}$	lb/VMT

Table 4-7 (Continued)

Phase	Activity	AP-42 recommended emission factor reference	PM_{10} emission factor[1] (uncontrolled emissions)	Units
	2a. Portable plants crushing and screening	Factors for similar material/operations in Section 11 of AP-42	Factors for similar material/operations in Section 11 of AP-42	
	2b. Material transfers	Material Handling Factor in Sec. 13.2.2	$0.0011(U/5)^{1.3}/(M/2)^{1.4}$	lb/ton
	3. Other operations	Factors for similar material/operations in Section 11 of AP-42	Factors for similar material/operations in Section 11 of AP-42	

Note: s = silt content, %; M = moisture content, %; U = mean wind speed, mph; S = mean vehicle speed, mph; W = mean vehicle weight, tons; w = mean number of wheels/vehicle; sL = silt loading, g/m^2, and p = number of days with at least 0.01" of precipitation.

Because the composite AP-42 emission factor for TSP can provide only a rough estimate of PM_{10} emissions, MRI in their report to SCAQMD recommended alternative emission factors based on four different levels of construction activity knowledge, as seen in Table 4-8 from the report.

Table 4-8. Recommended PM_{10} Emission Factors for Construction Operations[c]

Basis for emission factor	Recommended PM_{10} emission factor
Level 1 Only area and duration known	0.11 ton/acre/month (average conditions) 0.42 ton/acre/month (worst-case conditions)[a]
Level 2 Amount of earth moving known, in addition to total project area and duration	0.011 ton/acre/month for general construction (for each month of construction activity) <u>plus</u> 0.059 ton/1,000 cubic yards for on-site cut/fill[b] 0.22 ton/1,000 cubic yards for off-site cut/fill[b]
Level 3 More detailed information available on duration of earth moving and other material movement	0.13 lb/acre-work hr for general construction <u>plus</u> 49 lb/scraper-hr for on-site haulage[c] 94 lb/hr for off-site haulage[d]
Level 4 Detailed information on number of units and travel distances available	0.13 lb/acre-work hr for general construction <u>plus</u> 0.21 lb/ton-mile for on-site haulage 0.62 lb/ton-mile for off-site haulage[c]

[a] Worst-case refers to construction sites with active large-scale earth moving operations.
[b] These values are based on assumptions that one scraper can move 70,000 cubic yards of earth in one month and one truck can move 35,000 cubic yards of material in one month. If the on-site/off-site fraction is not known, assume 100% on-site.
[c] If the number of scrapers in use is not knows, MRI recommends that a default value of 4 be used. In addition, if the actual capacity of earth moving units is known, the user is directed to use the following emission rates in units of lb/scraper-hour for different capacity scrapers: 19 for 10 yd^3 scraper, 45 for 20 yd^3 scraper, 49 for 30 yd^3 scraper, and 84 for 45 yd^3 scraper.
[d] Factor for use with over-the-road trucks. If "off-highway" or "haul" trucks are used, haulage should be considered "on-site".

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[c] Some emission factors were revised by Countess based on median rather than mean values.

4.5.3 Phoenix

Construction activity levels for the Maricopa planning area were determined from the document, *PM_{10} Emissions Inventory Data for the Maricopa and Pima Planning Areas.*[16] The Maricopa County Air Pollution Bureau provided information on construction and earth moving permits, allowing location and area size to be tabulated. Information on permits is variable since each local governmental entity in the Phoenix metropolitan area establishes the information needed.

The Maricopa County Bureau of Air Pollution Control prepared a listing with addresses of approximately 1,500 earthmoving permits issued over a one-year period. Using a street atlas, each address for an earthmoving permit was manually located on a map of the inventoried area. Individual earthmoving permits listed the areas of disturbed earth and the lineal feet of trenching. A 20-ft width for each trench was assumed to allow calculation of area (acres for each disturbed site. All construction projects were assumed to have a 4-month duration so that a tons/acre/month inventory could be developed. An emission factor of 900 lb PM_{10}/acre was used, and appeared to be derived from the composite AP-42 TSP emission factor. The Phoenix methodology is summarized in Table 4-9.

Table 4-9. Estimation of Construction Emissions—Phoenix Methodology

Variable	Data resource
Acres under construction	Earthmoving permits from the Maricopa County Bureau of Air Pollution Control and the Pima County Air Quality Control District. Street addresses on permits were used to geographically map construction areas; approximately 1,500 permits had to be addressed. The permits listed acres of disturbed land and lineal feet of trenching; it was assumed that the disturbed width of trenches was 20 ft.
Construction duration	All construction projects were assumed to have a 4-month duration so that a tons/acre/month emission rate could be developed.

Reference: Donald R. Holtz. PM_{10} Emissions Inventory Data for the Maricopa and Pima Planning Areas, Engineering-Science; Pasadena, CA, January 1987.

4.5.4 Power/Bannock Counties

Construction-related emissions in an Idaho PM-10 nonattainment area were divided into (1) residential and commercial construction, and (2) road construction by Moore and Balakrishna.[17] They used AP-42 emission factors for construction activities, but devised unique ways to apportion emissions to smaller county areas (grid cells) for modeling purposes.

Residential and commercial construction activities were allocated to specific cells using U.S. Census tract data. Households were divided into low-, medium-, and high-growth areas, excluding urban areas. The numbers of households in each growth area were totaled and then divided by the total number in all three growth areas to obtain the percentage of households in each area. It was assumed that this percentage also applied to the number of construction events, and subsequently the percentage of emissions from construction. The calculated emissions for each growth area were divided equally among the total number of cells in each growth area.

Road construction activities were divided into (1) graveling, (2) rebuilding, (3) paving, and (4) sealing. Each activity was defined in terms of actual "road miles of construction" and "width" of the roads under construction. Road miles were multiplied by the road width that resulted in total acres of road being constructed. For road paving and sealing, the emission rate [factor] was reduced to half that of road graveling and rebuilding.

4.5.5 Las Vegas (Clark County, Nevada)

4.5.5.1 1991 Methodology

The 1991 emission inventory methodology began with the composite AP-42 TSP emission factor for construction activity. Activity levels for the Las Vegas, Nevada, nonattainment area were determined using the methodology presented in the document *Air Quality Implementation Plan for the Las Vegas Valley Particulate Matter PM_{10}*.[18] The primary piece of information was the total acres of construction, which was obtained from Topsoil Disturbance Permits from the Clark County Health District. Clark County requires Topsoil Disturbance Permits for land development activities affecting areas of 1/4 acre or more in size. These data are entered into the Clark County Geographic Information System (GIS) to calculate the total number of acres impacted by construction activities. There was no distinction between types of construction for the Las Vegas Valley.

PM_{10} emissions for Clark County were calculated using two components: (a) acres of construction, and (b) an emission factor of 654 lb PM_{10} per acre. A surrogate activity level factor was 1,000 gal diesel fuel/acre of construction, and resulted in a surrogate emission factor of 21.9 lb PM_{10} per 1,000 gal diesel fuel. These factors were "taken from research activities conducted in Arizona," and were not referenced or discussed further in the reviewed document. The 1991 Las Vegas methodology is summarized in Table 4-10.

Table 4-10. Estimation of Construction Emissions 1991 Las Vegas Methodology

Variable	Data resource
Gallons of diesel fuel	Estimate of 1,000 gallons of diesel fuel used in construction per acre of construction impacted land. This estimate was developed from a literature review that was referenced, but not discussed in the document.
Acres under construction	Clark County Health District Top Soil Disturbance Permits issued. Permits are required for any land development activity affecting more than one quarter of an acre. Permit data is entered into Clark County GIS for spatial distribution to each of 16 planning grids.

Reference: Clark County Department of Comprehensive Planning. Air Quality Implementation Plan for the Las Vegas Valley: Particulate Matter PM_{10}, Las Vegas, Nevada, November 5, 1991.

4.5.5.2 1998 Methodology[19]

The 1998 methodology to estimate annual PM_{10} emissions for the year 1995 was improved by staff from Clark County and considered three different sources of emissions during construction operations. "Construction activities" included grading, trenching, crushing, screening, on-site vehicle traffic, blasting, and demolition. A modified BACM[9] Level 1 methodology was used to estimate PM_{10} emissions, and required only the amount of land involved and the duration of the project, as separated into "large" and "remaining" projects. The average time to complete construction projects was defined as the number of months from initial ground breaking to final landscaping and paving.

A recommended BACM emission factor of 0.42 tons/acre/month was used for general construction sites that included cut and fill areas, large-scale earthmoving operations, or heavy traffic volumes. The BACM report also recommended an uncontrolled emission factor of 0.11 tons/acre/month for general construction sites that did not include any cut and fill areas, large-scale earthmoving operations, or heavy traffic volumes. Clark County judged that "remaining" projects (i.e., commercial, public parks, public buildings, residential homes, and miscellaneous) sometimes included cut and fill areas, large-scale earthmoving activities, and/or heavy traffic volumes.[19] Consequently, an average emission factor of 0.265 tons/acre/month [(0.42 + 0.11) / 2] was used for all construction projects other than "large" projects.

A control efficiency of 50 percent was applied because of local watering regulations, and using the control efficiency described in MRI's 1988 study for U.S. EPA OAQPS, "Control of Open Fugitive Dust Sources."[20] The control efficiency was then decreased by the percentage of construction sites implementing dust control, as estimated by air quality compliance officers.

"Track-out" dealt with *increased* paved road dust emissions due to dirt track-out from the construction site onto the adjacent paved street network. Track-out emissions were estimated for each type of construction using an estimated number of access points and vehicle traffic volumes on adjacent paved roadways. The number of access points ranged from 1 per 10 acres to 1 per 30 acres. Traffic that exited the access points was estimated at greater than 25 vehicles per day and corresponded to the associated emission factor. PM_{10} emissions from track-out were based on 13 grams/vehicle times the number of vehicle passes per day on the adjacent paved road, as recommended in the 1988 MRI report for EPA, "Control of Open Fugitive Dust Sources."[20] Traffic on adjacent paved roadways was estimated at 2,157 trips per day and was determined to match those from collector streets. This resulted in PM_{10} emissions of 0.0309 ton/day (except for public parks), from each track-out/access point. A control efficiency of 75 percent was stated to be determined from compliance rates for street sweeping and watering.

"Wind erosion" emissions from land exposed by construction activities were separately estimated. The methodology was based on geometric mean hourly emission rates from disturbed soils within the Las Vegas Valley, as reported in 1996 by David James, "Estimation of PM_{10} Emissions from Vacant Lands in the Las Vegas Valley." Wind speed dependent emission rates in tons/acre/hr were developed for nine wind speed classes (> 15 mph). These rates were adjusted for vegetative cover and for loss of loose surface material in an initial wind "spike." The annual number of hours of wind in each wind speed category for the year was then multiplied by the emission factor in tons/acre/hour of wind. This calculation produced a PM_{10} emission factor of 0.4472 tons/acre for 1995, and was applied to the permitted acres of construction in Las Vegas during that same year.

Summary. Regional emission inventories use more detailed information than is normally available at a national level for estimating county-level construction emissions. The methodologies do provide estimates that can be compared to estimates found using a composite emission factor to determine county-level emissions.

4.6 Methodology 6: Major Construction Project Inventory

A general conformity analysis of construction emissions associated with a major construction project provides a detailed and systematic procedure for inventorying fugitive dust PM_{10} emissions.[21] This large project [presumably for enlargement of an Arizona airport] consisted of seven construction phases: (1) first building; (2) second building; (3) parking lot; (4) fire station; (5) fuel storage facility; (6) maintenance hangar; and (7) large pavement project.

The inventory team used a spreadsheet to organize input data and calculate emission estimates. Data that were available to estimate PM_{10} emissions from the large construction project included:

- Project timelines and activity schedules
- Area and access points to the construction site
- Types of construction equipment
- Characterization of construction activities
- Quantities of material to be moved, crushed, and screened
- Precipitation and wind data
- Equipment speed and miles traveled
- Soil silt fraction and moisture content

The authors of the general conformity analysis stated that "Exhaust emissions associated with the construction activities have not been included." While this is true for generators and other stationary equipment, it is not true for AP-42 emission factors for PM from construction equipment activity. The emission factors for fugitive dust from construction equipment represent both exhaust and fugitive dust emissions because of the source profiling test method used by MRI to develop the AP-42 factors.

Direct PM emissions were estimated from demolition, site preparation, general construction, truck transport of debris, bulldozing, compacting, etc. Indirect emissions from transport and unloading of material to/from the construction site were also estimated. This included VMT estimates for paved road travel both on-site and off-site. Track-out emissions and wind erosion emissions from unpaved surfaces were also estimated. Wet suppression of fugitive dust sources was incorporated into the emission calculations using a control efficiency of 80 percent.

Summary. The detailed inventory done based on "unit-operation" emission factors is useful in determining the accuracy of emissions calculated for different types of construction activity using an emission factor for a specific type of construction and in determining which types of construction activity produce what amounts of emissions.

4.7 Methodology 7: U.S. EPA NONROAD Model

The U.S. EPA Office of Mobile Sources, Assessment and Modeling Division has developed a model for estimating non-road engine exhaust emissions. A second draft version of the NONROAD model was announced May 21, 1999 with the signing of the Tier 2/ Gasoline Sulfur Notice of Proposed Rulemaking. The model is available at http://www.epa.gov/oms/nonrdmdl.htm.

Construction equipment exhaust emissions are calculated using national or state engine population for each equipment/engine type. The engine populations are obtained from the PartsLink database available from Power Systems Research (a commercial source of data), and multiplied by the average power, activity, and emission factors to obtain pollutant emissions. The NONROAD model estimates exhaust emissions under "load" and "no load" conditions. Engine load is related to soil density, cycle time (distance/speed), and pull required (rolling resistance + grade resistance.) The following equation shows how NONROAD calculates emissions.

$$\text{Emissions} = (\text{Pop})(\text{Power})(\text{LF})(\text{UL})(\text{EF})$$

where:
- Pop = Engine population
- Power = Average power of equipment type (hp)
- LF = Load Factor (fraction of available power)
- UL = Usage level (hrs/yr)
- EF = Exhaust emission factor (g/hp-hr)

This equation shows that the NONROAD model uses a multi-parameter activity level combining engine population number with average power, load factor, and usage level. The primary element is the number of engines in an area, distributed by age, power, fuel type, and application. Each equipment/engine type is characterized for usage by horsepower-hours per year, and adjusted for a power load factor. Nationally-averaged horsepower-hours and the relative fraction of maximum available power are used.

The most important data for construction activity levels that are input to the NONROAD model originate from the 1996 PSR equipment population data (PartsLink), and revised population allocation data using the F.W. Dodge construction valuation data. Engine populations are divided into several discreet power levels rather than one average power level for each equipment application. Equipment populations are adjusted using the F.W. Dodge construction valuation data. An engine scrappage rate is assumed and the level of activity is a function of equipment age. The model is flexible and allows a "bottom up" approach with locally-derived estimates for all variables to estimate and allocate emissions from state to counties and sub-counties.

NONROAD input files are integral to the model and provide basic data by state and county that are required to calculate emissions: exhaust emission factors, base year equipment population, activity levels, load factor, average lifetimes, scrappage rates, growth estimates, and geographic and temporal allocation algorithms. Default values are provided in these input files, but the user can replace the default data with better information, either from EPA for national defaults or from local sources for locality-specific data. The input files can also be modified to test control strategies.

The NONROAD model can estimate current year emissions for a specified geographic area as well as project future year emissions and backcast past year emissions. Emissions can also be calculated for time periods—an entire year, one of the four seasons, or any particular month. The emissions are then temporally and geographically allocated using appropriate allocation factors.

One of the current shortfalls of the NONROAD model to predict emission estimates for construction activities is that the model accounts for only exhaust emissions from construction equipment. A simple correlation of fugitive dust emissions with exhaust emissions is not possible. For example, construction equipment will be under load at the earth cutting location and will emit high levels of exhaust emissions, but little fugitive dust will be generated because of typical sub-grade high moisture content. As the loaded equipment travels to the fill location, high levels of fugitive dust will be emitted from the exposed ground but the equipment may not emit high levels of exhaust emissions.

An EEA report of 1997 developed data on construction employees to scale equipment population as a function of construction employees, but this method did not include all types of construction activity. Sierra Research, SAI, ENVIRON, and the Texas Transportation Institute also have examined and used survey methods for obtaining information on construction equipment usage for input to the NONROAD model. Survey data of current construction projects were needed to provide location-specific data on a daily level.

The EPA model, PART5, was developed by the Office of Mobile Sources (OMS) to estimate PM emissions from only onroad vehicles, and is discussed here for background information and comparison of vehicle emission estimation methodologies. The name indicates consistency with the MOBILE5 model used to calculate emissions of other pollutants from onroad vehicles.

PART5 uses PM emission factors for direct and indirect sulfate, and carbon (soluble organic fraction and remaining carbon portion) to calculate exhaust emissions. Road dust, tire wear, and brake wear emissions are also calculated. The PART5 program uses VMT to calculate PM emissions in gram/mile. VMT data are obtained using onroad travel statistics available from local survey information maintained by state and local transportation agencies and assembled by the FHWA. VMT data are not collected for non-road sources, such as construction equipment.

Summary. The NONROAD model estimates PM emissions only from construction equipment exhaust. The model is useful to determine the exhaust emission component of the total emissions calculated using the AP-42 emission factor that includes both suspended dust and exhaust PM. The PART5 model does not apply to construction activities because it estimates vehicle exhaust emissions from onroad vehicles only.

Methodologies 1 through 6 are summarized in Table 4-11.

Table 4-11. Emission Inventory Methodologies

	Emission Calculation Parameters		
Inventory	Emission Factor	Activity Level Source	Notes
MRI National Inventory, 1974	1.2 tons/acre/month (TSP) AP-42	Construction Dollars and dollars to acres conversion factors(MRI developed factors,1972)	MRI durations of construction: 6 months residential, 11 months nonresidential, 18 months nonbuilding
National Emission Trends	1.2 tons/acre/month (TSP) AP-42 adjusted to PM_{10} and $PM_{2.5}$ PM_{10} = .26	Construction Dollars and dollars to acres conversion factors(MRI factors, adjusted using Heisler's method)	MRI durations: 6 months residential, 11 months nonresidential, 18 months nonbuilding
National Particulate Inventory	1.2 tons/acre/month(TSP), AP-42; used PM_{10}/TSP and $PM_{2.5}$/PM_{10} ratios derived from EPA "Gap Filling PM_{10} Emission Factors for Selected Area Dust Sources"	Emissions and methods derived from 1993 National Emission Trends Inventory	
California Air Resources Board (CARB)	1.2 tons/acre/month (TSP) AP-42 adjusted to PM_{10} and $PM_{2.5}$	Construction Dollars or Number of Units Constructed; CARB conversion factors for dollars to acres and units to acres	CARB Default Values: 6 months residential, 11 months commercial, industrial, and institutional
South Coast Air Quality Management District	0.31 tons PM_{10}/acre/month (based on AP-42 TSP emission factor)	CARB Methodology	CARB Defaults for Construction Duration
San Joaquin Valley	CARB Methodology	CARB Methodology	CARB Methodology
Las Vegas (Clark Co., NV) 1991	654 lb PM_{10}/acre (activity) plus 21.9 lb PM_{10}/1000 gal diesel fuel (equipment)	Top Soil Disturbance Permits for acres disturbed	Conversion of 1 acre of construction impacted land to 1000 gal. of diesel fuel
Las Vegas (Clark Co., NV) 1997	Heavy Construction—0.42 tons/acre/mo.; Other Construction—0.265 tons/acre/mo.; Track-Out—0.0309 ton/day/access pt. (based on traffic volume of 2,157 trips/day) Wind Erosion—0.4472 ton/acre, dependent on 1995 windspeeds	Topsoil Disturbance Permits for acres disturbed; other local data from air quality and metropolitan agencies	See text
Phoenix	900 lb PM_{10}/acre	Earth Moving Permits for acres disturbed	4 months for all construction projects
Power/ Bannock, 1996	1.2 tons/acre/month (TSP) AP-42 recommended emission factor		

Section 5.
Recommended Methodologies and Data Sources

This section presents an improved emission inventory procedure that calculates both exhaust and fugitive dust emissions from construction activities. The recommended procedure provides a balance between a "top-down" inventory and "bottom-up" inventory methodology. PM emissions at the county level are more accurately estimated for different types of construction operations using improved indicators of activity levels.

5.1 Assumptions and Limitations of Current Methodologies

The NET procedure and the CARB methodology both make assumptions and also use estimates that may no longer be applicable because of the date of their development. The NET methodology uses a single, composite emission factor for all types of construction based only on the dollar amount spent on construction. The first assumption is that all construction activity produces the same amount of dust on a per acre basis. The amount of dust produced is not dependent on the type of construction but merely on the area of land being disturbed by the construction. A second assumption is that land affected by construction activity is always affected the same amount, i.e., the methodologies do not account adequately for large scale cut and fill operations. Also, the methodologies are limited in that the conversion factors used to convert dollars spent on construction to acreage disturbed, along with the estimates for the duration of construction activity, were developed by MRI in 1974 and may result in a loss in reliability in calculating emissions.

5.2 Recommended Changes to the NET Methodology

MRI recommends the following changes to the current NET methodology. Following the California methodology, residential construction acreage should be based on the number of units constructed rather than the dollar value of construction. Accounting for the construction of foundations is also seen as a necessary change because of the difference in the amount of dirt moved when constructing a slab foundation as compared to a basement. Highway construction with significant cut and fill operations should be based on the new miles of highway constructed in each county. The control efficiency used in the 1996 Trends inventory for PM_{10} was 62.5% and was 37.5% for $PM_{2.5}$. MRI recommends using a control efficiency of 50% for both PM_{10} and $PM_{2.5}$ for areas in which dust control measures are used. The estimates for the duration of construction activity levels also need to be revised for each construction category.

increase factor to account for sig cut + fill

5.3 General Emission Factor for Construction

Construction emissions can be estimated when two basic construction parameters are known, the acres of land disturbed by the construction activity and the duration of the activity. As a general emission factor for all types of construction activity, MRI recommends using 0.11 tons PM_{10}/acre/month that is based on a 1996 BACM study by MRI prepared for the California South Coast Air Quality Management District (SCAQMD).[9] However, separate emission factors segregated by type of construction activity provide better estimates of PM_{10} emissions and give a more accurate estimate than could be obtained using a general emission factor. Specific emission factors and activity levels for residential, nonresidential, and road construction are described below.

5.4 Residential Construction Emissions

Residential construction emissions are calculated for three basic types of residential construction:

- Single-Family Houses
- Two-Family Houses
- Apartment Buildings

5.4.1 Emission Calculation Procedure

Emissions for housing construction activities are estimated using emission factors from the MRI BACM report.[9] Housing construction emissions are calculated using an emission factor of 0.032 tons PM_{10}/acre/month, (as recommended by the SCAQMD[2]), the number of housing units created, a units-to-acres conversion factor, and the duration of construction activity. The formula for calculating emissions from residential construction is:

$$\text{Emissions} = (0.032 \text{ tons } PM_{10}/\text{acre/month}) \times B \times f \times m$$

where: B = the number of houses constructed
f = buildings-to-acres conversion factor
m= the duration of construction activity in months

Figure 5-1 illustrates the calculation of residential construction emissions.

Residential Construction

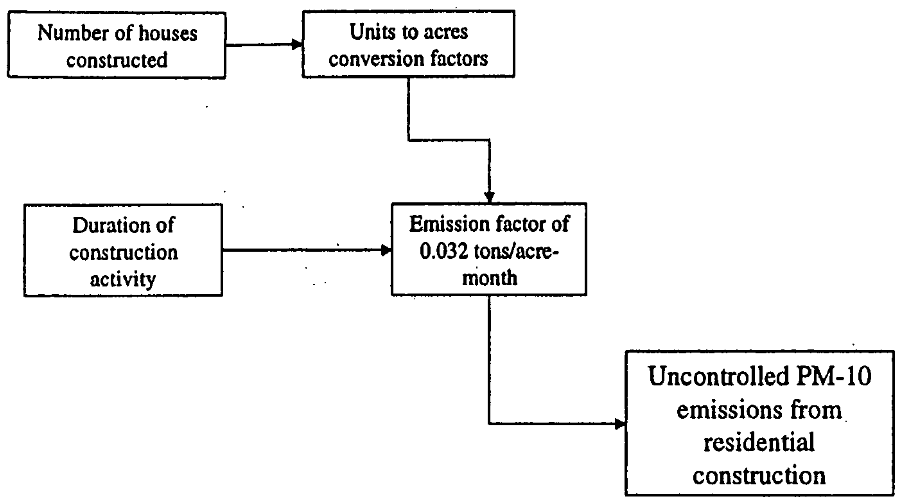

Figure 5-1. Residential Construction Emissions Flowchart

Apartment buildings vary in size, number of units, square footage per unit, floors, and many other characteristics. Since these variations exist and most apartment buildings occupy a variable amount of space, a dollars-to-acres conversion is recommended for apartment building construction rather than a building-to-acres factor. The estimate of 2.0 acres/$\$10^6$ (in 1992 constant dollar value) is recommended to determine the acres of land disturbed by the construction of apartments. The dollars-to-acres conversion factor was updated to a 1992 constant dollar value using the Construction Cost Index found in the annual edition of Statistical Abstract of the United States. A new estimate for the acres under construction per million dollars was developed using the difference in the 1992 index value and an estimated 1974 value. The approximately 40% difference led to an updated factor of 2 acres/$\$10^6$ derived from the original 5 acres/$\$10^6$ developed by MRI in 1974, The emission factor recommended for the construction of apartment buildings is 0.11 tons PM_{10} /acre/month because apartment construction does not normally involve a large amount of cut-and-fill operations.

An alternative formula is recommended for residential construction in areas in which basements are constructed or the amount of dirt moved at a residential construction site is known. The F.W. Dodge reports give the total square footage of homes for both single-family and two-family homes. This value can be used to estimate the cubic yards of dirt moved. Multiplying the total square feet by an average basement depth of 8 ft. and adding in 10% of the cubic feet calculated for peripheral dirt removed produces an estimate of the cubic yards of earth moved during residential construction. The added 10% accounts for the footings, space around the footings, and other backfilled areas adjacent to the basement. The cubic yards of earth moved along with the number of houses constructed can be used with the BACM Level 2 equation (emission factor of 0.011 tons PM_{10}/ acre/month plus 0.059 tons PM_{10}/1000 cubic yards of on-site cut/fill) to calculate emissions for regions in which basements are constructed or a large amount of dirt is moved during most residential construction. The Level 2 equation produces a slightly higher estimate of PM_{10} emissions than would be estimated using the residential construction emission equation.

5.4.2 Data Sources and Assumptions

The information available to determine activity level of residential construction is the dollar value of construction put in place and the number of units constructed. Construction costs vary throughout the United States and residential construction characteristics do not show as much variance as the cost does, so the number of units constructed is a better indicator of activity level. The amount of land impacted by residential construction is determined to be about the same on a per house basis rather than a per dollar basis. The average 2000 sq. ft. home can vary from the low to upper $100,000s depending on where the home is located in the United States. Incorporating a dollars-to-acres conversion factor would give a larger estimate for the acreage of land disturbed even though the construction affects the same amount of land as an area with a lower dollar value for residential construction and vice versa.

The number of housing units constructed by a county or state are available from the F.W. Dodge's "Dodge Local Construction Potentials Bulletin." Housing units are available for the three types of residential construction previously mentioned.

The conversion for single-family housing is estimated to be 1/4 acre per house. The conversion factor was determined by finding the area of the base of a home and estimating the area of land affected by grading and other construction activities beyond the "footprint" of the house. The average home is around 2000 sq. ft. Using a conversion factor of 1/4 acre/house indicates that five times the base of the house is affected by the construction of the home. This estimate is reasonable when considering the amount of grading, cut and fill, and transportion of materials on the property that occurs during residential construction.

The conversion for two-family housing was found to be 1/3 acre per building. The 1/3 acre was derived from the average square footage of a two-family home, around 3500 sq. ft., and the land affected beyond the base of the house, about 4 times the base for two-family residences.

5.4.3 Example Emission Calculation

Table 5-1 presents an example calculation of county-level emissions for residential construction.

Table 5-1. Example Annual PM_{10} Emissions from Residential Construction in a Hypothetical County

Residential type	No. of buildings	Acreage per building	Total Acres disturbed	Duration of construction	Emission factor (tonsPM_{10}/ acre/month)	Uncontrolled PM_{10} (tons)	PM_{10} control efficiency (%)	Controlled PM_{10} (tons)
Single-family	2422	1/4	606	6	0.032	116	0	116
Two-family	48	1/3	16	6	0.032	3.1	0	3.1
Apartment	59	1/2	30	12	~~0.032~~ 0.11	11.3	0	11.3
Total						130		130

A comparison of emission calculations using unit-operation emission factors, the residential construction emission equation, and the BACM Level 2 calculation shows that the Level 2 equation provides a higher estimate of emissions than using the general residential emission factor. The unit-operation emission calculation for bulldozing and grading produces an estimate similar to that from the Level 2 equation. The general residential emission factor calculates PM_{10} emissions from the construction of one single-family home to be 96 lbs/house. The Level 2 equation for a single-family home with a basement produces emissions of 109 lb PM_{10}/house. The emission calculation for bulldozing and grading estimates emissions to 112 lb/house PM_{10} (assuming 10 days of operation, 8% silt content, and 6% moisture content).

The comparison of residential construction emission methods for one single-family home were based on typical parameters for a single-family home:

- area of land disturbed 1/4 acre
- area of home 2000 sq. ft.
- duration 6 months
- basement depth 8 ft.
- moisture level 6%
- silt content 8%

Residential construction emission factor calculations are shown below. The general residential calculation is:

$$0.032 \text{ tons } PM_{10}\text{/acre/month} \times 1/4 \text{ acre} \times 6 \text{ months} = 0.048 \text{ tons or } 96 \text{ lb } PM_{10}$$

The BACM Level 2 emission calculation is:

Cubic yards of dirt moved: 2000 ft^2 x 8 ft. x 110% = 17600 ft^3 = 652 yd^3

(0.011 tons PM_{10}/acre/month x 1/4 acre x 6 months)+
(0.059 tons PM_{10}/1000 yd^3 dirt x 652 yd^3 dirt) =
0.016 +0.038 = 0.0545 tons or 109 lb PM_{10}
33 +76

The Unit Operation Emissions (Bulldozing) calculation from AP-42 is:

$$PM10 = 0.75\,(s)^{1.5}/(M)^{1.4} = 0.75\,(8)^{1.5}/(6)^{1.4}$$
$$= 1.4 \text{ lb } PM_{10}/\text{hr} \times 10 \text{ days} \times 8 \text{ hours} = 112 \text{ lb } PM_{10}$$

5.5 Nonresidential Construction Emissions

Nonresidential construction includes building construction (commercial, industrial, institutional, governmental) and also public works.

5.5.1 Emission Calculation Procedure

The emissions produced from the construction of nonresidential buildings are calculated using the value of the construction put in place. The formula for calculating the emissions from nonresidential construction is:

$$\text{Emissions} = (0.19 \text{ tons } PM_{10}/\text{acre/month}) \times \$ \times f \times m$$

where: \$ = dollars spent on nonresidential construction in millions
f = dollars-to-acres conversion factor
m = duration of construction activity in months

Figure 5-2 illustrates the calculation of PM_{10} emissions from non residential construction.

The emission factor of 0.19 tons PM_{10}/acre/month was developed using a method similar to a procedure originated by Clark County, NV (Las Vegas) and the emission factors recommended in the MRI BACM Report.[9] A quarter of all nonresidential construction is assumed to involve active earthmoving in which the recommended emission factor is 0.42 tons PM_{10}/acre/month. The 0.19 tons PM_{10}/acre/month was calculated by taking 1/4 of the heavy construction emission factor, 0.42, plus 3/4 of the general emission factor 0.11 tons/acre/month. The 1/4:3/4 apportionment is based on a detailed analysis of a Phoenix airport construction where specific unit operations had been investigated for PM_{10} emissions[21].

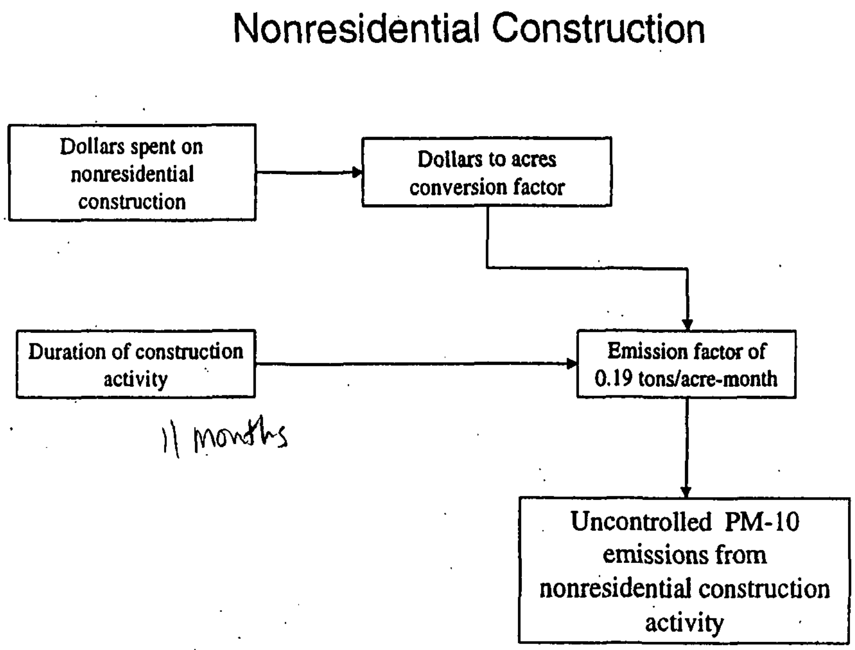

Figure 5-2. Nonresidential Construction Emissions Flowchart

Regions known to have extensive earthmoving activities will produce higher amounts of PM_{10} emissions. Since this larger amount would not be accounted for in building construction, the BACM "heavy construction emission factor" of 0.42 tons PM_{10}/acre/month may provide a better estimate for areas in which a significant amount of earth is disturbed.

An emission inventory for a 114-acre airport project[21] provides a comparison of detailed PM_{10} emissions as contrasted with the new recommended PM_{10} emission factor of 0.19 tons/acre/month. The results show total uncontrolled PM_{10} emissions using the detailed unit operation emission inventory methodology is 210 tons PM_{10} for the duration of the construction. The proposed emission factor results in total uncontrolled PM_{10} emissions of 260 tons PM_{10}. The new factor along with the acres under construction as an indicator of activity level provides an estimate of PM_{10} emissions from nonresidential construction within 25% of the emissions calculated using detailed engineering plans and "unit-operation" emission factors.

5.5.2 Data Sources and Assumptions

The dollar amount spent on nonresidential construction is available from the U.S. Census Bureau, Census of Construction Industries and the Dodge Construction Potentials Bulletin. Census data are divided by SIC Code whereas the Potentials Bulletin divides activity by the types of building being constructed rather than by SIC Code.

MRI has determined that the previous 1974 dollars-to-acres conversion factors can be updated to a single factor for nonresidential, nonroad construction. It is estimated that for every million dollars spent on construction, in 1992 constant dollars, 2 acres of land are impacted. The conversion factor reflects the current dollar value using the Price and Cost Indices for Construction that are available from the Statistical Abstract of the United States, published yearly. For example, the 1997 dollars-to-acres conversion factor would be 2/(118.7%) or 1.7 acres/ $ 10^6. The estimate for the duration of nonresidential construction is 11 months.

5.5.3 Example Emission Calculation

Table 5-2 presents an example calculation of 1992 PM_{10} emissions from nonresidential, nonroad construction for a hypothetical county.

Table 5-2. Example 1992 PM_{10} Emissions for Nonresidential Construction in a Hypothetical County

Construction put in place ($\$10^6$)	1992 ($ to acres)	Acres disturbed	Duration of activities	PM_{10} emissions factor (tons/acre/month)	Uncontrolled PM_{10} (tons)
57.7	2 acres/$\$10^6$	115	11	0.19	240

5.6 Roadway Construction Emissions

Roadway construction emissions are highly correlated with the amount of earthmoving that occurs at a site. Almost all roadway construction involves extensive earthmoving and equipment travel, causing emissions to be higher than found for other construction types.

5.6.1 Emission Calculation Procedure

The PM_{10} emissions produced by road construction are calculated using the BACM recommended emission factor for heavy construction and the miles of new roadway constructed. The formula used for calculating roadway construction emissions is:

$$\text{Emissions} = (0.42 \text{ tons } PM_{10}/\text{acre/month}) \times M \times f \times d$$

where: M = miles of new roadway constructed
f = miles-to-acres conversion factors
d = duration of roadway construction activity in months

The emission factor of 0.42 tons/acre/month is used to account for the large amount of dirt moved during the construction of roadways. Since most road construction consists of grading and leveling the land, the higher emission factor more accurately reflects the high level of cut and fill activity that occurs at road construction sites. Figure 5-3 illustrates the calculation of road construction emissions of PM_{10}.

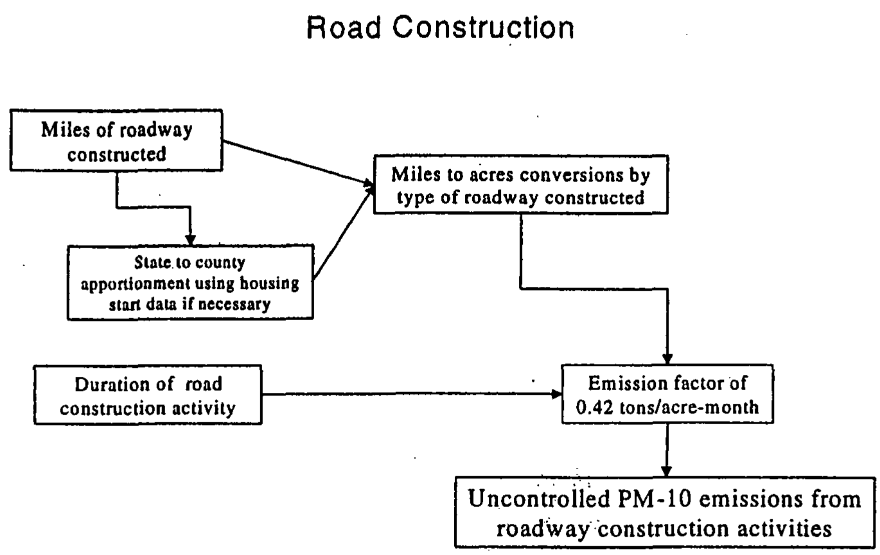

Figure 5-3. Road Construction Emissions Flowchart

5.6.2 Data Sources and Assumptions

The miles of new roadway constructed are available at the state level from the *Highway Statistics* book published yearly by the Federal Highway Administration and the Bureau of Census' Statistical Abstract of the United States. The miles of new roadway constructed can be found by determining the change in the miles of roadway from the previous year to the current year. The amount of roadway constructed is apportioned from the state to the county level using housing start data that is a good indicator of the need for new roads.

The conversion of miles of roadway constructed to the acres of land disturbed is based on a method developed by the California Air Resources Board. This calculation is done by estimating the roadway width, then multiplying by a mile to determine the acres affected by one mile of roadway construction. The California conversion factors are for freeway, highway and city/county roads. In the *Highway Statistics* book, roadways are divided into separate functional classes. MRI developed the miles-to-acres conversion according to the roadway types found in the "Public Road Length, Miles by Functional System" table of the annual *Highway Statistics*. The functional classes are divided into four groups. Group 1 includes Interstates and Other Principal Arterial roads and is estimated to have a conversion factor of 15.2 acres/mile. Group 2 includes Other Freeways and Expressways (Urban) and Minor Arterial Roads and is estimated at 12.7 acres/mile. Group 3 has Major Collectors (Rural) and Collectors (Urban) and a conversion factor of 9.8 acres/mile. Minor Collectors (Rural) and Local roads are included in Group 4 and converted at 7.9 acres/mile. Table 5-3 shows the data used to calculate the acres per mile of road constructed.

Table 5-3. Road Miles-to-Acres Conversion Calculation

	Group 1	Group 2	Group 3	Group 4
Lane Width (feet)	12	12	12	12
Number of Lanes	5	5	3	2
Average Shoulder Width (feet)	10	10	10	8
Number of Shoulders	4	2	2	2
Roadway Width* (feet)	100	80	56	40
Area affected beyond road width	25	25	25	25
Width Affected (feet)	125.0	105.0	81.0	65.0
Acres Affected per Mile of New Roadway	15.2	12.7	9.8	7.9

*Roadway Width= (Lane Width x # of Lanes) + (Shoulder Width x # of Shoulders)

Since the amount of new roadway constructed is available on a yearly basis, the duration of the construction activity is determined to be 12 months. The duration accounts for the amount of land affected during that time period and also reflects that construction of roads normally lasts longer than a year. The estimate for the duration of construction to find the total emissions produced by the construction over the length of the activity is 18 months.

5.6.3 Example Emission Calculation

Table 5-4 presents an example calculation of PM emissions from road construction. State miles are obtained from Table HM-50 in the annual report of the FHWA Report, *Highway Statistics*. State emissions are apportioned to the county level based on new housing statistics that are believed to be a good indicator for the construction of new road mileage.

Table 5-4 Example PM_{10} Emissions from Road Construction in a Hypothetical County

Road Type	State road mileage 1996	State road mileage 1997	New 1997 state road mileage	Miles to Acre factor	Affected state acres	Duration of construction (mo)	Emission factor (tons PM10/acre/ month)	State uncontrolled PM_{10} emissions (tons)	County X uncontrolled PM_{10} emissions (tons)*
1	2980	3030	50	15.2	760	12	0.42	3830	192
2	3470	3530	60	12.7	762	12	0.42	3840	192
3	4200	4400	200	9.8	1960	12	0.42	9878	494
4	11100	11500	300	7.9	2370	12	0.42	11945	597

*Based on 0.05 fraction of state housing constructed in County "X".

5.7 Correction Parameters

The regional variances in construction activity, as previously mentioned, cause PM emissions to vary even though the same level of activity may occur at construction sites. These differences are accounted for using correction parameters.

5.7.1 Control Efficiency

The first correction parameter accounts for the emission reductions afforded by dust control measures used at construction sites. At most large construction sites watering is used to control dust suspended by construction equipment activity and vehicle travel on unpaved roads. The recommended emission factors are representative of uncontrolled sites which is consistent with the AP-42 manual. The recommended control efficiency for PM emissions, including PM-10 and PM-2.5, is 50% based on data presented in Reference 20 and recent MRI unpaved road tests.

5.7.2 Soil Moisture Level and Silt Content

The emission factors developed in the BACM report were developed from test sites in the southwestern United States which have different moisture levels and silt contents than other areas in the country. To account for the differences in moisture level and silt content, adjustments are applied to the controlled PM emissions.

Soil moistures for the areas from which the emission factors were developed are typically much lower than other regions. Thornthwaite's Precipitation-Evaporation Index ranges from 7 to 41 and is shown in Figure 5-4. The average value for the test sites is 24. The adjustment for moisture is:

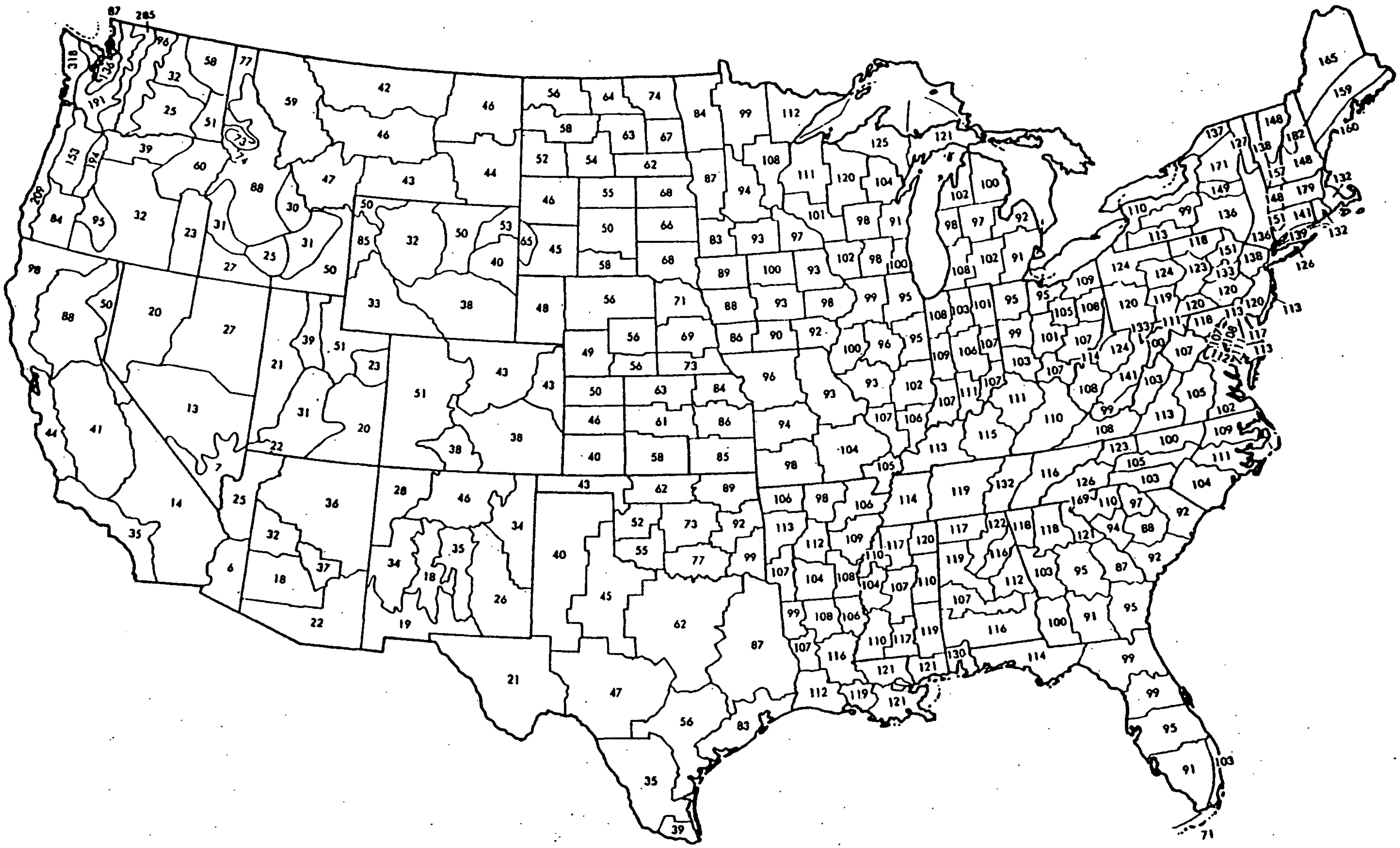

Figure 5-4. Map of PE Values for State Climatic Divisions

Moisture Level Corrected Emissions = Base Emissions x (24/PE)

where PE = the Precipitation-Evaporation value for the county being inventoried

The average dry silt content found for the test sites in the BACM report was 9%. To adjust for the level of silt content of surface soil in a particular county, a proportionality is used along with the base emissions. The equation to adjust for silt content is:

Silt Content Corrected Emissions = Base Emissions x (s / 9%)

where s = % dry silt content in soil for area being inventoried

The silt content of soil for a county can be found using the same procedure as in the NET Inventory. Section 4.8.2.2.1.1 in Reference 6 gives the methodology for determining the silt percentage of soils. The silt percentage is corrected using information from the California ARB which gives the conversion from a wet silt value to a dry silt value[23]. The dry silt percentage is used as a correction parameter for construction emissions. Typical silt contents for the various soil types are listed in Table 5-5, as reported in Reference 6.

Table 5-5. Dry Silt Content by Soil Type

Soil type	Silt content (%)
Silt Loam	52
Sandy Loam	33
Sand	12
Loamy Sand	12
Clay	29
Clay Loam	29
Organic Material	10-82
Loam	40

5.7.3 Emissions Adjustments

County level emissions of PM_{10} should be adjusted for dust control measures, precipitation/evaporation, and dry silt content of the soil. PM_{10} emissions can also be used to estimate $PM_{2.5}$ emissions using a $PM_{2.5}/PM_{10}$ ratio.

$PM_{2.5}$ Emissions = Uncontrolled PM_{10} Emissions x 50% x (24 / PE) x (s / 9%) x $PM_{2.5}/PM_{10}$

where: PE = PE value
s = % dry silt content
50% = 50% Control efficiency from periodic watering
$PM_{2.5}/PM_{10} = 0.15$

Table 5-6 presents the data sources, emission factors, and correction parameters for all three types of construction.

Table 5-6. Recommended Methodology

Construction activity type	Activity level data source	Emission factor	Control efficiency	Climatic factor	Soil factor
Residential	Houses: Number of housing units Apartments: Value of apartment construction (Statistical Abstract of the United States, published annually by the U.S. Census Bureau, or the F.W. Dodge Reports)	Houses: 0.032 tons PM_{10}/acre/month (Source: South Coast Air Quality Managment District $PM/_{10}$ Fugitive Dust Integration Project 1996) Apartments: 0.11 tons PM_{10}/acre/month	None	Precipitation/Evaporation Index	Dry Silt content as converted from wet silt
Nonresidential	Dollar Value of New Construction (Statistical Abstract of the United States or the F.W. Dodge Reports)	0.19 tons PM_{10}/acre/month (Source: SCAQMD, BACM Report No. 1, 1996, assumes 1/4 of all nonresidential construction activity is heavy construction	50%		
Road	New highway miles (Highway Statistics, FHWA annual publication)	0.42 tons PM_{10}/acre/month (Source: SCAQMD, BACM Report No. 1, 1996)			

5.8 PM_{10} Emissions from Combustion of Cleared Materials

Construction operations begin with general site preparation. This involves the clearing of trees, shrubs, and other vegetation that are usually burned. PM emissions are produced during the combustion of cleared materials.

The PM emissions from the combustion of cleared materials can be calculated using the emission factors from AP-42 Section 13.1, Wildfires and Prescribed Burning. The information needed to find PM emissions from burning are the acres affected by the construction activity and the tons of fuel per acre (available from Table 13.1- 1 of AP-42 by region). The total acres affected by construction can be found by using the conversion factors for units to acres, dollars to acres, and miles to acres for the three types of construction.

The emission factors used for the combustion of cleared materials come from Table 13.1-4 of AP-42 and are by region. Piled slash best represents vegetative residue cleared at a construction site and is typically 1/2 of the regional average emission factor for prescribed burning. The PM_{10} emission factor used for each region is 5 g PM_{10}/kg fuel for the Pacific Northwest, 6.5 g PM_{10}/kg fuel for the Pacific Southwest, 9.4 g PM_{10}/kg fuel for the Southeast, 6 g PM_{10}/kg fuel for the Rocky Mountain region, and 7 g PM_{10}/kg fuel for the North Central and Eastern Regions.

The equation for calculating PM_{10} emissions from the combustion of cleared materials is:

$$PM_{10} \text{ Emissions} = EF \times t \times a$$

where: EF = Regional emission factor for combustion in g/kg
t = conversion from acres to tons of available fuel (AP-42 Table 13.1-1)
a = total acres affected by construction

Table 5-7 gives the PM_{10} emission factors by region for the combustion of materials cleared from construction activities by region.

Table 5-7. Combustion of Cleared Materials Emission Factors by Region

Region	PM_{10} emission factor (g/kg of fuel)
Pacific Northwest	5.0
Pacific Southwest	6.5
Southeast	9.4
Rocky Mountain	6.0
North Central and Eastern	7.0

An example calculation of PM_{10}emissions from the burning of vegitative residues for a hypothetical county in the Rocky Mountain Region is shown in Table 5-8.

Table 5-8. Example Calculation of PM_{10} Emissions from the Burning of Vegetative Residues

Construction type	Acres affected	emission factor (g/kg)	Fuel loading per acre (ton/acre)	PM_{10} Emissions (tons)
Residential	652	6.0	60	234
Non-residential	115	6.0	60	41
Roads	293	6.0	60	105
Total				380

Section 6. References

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   www. fwdodge.com/newdodgenews.asp

Response to Letter 12b

Response 12b-1

The commenter states that an EDR Data Map does not constitute a Phase 1 Site Assessment.

It is acknowledged that an EDR Data Map Area Study does not constitute a Phase I ESA. However, in response to this and other comments, additional information was reviewed, and the rest of the investigation needed to complete a Phase 1 ESA was completed (See Appendix T of this Final EIR/EA). That Phase 1 ESA confirmed the conclusions of the EDR Data Map analysis conducted for the Final EIR/EA.

The Final EIR/EA has been revised as follows to correct the references to the EDR Data Map analysis to clarify that it does not constitute a Phase 1 ESA. This change represents a correction to the Final EIR/EA which does not alter or change the conclusion of the Project's environmental analysis. Section 4.2.8, Hazards and Hazardous Materials, (page 4-214) of the Final EIR/EA is hereby revised and incorporated into the Final EIR as follows. Please refer to page 53 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

> The hazardous materials analyzed include those potentially existing on the site and those that would be used as part of Project construction, operations and maintenance, and decommissioning. Potential existing hazards were assessed based on information contained in the ~~Phase I~~ <u>EDR</u> DataMap Area Study <u>as part of the Phase I Environmental Site Assessment</u> prepared for the parcels comprising the Project area. This report is available in Appendix F of this Draft EIR/EA.

As discussed in Responses to Comments 12-15 and 12-16, the environmental setting relating to hazards and hazardous materials described in Final EIR/EA Section 3.2.8 (pages 3-102 through 3-108) contains a summary of environmentally affected sites and other sites that are within a one-mile radius surrounding the Project area. The EDR report was included in its entirety in Appendix F of the Final EIR/EA and includes descriptions of each agency database, site names and addresses, and status, with some repetition existing among the different databases including Federal Database Records and State and Local Database Records. These databases do identify recognized environmental conditions on a property and within a given radius of the property. Chapter 3, Section 1.2.5 of the Final EIR/EA gives a detailed description of the World War II Desert Training Center/California-Arizona Maneuver Area, as well as the BAAB. Potential existing hazards were assessed based on information contained in the DataMap Area Study prepared for the parcels comprising the Project area. An updated DataMap Area Study map is included with the Phase I Environmental Site Assessment ESA in Appendix C of this Final EIR/EA document. The identified hazardous sites are identified on Figure 3.2.8-1 on page 3-103 of the Final EIR/EA. Therefore, the Final EIR/EA adequately sets forth an accurate and complete environmental baseline and analyses of hazards and hazardous materials as required by CEQA.

Response 12b-2

The commenter states that the Draft EIR/EA fails to identify two potential hazards; 1) Residual Pesticides and 2) ordnance and munitions and no mitigation is identified in the Draft EIR/EA to address these potential hazards.

Refer to Response to 12b-3 relative to residual pesticides and Response to 12b-5 relative to ordinance and munitions.

Response 12b-3

The commenter states that the Project site soils may be contain residual pesticides, including DDT.

Please refer to response to comments 12-20, 12-21, and 12-38. The Final EIR/EA acknowledges a portion of the Project site is in agricultural production and that there is a potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater. However, as discussed in Response 12-21, Studies in Imperial County California have shown that pesticide residues on farm lands are typically 25 to 50 percent of regulatory action levels (GS Lyon 2011). These studies noted that the typical agricultural practices include aerial and ground application of pesticides and application of chemical fertilizer to both ground and irrigation water. Based on the findings of Lyon's studies, it was determined that there is the potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and groundwater. Because Imperial County and Riverside County would have similar soil characteristics and similar farming practices, it is assumed that the Project area would also have the potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater. In addition, the proposed Project and action alternatives would require minimal ground disturbance of agricultural sites, for the foundation of the substations, access roads, O&M buildings, and supports for gas-powered generators. Accordingly, trenching and grading work associated with the proposed Project and action alternatives is not projected to result in substantial exposure of either on-site workers or off-site receptors to risk from pesticides.

Furthermore, the Project site would transition from agricultural use to a solar facility which would result in the substantial reduction in pesticide, herbicide, and fertilizer application. In addition, the proposed Project is the construction and operation of a solar facility and would not contain a residential or commercial component that would expose people to potential pesticides/herbicides.

BMP 3, Fugitive Dust Abatement Plan, as required by the Mojave Desert Air Quality Management District Rule 403, requires a Fugitive Dust Abatement Plan be prepared to address fugitive dust emissions during Project construction, operation, maintenance, and decommissioning. The plan would include measures to minimize fugitive dust emissions from wrecking, excavation, grading, clearing of land, and solid waste disposal operations.

As stated in Section 3.2.8, *Hazards and Hazardous Materials*, page 3-111 of the Final EIR/EA, Congress passed the Occupational Safety and Health Act (OSHA) to ensure safe and healthful working conditions for working men and women. OSHA authorized enforcement of the standards developed under the Act and assisted states in their efforts to ensure safe and healthful working conditions. The Project would be subject to OSHA requirements during construction, operations and maintenance, and decommissioning.

With implementation of BMP-3 and adherence to OSHA requirements, no adverse effects would be associated with potential pesticide residues in the soils.

Response 12b-4

The commenter notes the City of Blythe 2025 General Plan Policy states that it has become the City's policy to require a Phase 1 ESA. In addition, the commenter further states that construction workers may be subject to health risks from pesticide-contaminated soils.

A Phase 1 ESA was prepared for the project was prepared with the standards promulgated by the EPA. The Phase I notes the presence of pesticides and recommends a Phase II ESA shall be required to be completed for pesticides or other hazardous materials used on the property. The results must be reviewed by the Environmental Cleanup Program (ECP) to verify that the levels are below hazardous waste criteria pursuant to the Conditions of Approval developed by the County of Riverside Department of Public Health.

Furthermore, additional analysis was undertaken and confirmed that the potential for deposits at a location and in concentrations sufficient to create significant impacts is low. As explained in the Final EIR/EA, the Project site, including the area within the City of Blythe, was subjected to an EDR DataMap™ Area Study, which contains a summary of environmentally affected sites and other sites that are within a one-mile radius surrounding the Project area (refer to Appendix F of the Final EIR/EA). The EDR report includes descriptions of each agency database, site names and addresses, and status, with some repetition existing among the different databases. This analysis revealed that the Project site is not listed on any databases of hazardous sites.

As acknowledged in Section 4.2.8, portions of the proposed Project area are in agricultural production. As a result, there is a potential for residual, low-level concentrations of pesticides and other agricultural chemicals to be present in soil and/or groundwater. Should there be chemically impacted soils (i.e., fuels, pesticides, herbicides) present in the Project area, the risk of exposure to human health is not believed to be a significant concern (refer to Blythe Mesa Solar Project Phase I Environmental Site Assessment report in Appendix C of this Final EIR/EA document). The construction of the proposed Project would require minimal grading for the foundations of the substations and O&M buildings; therefore, it is anticipated that workers' exposure to impacted soils would be at low-level concentrations. As noted in Section 4.2.8, one aboveground storage tank was located within the Project solar facility site. It would be removed in compliance with all rules, laws, and regulations. Therefore, the Project would result in a less than significant hazard to the public or the environment.

As discussed above in Response to 12b-3, the Project would be subject to OSHA requirements during construction, operations and maintenance, and decommissioning. With implementation of BMP-3 and adherence to OSHA requirements, no adverse effects would be associated with potential pesticide residues in the soils.

Refer to Responses to 12-21 and 12b-3 above relative to residual pesticides and potential public health effects.

Response 12b-5

The commenter states that the Draft EIR/EA should include a Phase I ESA for an evaluation of military operations.

As stated in Response to 12-17, Chapter 3, Section 1.2.5 of the Final EIR/EA gives a detailed description of the World War II Desert Training Center/California-Arizona Maneuver Area, as well as the BAAB. Potential existing hazards were assessed based on information contained in the DataMap Area Study prepared for the parcels comprising the Project area. This report is available in Appendix F of the Final EIR/EA. An updated DataMap Area Study map is included with the Phase I ESA in Appendix C of this Final EIR/EA document. The ESA indicates that three areas within the BAAB as having the potential for munitions-related impacts (Poorman, Jeep Range, and Skeet Range) based on findings presented in Parsons' Site Inspection Report, Former Blythe Army Airfield dated September 2011 (Parsons, 2011). The Project Property does not fall within any of three munition-related areas. Explosive hazards were ruled out for the BAAB during a 2011 field investigation because during the field reconnaissance performed in 2011, only spent small arms ammunition was noted. In addition, no evidence of the storage, use, or disposal of chemical warfare has been identified for the BAAF FUDS listing. As indicated in the ESA, the DTSC project manager for this FUDS study area, Omoruyi Patrick, indicated that no other areas within the former BAAB are under investigation other than the Poorman, Jeep Range, and Skeet Range which are not part of the Subject Property.

Coincidentally, within a few months of the 2011 Parsons' field investigation, POWER conducted a BLM Class III archaeological and historic built environment survey of lands within the Project boundary that includes the 125-foot ROW of the proposed and alternative 230 kV transmission line corridors. These lands included private and BLM-managed public lands. During the surveys, archaeologists walked parallel transects, using 15-meter (50-foot) intervals, to identify archaeological and architectural resources. The ground surface was visually examined for evidence of prehistoric or historic archaeological materials and historic structures. Visible ground surfaces were examined, including fence lines, drainage channels, and other exposures. .There was little vegetation and ground surface visibility was very high. A sub-meter Global Positioning System (GPS) was used to record the location of each cultural resource. As a result of these field surveys conducted by POWER, other than shotgun shells and bullets associated with domestic trash deposits, no evidence of munitions or explosives were identified.

Response 12b-6

The commenter states that the Draft EIR/EA fails to identify other potential hazards across the Project site.

Refer to Responses to Comments 12b-3 and 12b-5 above.

Response 12b-7

The commenter states that the Draft EIR fails to disclose the extent of the potential impacts associated with Valley Fever.

The Project's potential effects with respect to the risk of Valley Fever infections are described and analyzed in Section 4.2.8, Hazards and Hazardous Materials, of the Final EIR/EA, which concludes that implementation of a dust abatement plan as required by the MDAQMD would minimize the spread of fungal spores, thereby reducing potential for contracting Valley Fever during construction (refer to BMP-2: Fugitive Dust). Also, please refer to Responses 2-6 and 12-40.

Response 12b-8

The commenter contends that the measure in Draft EIR/EA would not be effective in the prevention of Valley Fever.

BMP-3 would reduce fugitive dust, which would reduce the risk of Valley Fever infections in the most susceptible groups (i.e. construction workers, etc); it would also reduce the risk of Valley Fever infections in the general public. BMP-17, High Wind Conditions, would also reduce fugitive dust during high wind events; it would suspend soil-disturbing activities and travel on unpaved roads during periods of high winds (25 mph or greater), with the exception of those trips necessary to maintain the facility and prevent property damage. Similar programs have been employed at other solar facilities, and BLM experience indicates that incidences of Valley Fever have not increased appreciably. Accordingly, the measures have proven adequate to protect against Valley Fever. In addition, a WEAP, as Mitigation Measure Hazards-3, to be implemented to ensure worker safety and minimize worker hazards during construction and operation. Refer to Responses 2-6 and 12-40 for further discussion regarding Valley Fever.

Response 12b-9

The commenter states that the Draft EIR/EA needs to be revised to include a discussion on the Palo Verde Drain DDE TMDL and the impact Project construction may have on impaired water quality in the Drain and on the Colorado River.

See Responses 12-20 through 12-24 and 12-38. In particular, see response to comment 12-24 regarding the water quality of receiving waters.

Response 12b-10

The commenter states that they have identified two significant impacts to air quality; 1) PM10 emissions above threshold, and 2) emission of diesel particulate matter during construction could pose health risks. The commenter also contends that there are several methodological inaccuracies in the air quality report prepared for the proposed Project.

The air quality analysis in the Final EIR/EA was based on the technical analysis provided in the *Air Quality and Global Climate Change Technical Report* prepared by a qualified consultant. This report adequately sets forth an accurate and complete environmental baseline and disclosed and analyzed the potential impacts of the proposed Project based proven methodologies.

Table 4.2.3-2 in the Final EIR/EA (page 4-73) illustrates that emissions from construction of the Project would be below the general conformity thresholds and MDAQMD thresholds for all criteria. The proposed Project would not create substantial emissions, include PM10 emissions, and would not conflict with or obstruct implementation of the air basin's air quality management plan.

Refer to Responses to Comments 12-50 through 12-53 for further discussion regarding air quality and the methodology used to determine the significance of impacts.

Response 12b-11

The commenter contends that the Draft EIR/EA evaluates emission from a number of sources; therefore the 75% efficiency rating is inapplicable to the totality of emissions.

Refer to Response 12-52.

Response 12b-12

The commenter states that the Draft EIR/EA does not address impacts to nearby sensitive receptors from DPM [diesel particulate matter] emissions.

Refer to Response 12-53.

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Letter 13: Center for Biological Diversity

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CENTER for BIOLOGICAL DIVERSITY Because life is good.

protecting and restoring natural ecosystems and imperiled species through science, education, policy, and environmental law

via email and USPS

8/4/2014

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Re: Comments on the Blythe Mesa Solar Project - Draft Environmental Impact Report /Environmental Assessment - EIR No. 529, EA No. 0021, SCH No. 2011111056 dated June 2014

Dear Mr. McMenimen and Mr. Ross:

These comments are submitted on behalf of the Center for Biological Diversity's more than 775,000 staff, members and supporters in California and throughout the western states, regarding the Blythe Mesa Solar Project (BMSP) - Draft Environmental Impact Report /Environmental Assessment (DEIR/DEA) - EIR No. 529, EA No. 0021, SCH No. 2011111056 dated June 2014. We have concerns about the impacts from this project primarily regarding migratory and non-migratory avian species because of its proximity to the Colorado River, threads of the Pacific Flyway and movements between the Colorado River and the Salton Sea. We also have concerns about impacts to the Mojave fringe-toed lizard in light of the past failure of avoidance measures to minimize impacts to in and around the Colorado River substation.

The development of renewable energy is a critical component of efforts to reduce greenhouse gas emissions, avoid the worst consequences of global warming, and to assist California in meeting its required emission reductions. The Center for Biological Diversity (the "Center") strongly supports the development of renewable energy production, and the generation of electricity from solar power, in particular. However, like any project, proposed solar power projects should be thoughtfully planned to minimize impacts to the environment. In particular, renewable energy projects should avoid impacts to sensitive species and habitats, and should be sited in proximity to the areas of electricity end-use in order to reduce the need for extensive new transmission corridors and lines and the efficiency loss associated with extended energy transmission. Only by maintaining the highest environmental standards with regard to local

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impacts, and effects on species and habitat, can renewable energy production be truly sustainable.

The project is proposed as a solar photovoltaic (PV) electrical generating facility of up to 485 megawatt (MW) and an 8.4-mile generation interconnection (gen-tie) line located in the Palo Verde Mesa region of Riverside County near Blythe, California. The solar facility would cover 3,587 acres of private lands with in the jurisdiction of the County of Riverside and the City of Blythe as well as public lands managed by the Bureau of Land Management (BLM). The 230 kilovolt (kV) gen-tie line would cover 73 acres of Class M public lands managed by the BLM within an existing BLM designated energy corridor and tie into the grid at the Colorado River Substation.

The Center appreciates that this project is proposed on previously disturbed lands and for the most part, except for the gen-tie line, avoids in-tact desert habitats. Given that the project may have significant impacts on several biological resources, we believe that the use of an EA by the BLM is inappropriate and an EIS should have been prepared.

Our primary concerns are regarding biological impacts as described below:

1. Migratory Birds

13-1

Large-scale renewable energy facilities in California are having direct and indirect impacts on migratory birds[1]. The scale of the impacts and the significance to the overall population abundance and ecology of migratory bird species is potentially significant, yet due to a lack of standardized monitoring and analysis, remains unknown. It is essential that standardized before-after-control-impact surveys of migratory birds are conducted when developing new projects, including the BMSP in order to understand how renewable energy projects are affecting our migratory bird populations and to ensure that projects are developed in accordance with federal law and international treaties.

At this time, there are three large-scale solar energy projects operational in the California desert with others under review or approved. The land being developed for renewable energy is habitat used by migratory bird species as they migrate and periodically stopover at various sites. These areas are crucial for the viability of the migratory populations. At solar facilities in California that are either under construction or operational, individuals of over 40 species of migratory birds have been found injured or dead[2]. Avifauna impacted by these facilities includes multiple species of raptors, passerines, and water birds, including the endangered Yuma clapper rail (*Rallus longirostris yumanensis*), and the proposed endangered Yellow-billed cuckoo (*Coccyzus americanus*).

We are seriously concerned that birds of multiple species may perceive some solar facilities as large bodies of standing water or reflected airspace through which to fly.

1 Kagan et al. 2014. http://docketpublic.energy.ca.gov/PublicDocuments/09-AFC-07C/TN202538_20140623T154647_Exh_3107_Kagan_et_al_2014.pdf
2 IBID

Pursuant to Executive Order 13186, federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations are responsible for promoting the conservation of migratory birds. Per the Migratory Bird Treaty Act, and related regulations, the USFWS has no framework to accept compensation to help mitigate a project's impact on migratory bird populations and habitats; however, the BLM and the County may accept mitigation in collaboration with USFWS. At this time, it is essential that the agencies focus on identification of the source of mortality and likely extent so that it can be analyzed, avoided completely, or minimized and mitigated. Because the project may actually create an attractive nuisance for migratory birds, mitigation for migratory bird impacts should be separate from, and in addition to, mitigation for the loss of habitat for terrestrial species. As is well documented, this mitigation, to be effective, needs to involve riparian areas, additions to wildlife reserves and/or conservation and restoration of lands adjacent to riparian corridors or wildlife reserves. Consultation with the USFWS will provide a ratio, which we suggest should be 3:1 due to the cumulative impacts of this project and others in the same area. 13-1

With regard to the BMSP project, the BLM and the County must require the project proponent to accumulate accurate and reliable information on the background mortality rate of migratory birds at the project site and to establish protocols for mandatory standardized monitoring during and post-construction and commit to avoidance and mitigation measures. The project design should take into account this risk and adopt measures that could protect avian species if possible. If the project is approved and constructed, then consistent monitoring must be put in place so that the agencies can assess the impacts to migratory birds and develop strategies to avoid, minimize and mitigate these impacts at this facility and use any information gleaned to help improve avoidance and minimization at other projects in the future.

Because every large scale solar project approved by BLM and County also has indirect impacts through loss of habitat for migratory birds, and since this loss is potentially significant, the DEIR/EA must provide for mitigation lands for the indirect loss of migratory bird habitat in addition to other mitigation lands.

2. Yuma Clapper Rail

The Yuma clapper rail is protected under both the California and federal Endangered Species Acts, as endangered. Indeed, USFWS' Draft Yuma Clapper Rail Recovery Plan, First Revision[3] states that the Yuma clapper rail has a "high degree of threat and low recovery potential from loss of habitat due to lack of natural river processes that create and maintain marshes, and lack of security relative to the protection of existing habitats in the U.S. and Mexico". The USFWS identifies the population along the Colorado River as non-migratory[4]. 13-2

3 USFWS 2010. Draft Yuma Clapper Rail Recovery Plan, 1st Revision http://ecos.fws.gov/docs/recovery_plan/Draft%20Yuma%20Clapper%20Rail%20Recovery%20Plan,%20First%20Revision.pdf

4 USFWS 2006. Five year review – Yuma clapper rail. http://ecos.fws.gov/docs/five_year_review/doc782.pdf

The DEIR/EA incorrectly identifies the highly imperiled and federally and state listed endangered Yuma clapper rail potential for occurrence within the solar array project boundary and the three gen-tie line alternatives as "none" (DEIR/EA at 3-67). Both the resident and migratory population could be impacted by the proposed project – the migratory population when making movements from the Salton Sea to the Colorado River and both populations as they move around the Colorado River Valley or more northerly populations when migrating south. To date, two Yuma clapper rails that we know of have been found dead at industrial-scale photovoltaic projects. Because of already low and now declining population numbers, additional impacts and mortalities, will drive the Yuma clapper rail closer to the brink of extinction. 13-2

3. Failure to Fully Evaluate At-Risk Avian Species

We agree with the DEIR/EA that "Indirect impacts to migratory birds include the potential of PV panels to give off a reflection during the daytime that can resemble water when viewed from the sky and cause birds to be attracted to the solar facility site (Riverside County Planning Department, personal communication 2014)". (DEIR/EA at 4-100) Clearly direct impacts[5] to avian species have occurred as well. It is likely that on-site avian surveys are inadequate to evaluate the potential impacts of the proposed project to avian species due to the potential for attraction. Therefore the DEIR/EA should have looked at nearby water features to evaluate the number and types of species that could be attracted to the thousands of acres of PV panels. Review of ebird local hotspots indicates that numerous special status species occur at locations very close to the proposed project site including: 13-3

Common Name	**Scientific Name**	**Status***	**Location****
American kestrel	*Falco sparverius*	SSC(BP)	BFP/BWTP/BDCP/MCP
White-faced ibis	*Plegadis chihi*	SSC	BFP/BWTP/BDCP/MCP
Northern harrier	*Circus cyaneus*	SSC(BP)	BFP/BDCP/MCP
Burrowing owl	*Athene cunicularia*	SSC(BP)	BFP/BWTP/MCP
Osprey	*Pandion haliaetus*	SSC(BP)	BFP/MCP
Peregrine falcon	*Falco peregrinus*	SFP	BFP
Prairie Falcon	*Falco mexicanus*	SSC(BP)	BWTP/BDCP/MCP
Swainson's hawk	*Buteo swainsoni*	ST	BWTP/MCP
snowy plover (interior population)	*Charadrius alexandrinus*	SSC	BWTP/RE
Crissal thrasher	*Toxostoma crissale*	SSC	BWTP/MCP
Ferruginous hawk	*Buteo regalis*	SSC(BP)	BDCP/MCP
Sandhill crane	*Grus canadensis*	SSC	BDCP/MCP
willow flycatcher	*Empidonax traillii*	SE/FE(SWWF)	RE/MCP
loggerhead shrike	*Lanius ludovicianus*	SSC	RE/MCP
Gila woodpecker	*Melanerpes uropygialis*	SE	MCP
yellow breasted chat	*Icteria virens*	SSC	MCP
Bell's sage sparrow	*Amphispiza belli bellii*	SSC	MCP

*SE = State Endangered

5 Kagan et al. 2014 http://docketpublic.energy.ca.gov/PublicDocuments/09-AFC-07C/TN202538_20140623T154647_Exh_3107_Kagan_et_al_2014.pdf

ST = State Threatened
SFP = State Fully Protected
SSC = Species of Special Concern
SSC (BP) = Species of Special Concern – Bird of Prey
FE = Federally Endangered (Southwestern willow flycatcher)
**BFP = Blythe Fish Ponds http://ebird.org/ebird/ca/hotspot/L1490204
BWTP = Blythe Water Treatment Plant http://ebird.org/ebird/ca/hotspot/L719463
BDCP= Blythe D Canal Pond http://ebird.org/ebird/ca/hotspot/L1072812
RE= River Estates http://ebird.org/ebird/ca/hotspot/L1164384
MCP = Mayflower County Park http://ebird.org/ebird/ca/hotspot/L353751 13-3

In addition to the proposed project being located in a recognized avian migratory corridor – the Colorado River corridor, it is also adjacent to one of Audubon's global Important Bird Areas – the lower Colorado River Valley.[6]

Additionally, as part of the California Energy Commission proceedings for the nearby Blythe Amendment, an estimate of impacts to avian species was performed[7], and that determination should be used as a basis for evaluating the impacts to avian species in this environmental review process in the supplemental DEIR/EA.

Other resources to help analyze the potential impacts to migratory birds include the recent article[8] written by Pat Flanagan, which used the existing data from e-Bird "hotspots" to evaluate potential migration pathways over the Mojave Desert using the following assumptions:

- "birds migrate toward breeding or wintering locations;
- Birds fly at an elevation allowing visibility over a wide area;
- Birds utilize great amounts of energy when flying and look for areas to rest, drink and eat;
- Over millennia birds have seen the Pleistocene lakes and Holocene wetlands come and go – they know how to recognize and take advantage of a water source from even the briefest glint; 13-4
- Birds will veer off their route to access the promise from the glint;
- Birds ignore what has no immediate value."[9]

Comparing species at hotspots along a 380 mile migratory corridor from the Salton Sea to Death Valley National Park, shows a vast overlap in species along the transect, indicating the ubiquity of migratory birds on the landscape. The article also points to the problem with point-count bird surveys as are typically executed on proposed projects:

> "Point-count surveys focus on undeveloped project sites, and provide scant understanding of the attractions to birds created by vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panes; actively

6 http://ca.audubon.org/california-iba-interactive-site-map
7 http://docketpublic.energy.ca.gov/PublicDocuments/09-AFC-06C/TN201152_20131108T155000_Testimony_of_K_Shawn_Smallwood_PhD.pdf
8 Desert Report, Flanagan, P., June 2014, "The Impacts of Energy Projects on Migrating Birds: NEW TOOL AVAILABLE TO ASSESS MIGRATORY BIRD SPECIES"; available at http://www.desertreport.org/wp-content/uploads/2014/05/DR_Summer_2014.pdf
9 Id. at 17.

fluxing towers, open bodies of water; aggregations of insects that attract insectivorous birds."[10] 13-4

4. Willow Flycatcher

The DEIR/EA overlooks the presence of the willow flycatcher (*Empidonax trallii*) near the project site. The willow flycatcher is a state-listed endangered species. The southwestern willow flycatcher is a federally endangered species. While the willow flycatcher has not been reported on the proposed project site, it has recently been recorded very close to the site along the Colorado River. According to eBird hotspot list, which is reviewed by local experts prior to posting, willow flycatchers were documented using the resources at River Estates and the Mayflower County Park (see above table). It is unclear if the birds were the federally protected southwestern willow flycatcher. However, southwestern willow flycatchers are known to migrate along the Colorado River[11], and it is possible that the willow flycatchers were the southwestern subspecies. Regardless, willow flycatchers are state endangered species. Therefore, the County and BLM should consult with US Fish and Wildlife Service and California Department of Fish and Wildlife on impacts associated with the proposed project to the endangered southwestern willow flycatcher and endangered willow flycatchers respectively. 13-5

5. Burrowing Owl

The DEIR/EA identifies 6-8 burrowing owls currently using the proposed solar array areas and they would be permanently impacted (at pg. 4-98). The DEIR/EA fails to indicate the status of the burrowing owls in the gen-tie area although Figure 3.2.4-3 indicates an additional three burrowing owls occur in the general area of the proposed gen-tie alternatives (at pg. 3-59). Indeed the DEIR/EA admits that adequate surveys were not performed for burrowing owl, stating "Alternative 3 corridor was not [surveyed], and it is unknown if any owls are present in it" (at pg. 4-110) and "While the Alternative 1 gen-tie corridor was surveyed for burrowing owls in 2011, the Alternative 4 corridor was not, and it is unknown if any owls are present in it." (at pg. 4-116). While burrowing owls are declining in California, the remaining stronghold for burrowing owls in California – the Imperial Valley – has documented decline of 18% in the 2011-2012 [12], resulting in an even more dire state for burrowing owls in California. Because burrowing owls are in decline throughout California, and now their "stronghold" is documented to be significantly declining, the burrowing owls on this proposed project site (and on other renewable energy projects) become even more important to species conservation efforts. Biology 4 is wholly inadequate to off set the impacts to burrowing owls. While the it states "4) To compensate for impacts to the burrowing owls in activity areas on the northern part of the Project, 146 acres of habitat have been identified adjacent to the Project area" (DEIR/EA at 4-138) it is unclear if this habitat is for acquisition. Please see below for discussion on appropriate mitigation acquisition. 13-6

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10 Id. at 19.
11 USFWS 2013 http://www.gpo.gov/fdsys/pkg/FR-2013-01-03/pdf/2012-30634.pdf at PDF pg 11.
12 IID 2012 http://www.iid.com/Modules/ShowDocument.aspx?documentid=8171

Because there is no scientific evidence that passively relocating burrowing owls is a successful strategy for long-term survival of burrowing owls, "passively relocated"owls, as proposed in Biology 4 need to be monitored to determine the effectiveness of that action. Therefore the County and BLM need to work with the state and federal wildlife agencies to set up a statistically useful monitoring program to assess the outcome of passively relocated owls.

If indeed the 146 acres of burrowing owl habitat is to be acquired to off-set impacts from the construction and operation of the solar project and transmission line, it is woefully inadequate. Mean burrowing owl foraging territories are 242 hectares in size, although foraging territories for owl in heavily cultivated areas is only 35 hectares[13]. The DEIS fails to identify the number of territories that occur on the proposed project site. Absent the actual number of territories that overlap with the proposed project site, the evaluation of mitigation acquisition is flawed. However, additional mitigation acreage is likely needs to be required – calculated using the mean foraging territory size times the number of territories, will result in a much greater number of acres of habitat that would need to be acquired, although using the average foraging territory size for mitigation calculations may not accurately predict the carrying capacity and may overestimate the carrying capacity of the lands selected for mitigation. While the DEIS may have relied on guidance from CDFW from 2012, that guidance still does not fully incorporate current population declines[14] and additional research on the species habitat[15]. Lastly, because the carrying capacity is tied to habitat quality, mitigation lands that are acquired for burrowing owl that can not be avoided be native habitat on undisturbed lands, not cultivated lands, which are subject to the whims of land use changes. The long-term persistence of burrowing owls lies in their ability to utilize natural landscapes, not human-created ones. 13-7

6. Mojave fringe-toed lizard

The DEIR/EA states "Suitable Mojave fringe-toed lizard habitat is located throughout the solar array site, and the potential for occurrence there is high (refer to Table 3.2.4-3 in Chapter 3). The species was found throughout the gentie line portion of the Project (refer to Figure 3.2.4-4 in Chapter 3)." (at pg. 4-96). While Biology 8 proposes a 3:1 mitigation for impacts, other projects on BLM lands were required to mitigate at a higher ratio for occupied Mojave fringe-toed lizard habitat. For example, Desert Sunlight was required to mitigate any unavoidable impacts to the Mojave fringe-toed lizard habitat up to 5:1 for direct impacts to all occupied Mojave fringe-toed lizard habitat and lesser ratios for indirect impacts (Desert Sunlight FEIS at 4.4-40). Also, the Desert Sunlight project (Desert Harvest FEIS at Wil-4) is required to produce a Mojave Fringe-toed Lizard Protection Plan. The DEIR/EA provides no explanation for failing to require a Mojave Fringe-toed Lizard Protection Plan for this proposed project which clearly is sited in more Mojave Fringe-toed lizard habitat than the Desert Sunlight and will have significantly more impacts to the species if approved. 13-8

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13 USFWS 2003 http://www.fws.gov/mountain-prairie/species/birds/wbo/Western%20Burrowing%20Owlrev73003a.pdf
14 IID 2012 http://www.iid.com/Modules/ShowDocument.aspx?documentid=8171
15 USFWS 2003 http://www.fws.gov/mountain-prairie/species/birds/wbo/Western%20Burrowing%20Owlrev73003a.pdf

It is unclear in the DEIR/EA if fencing will allow sand habitat for Mojave fringe-toed lizards to remain on the proposed project site within the boundaries of the solar field. It puts Mojave fringe-toed lizards potentially in harms way not only from construction but also from operation of the proposed project infrastructure from the motorized vehicles and roads used for maintenance, panel washing, etc. No analysis of the on-going impacts to Mojave fringe-toed lizards from road related mortality or use of other motorized equipment on site as part of the operations is provided. Other roads associated with development projects located in Mojave fringe-toed lizard habitat have documented significant mortality despite enacted avoidance and minimization measures[16]. The DEIR/EA completely fails to address the avoidance and minimization required. Based on those impact studies mentioned above, a supplemental DEIR/EA needs to include avoidance and minimization measure not only for construction but for operations and maintenance. Because of the failure to identify and analyze these impacts, the DEIR/EA must be revised. 13-9

The DEIR/EA also fails to evaluate other impacts of the proposed project on Mojave fringe-toed lizard outside of the project site. As Barrows et al. (2006)[17] found, edge effects are significant for fringe-toed lizards and, in addition, the increase in predators and predation opportunities associated with developed edges may also have a significant adverse effect on fringe-toed lizards and other species. For example, proposed site fencing and gen-tie line will provide perching opportunities for birds that can predate on fringe-toed lizards (and other species). Avoidance and minimization strategies need to be included for this impact as well. 13-10

7. Badger and Desert Kit Foxes

The desert kit fox and badgers are experiencing unprecedented impacts from development of renewable energy projects in their habitat. For desert kit fox, to date on public lands alone, eighteen solar and transmission project applications covering more over 96,000 acres are currently filed as of January 2013[18]. Fifteen approved solar projects, most of which are currently under construction, cover almost 39,000 acres of desert kit fox habitat[19]. Over 30,000 additional acres of proposed solar projects are actively undergoing environmental review[20]. As of January 2013, eleven wind projects covering almost 75,000 acres have been approved with many of them in the construction phase[21]. Three additional projects covering 16,611 acres are currently under environmental review[22]. In addition, twenty-eight projects are authorized to do wind testing on almost 270,000 acres[23]. Another forty wind project applications are in development or 13-11

16 Helix 2013 (Attachment)
17 Barrows et al. 2006 http://escholarship.org/uc/item/06c0q5pw.pdf
18 BLM 2012. Solar Apps and Auths.
http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/pa/energy/solar.Par.84447.File.dat/BLM%20Solar%20Apps%20and%20Auths.pdf
19 Ibid
20 Ibid
21 BLM Wind Apps & Auths July 2012
http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/pa/energy.Par.5556.File.dat/BLM%20Solar%20Apps%20&%20Auths%20July%202012.pdf and Kern County wind projects
http://www.co.kern.ca.us/planning/pdfs/renewable/wind_projects.pdf
22 Kern County wind projects http://www.co.kern.ca.us/planning/pdfs/renewable/wind_projects.pdf
23 BLM Wind Apps & Auths July 2012

propose testing, covering an additional 485,000 acres[24]. The potential cumulative development for wind in desert kit fox and badger habitat could cover close to 850,000 acres. In our review of these projects, very few of them evaluate the impacts to desert kit fox populations or require any mitigation other than "passive relocation". The DEIR/EA still fails to adequately discuss the desert kit fox in the context of their great site fidelity, challenges of "passive relocation" with this species that generally go to great effort to return to their on-site territories. 13-11

Additionally, the DEIR/EA fails to estimate the number of desert kit fox or badgers on the project site, or analyze impacts to them from the proposed project. Through Biology 6 in the DEIR/EA (at pg. 4-138-139) does not even require an American Badger and Desert Kit Fox Mitigation and Monitoring Plan, that would additional safeguards are put in place for the kit fox and badger. Instead, the animals are proposed to be "passively relocated". 13-12

Among other concerns about passive relocation, we share all of the State veterinarians' concerns about passive relocation as stated in a recent CEC proceeding[25]:

- "canine distemper virus (CDV) can cause repeated (cyclical) outbreaks. The time when this is most likely to happen is when susceptible young of the year are growing up and dispersing because density is high and animals are moving, therefore there is more opportunity to transmit the virus and more naïve animals present on the landscape to be infected. This time of year also corresponds to the time when projects are permitted to passively relocate foxes whose dens are within the project construction area
- Passive relocation or hazing activities conducted in an area experiencing or adjacent to distemper cases may enhance disease transmission and spread by multiple mechanisms.
    - First, animals stressed by disturbance or relocation may be more susceptible to illness and death because CDV infection decreases immune function (ref). 13-13
    - Second, passive relocation activities in an area experiencing clinical CDV cases may result in increased movement of animals shedding virus, thereby increasing the number of new cases or enhancing the spread of disease into new areas.
- Little to nothing is known about the potential impacts of passive relocation on foxes from solar sites nor have alternative techniques been explored to determine best practices. Important unanswered questions include:
- Do passively relocated animals re-establish territories adjacent to the solar site? Or might this depend on the density or spatial distribution of foxes around a site.
- Do relocated foxes experience lower survival or different causes of mortality that might need to be addressed through mitigation efforts?
- Recursion rate – how likely are relocated foxes going to try to get back on site and return to former den areas?
- Demographic shifts of neighbors

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http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/pa/energy.Par.5556.File.dat/BLM%20Solar%20Apps%20&%20Auths%20July%202012.pdf
24 Ibid
25 http://docketpublic.energy.ca.gov/PublicDocuments/09-AFC-07C/TN200995_20131022T141658_Exhibit_2005__CDFW_Outline_for_Proposed_Desert_Kit_Fox_Health_M.pdf

- Reproductive impact (n=1 relocated pair this year had den failure; most other dens were successful this year in producing pups).
- Rapid vs. slow relocation etc.
- Utilization of artificial dens
- Longer term translocation decisions 13-13
- Current monitoring limited in scope and inadequate to address needs (underfunded).
- Methods and outcomes for relocation are not evaluated systematically or reported."

These issues should also be incorporated into requirements for the proposed project, especially because this proposed project is within the envelope of the distemper outbreak first documented at the Genesis solar project.[26]

Conclusion

Thank you for your consideration of these comments. In light of the many omissions in the environmental review to date, we urge the County and the BLM to revise and re-circulate the DEIR/EA for the BMSP and to prepare a revised or supplemental DEIR/EA addressing these issues and others before making any decision. In the event the County and BLM choose not to revise the DEIR/EA and provide adequate analysis, the agencies should reject the proposed project at this time. Please feel free to contact me if you have any questions about these comments or the documents provided.

Sincerely,

Ileene Anderson
Biologist/Desert Program Director

cc: (via email)
Brian Croft, USFWS, brian_croft@fws.gov
Kevin Hunting, CDFG, khunting@dfg.ca.gov
Tom Plenys, EPA, Plenys.Thomas@epa.gov

Attachment: Helix 2013. Memorandum: Summary of MFTL monitoring during DPV2 construction. July 11, 2013. Pgs. 4.

26 http://articles.latimes.com/2012/apr/18/local/la-me-0418-foxes-distemper-20120418

Memorandum

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Date: July 11, 2013

To: Vida Strong, Aspen Environmental Group

Cc: Fritts Golden and Ryann Loomis, Aspen Environmental Group

From: Jesse Miller and Shelby Howard

Subject: Summary of MFTL monitoring during DPV2 construction

HELIX Proj. No.: AEG-03.05

Message:

In response to Mojave Fringe-Toed Lizard (MFTL) mortalities that were occurring in 2012 along the Colorado River Substation (CRS) access road associated with the Devers to Palo Verde 2 (DPV2) transmission line project, HELIX Environmental Planning, Inc. (HELIX) was contracted for MFTL monitoring. The monitoring commenced in October 2012 at a rate of 6 days per week and ended in November 2012 when MFTL were no longer active. Monitoring re-commenced in April 2013 at a rate of 5 days per week and ended in June 2013 when construction was completed in this portion of the project. The purpose of the monitoring was to document MFTL activity on and adjacent to the CRS access road, relocate MFTL away from the access road as appropriate to reduce mortality risk due to project vehicles, and report project vehicle speeding and lack of vehicle escorts to Southern California Edison (SCE) monitors.

Methods

HELIX conducted MFTL monitoring through a combination of driving and walking searches along the CRS access road, in accordance with the guidance provided by BLM for monitoring for this species. Driving searches consisted of driving slowly along the access road to search for MFTL. If a MFTL was sighted during a driving search, the biologist would pull over and attempt to relocate the lizard, in accordance with the methods described below. Walking searches consisted of a biologist walking along and adjacent to the CRS to search for lizards. Walking searches consisted of slow, meandering searches for lizards, including under shrubs and on sandy areas.

When a MFTL was observed on or near the CRS, the individual was relocated to a shady location away from the access road, a GPS point was recorded, and air and ground temperatures were recorded. HELIX biologists conducted both active (lizards were captured and physically moved to a shady location) and passive (lizards were chased away from the road until they moved to a safe location away from the road) relocations. The same data were collected when a dead MFTL was discovered. Air temperatures were recorded in a shady

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location using a handheld thermometer. Ground temperatures were recorded using a digital scanning thermometer. A daily monitoring report was provided to summarize relocations, mortalities, temperatures, and issues noted during the monitoring.

HELIX biologists evaluated driving speeds of DPV2 project trucks and whether those trucks had an escort by SCE monitors. General observations of compliance with speed limits and presence of vehicle escorts were provided in daily monitoring reports.

The MFTL monitoring was conducted by HELIX biologists Benjamin Rosenbaum, Brian Payne, Jesse Miller, and Robert Hogenauer.

Results

HELIX relocated a total of 304 MFTL (40 in fall 2012 and 264 in spring/summer 2013) and recorded 90 MFTL mortalities (9 in fall 2012 and 81 in spring/summer 2013) during the two seasons of monitoring. In fall 2012, a total of 29 days of monitoring were conducted, which resulted in an average of 1.4 MFTL relocated/day and 0.3 MFTL mortalities/day. In spring 2013, a total of 61 days of monitoring were conducted, which resulted in an average of 4.3 MFTL relocated/day and 1.3 MFTL mortalities/day. By comparison, 3 times as many MFTL were relocated per day in spring 2013 as compared to fall 2012, and approximately 4 times as many MFTL mortalities per day were noted in spring 2013 as compared to fall 2012.

There was variation in the number of individuals observed on any given day, which was attributed to a variety of environmental conditions, most notably wind speed, presence of blowing sand on the road, and temperature. Although this factor was not qualitatively assessed on a daily basis, when wind-blown sand was more prevalent on or directly adjacent to the CRS, more MFTL were observed during the monitoring.

The greatest concentration of MFTLs was found before the curve in the CRS access road and along the final stretch of asphalt before the substation. The mean air temperature for a MFTL observation was 84 degrees Fahrenheit, and the individual was often basking directly on the access road or on the berm adjacent to the road. Mean ground temperature during observations was 105 degrees Fahrenheit.

Day-to-day compliance with access road speed limits and vehicle escorts was variable during the two seasons of monitoring. All project personnel went through Workers Education Awareness Program (WEAP) training that included information on MFTL and project requirements. Despite the training, there were regular instances of trucks exceeding the speed limit or using the access road without an SCE escort. When project trucks were noted to be either speeding or travelling along the road without an escort, the vehicle number was reported to the lead SCE monitor. The SCE monitors were quick to respond when speeding and escort issues were reported to them. Even when drivers were following the speed limits, one of the major challenges seemed to be the difficulties for the drivers to see MFTL while driving because of the species' cryptic coloration and desire to stay close to sandy areas. Several of the drivers

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expressed confusion on why vehicle escorts were present and why speed limits were set at 15 or 25 mph.

Recommendations for Future Projects in MFTL Habitat

We have several recommendations for future projects where exclusionary fencing cannot be employed to keep MFTL out of the construction zone:

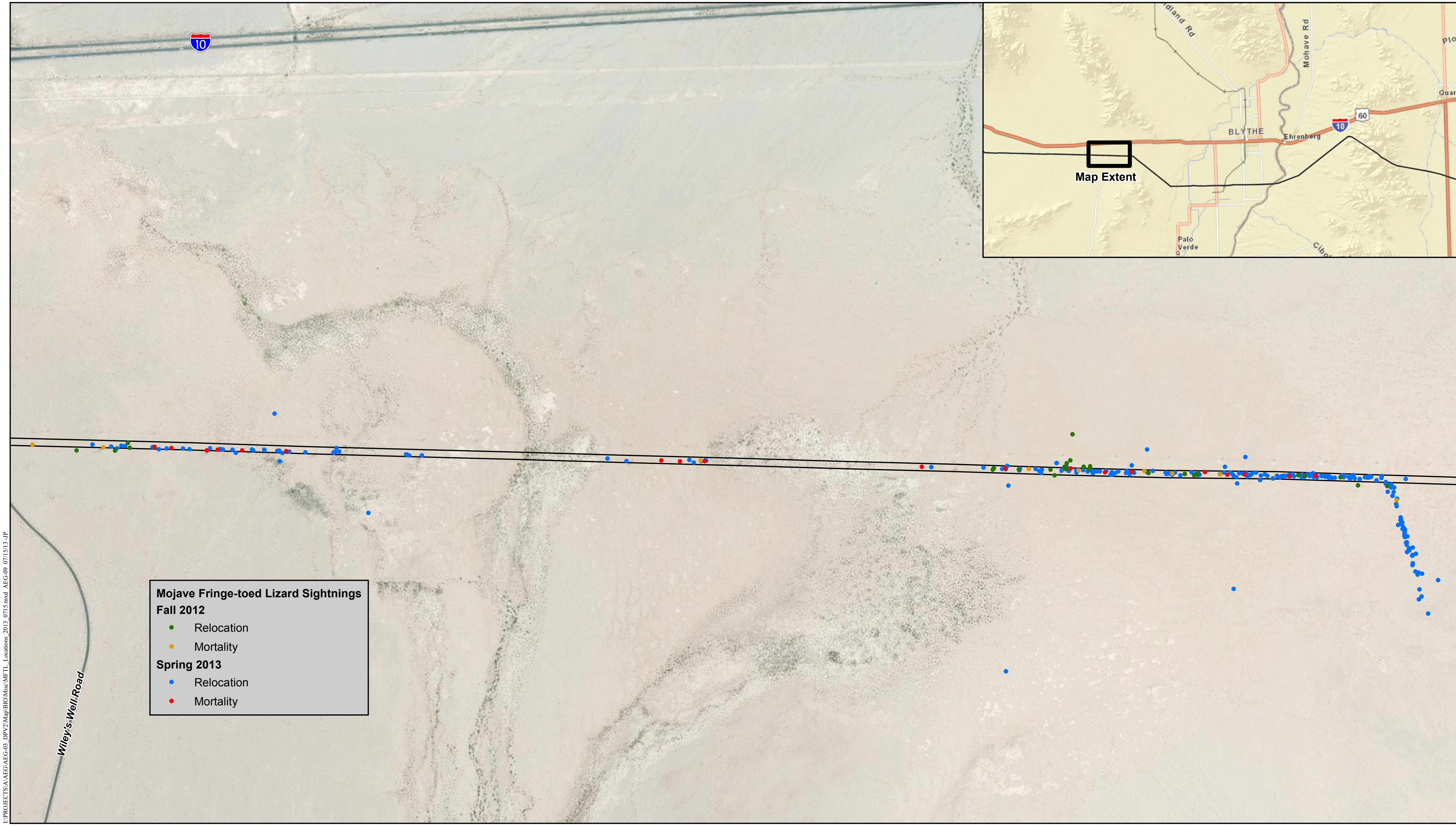
- Speed limits in areas where MFTL are known to occur or have high potential to occur should be 15 mph or less. The species is extremely difficult to see when vehicle speeds exceed 15 mph.

- Road bumps are effective at slowing vehicles down. The design and placement of bumps should be evaluated critically prior to installation. Larger and more frequent speed bumps in the areas of greatest potential would help keep vehicle speeds lower in the areas of greatest concern.

- Initial WEAP trainings can have a greater emphasis on MFTL threats and project requirements.

- Refresher WEAP trainings (e.g., quarterly) can be held periodically during the construction phase to reiterate project requirements and importance of compliance with minimization measures. This will allow for reminders of project requirements and the reasoning behind the project restrictions.

- Triggers may need to be considered if MFTL mortalities during construction exceed the number of mortalities assumed in the environmental document as “less than significant.” In order to track and implement triggers during construction, a regular monitoring program would need to be implemented to track effectiveness of the mitigation measure and to document mortalities. Examples of triggers could include installation of additional speed bumps in areas of high mortality, reduced speed limits in problematic areas, greater monitor presence, and enforcement actions against drivers who violate speed limits or escort requirements.



I:\PROJECTS\A\AEG\AEG-03_DPV2\Map\BIO\Misc\MFTL_Locations_2013_0715.mxd AEG-09 07/15/13 -JP

Mojave Fringe-toed Lizard Sightings

DEVERS-PALO VERDE 2 TRANSMISSION LINE

HELIX
Environmental Planning

N 0 1,500 Feet

Response to Letter 13

Response 13-1

The commenter states that large-scale renewable energy facilities in California are having direct and indirect impacts on migratory birds. The commenter goes on to discuss how they are seriously concerned that birds of multiple species may perceive some solar facilities as large bodies of standing water or reflected airspace through which to fly.

As outlined in Final EIR/EA, Chapter 4, Section 4.2.4 Biological Resources, the phenomenon of avian collisions with solar panels has been documented at some commercial solar facilities; however, the cause and effects are not well understood. The proposed Project lacks components, such as open evaporation and holding ponds, which appear to have attracted water birds at studied sites in Riverside County. While water bird collision with solar panels is not ruled out, the proposed Project incorporates measures and BMPs to minimize such effects. Accordingly, the facts presented in the EIR/EA, including the opinion of qualified experts who prepared the EIR/EA, supports the conclusion that the impacts to avian species, including waterfowl, due to collisions with solar panels are less than significant with the mitigation measures included.

The commenter goes on to state that per the MBTA and related regulations, the USFWS has no framework to accept compensation to help mitigate a project's impact on migratory bird populations and habitats. The USFWS has recommended compensation under adaptive mitigation be directed to the Sonoran Joint Venture or the Migratory Bird Conservation Fund or the National Fish and Wildlife Foundation. The BBCS Adaptive Management Program within Appendix C4 of the Final EIR/EA has been updated to include funding for fatality impacts to migratory species and groups that suffer higher mortality as a result of the project.

The commenter also recommends that indirect habitat loss for migratory birds is significant and the Final EIR/EA must provide mitigation lands for indirect loss of migratory habitat. Loss of habitat does not represent regulatory "take" under the MBTA. The Project declines to incorporate the suggested mitigation that would contribute funding or other non-specific habitat enhancements for migratory bird habitat loss.

Response 13-2

The commenter states that the Draft EIR/EA incorrectly identifies the potential for Yuma clapper rail occurrence within the solar array project boundary and gen-tie line alternatives as none. The commenter goes on to state that resident and migratory populations could be impacted by the proposed Project when making movements from the Salton Sea to the Colorado River.

The Biological Resources section within Chapter 4 has been updated to include more information regarding direct, indirect, cumulative and appropriate mitigation measures as needed for the Yuma clapper rail. Please refer to page 53 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 13-3

The commenter states that the Draft EIR/EA should have surveyed nearby water features to evaluate the number and types of avian species that could be attracted to the proposed Project.

Surveys were performed to evaluate biological resources and determine the potential for occurrence of common and special-status species, their habitats, and special aquatic resource areas. Where pedestrian access to several nearby water features was not possible as a result of private property, topographic relief, or other physical barriers, observations were made from nearest appropriate vantage points with binoculars and assisted by aerial photographic interpretation so as to allow for visual coverage. The Project would result in the elimination of six irrigation ponds. Approximately 1.5 miles north of the Project area is an irrigation pond that will remain intact. Approximately 0.25 mile east and 0.3 mile south of the Project area are irrigation canals. Avian species may utilize the existing sewage pond adjacent to the project and other ponds around the project area; however habituation of avian species to this existing disturbed area has reduced potential new impacts to the species with the implementation of the project. The BBCS has been developed with consideration and guidance from the field data, including water features, and suggestions presented in the *USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities* and the Avian Power Line Interaction Committee's *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. As part of the adaptive management process outlined in Appendix C4 of the Final EIR/EA, BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk. As progress is made through the program or challenges are encountered, the BBCS may be reviewed, modified, and updated. Appendix C4 will be updated to include additional avian recommendations provided by USFWS. The changes to Appendix C4 do not affect the overall conclusions of the environmental analysis relative to the significance of impacts.

Response 13-4

The commenter states that information on avian species pertaining to the Blythe Amendment should be used as a basis for evaluating the impacts to avian species and guidance from Pat Flanagan's article should be considered in the Draft EIR/EA.

The impacts estimates presented to the CEC for the Blythe Amendment appear to be based on equations with very large assumptions that have yet to be fully tested. Analysis for this project was conducted based on guidance from USFWS and other agencies. The information in Pat Flanagan's article may be utilized to adjust the BBCS as it is a living document that will adapt throughout the life of the Project. The BBCS has been developed with consideration and guidance from the data and suggestions presented in the *USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities* and the Avian Power Line Interaction Committee's *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines*, and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*.

Response 13-5

The commenter states that the willow flycatcher was overlooked in the Draft EIR/EA.

No suitable habitat for any subspecies of willow flycatcher, including the southwestern subspecies, occurs on or immediately adjacent to the proposed Project site. Any potentially suitable habitat for this species occurs more than eight miles from the proposed Project, along the Colorado River. The recent recordation reported by the commenter was in an area along the Colorado River and at River Estates and Mayflower County Park.

Response 13-6

The commenter states that the Draft EIR/EA fails to indicate the status of burrowing owls in the gen-tie area.

The Burrowing Owl Monitoring and Mitigation Plan as set forth in Mitigation Measure Biology-4 and Burrowing Owl Protection on page 4-143 of the Final EIR/EA outline that additional protocol surveys will be required prior to construction.

Biology-4 **Burrowing Owl Protection:**
A Burrowing Owl Monitoring and Mitigation Plan (Plan) has been developed to describe monitoring, reporting, and management of the burrowing owl during the construction, O&M, and decommissioning of the proposed Project, as required by the BLM, CDFW, and County of Riverside. It has been prepared following the 2012 CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012b), and describes a multi-tiered approach to prevent or reduce impacts during construction and operation of the Project. Below is a general summary of the Plan requirements:

- Pre-construction Surveys will be conducted throughout the Project area and laydown areas for burrowing owls, possible burrows, and sign of owls (e.g., pellets, feathers, white wash) 30 days prior to construction;
- Should any of the pre-construction surveys yield positive results for the presence of burrowing owl or active burrows within the Project area, the approved Biologist will coordinate with the Construction Contractor to implement avoidance and set-back distances;
- If suitable burrows are observed and documented during the pre-construction surveys within the Project footprint and determined to be inactive, these burrows will be excavated and filled in under the supervision of the approved Biologist(s) prior to clearing and grading;
- To compensate for impacts to the burrowing owls in activity areas on the northern part of the Project, 146 acres of habitat have been identified adjacent to the Project area. A letter agreeing to dedicate the existing compensation lands must be approved by CDFW and the County prior to ground disturbance. Land used for compensation must be of equal value or better than the land impacted. Ownership of compensation lands will be transferred prior to any surface disturbance to one of the following: the BLM; or an entity acceptable to the BLM or CDFW that can effectively manage listed species and their habitats.
- The Plan provides detailed methods and guidance for passive relocation of burrowing owls occurring within the Project disturbance area; and
- The Plan describes monitoring and management of the passive relocation effort, including the created or enhanced burrow location and the Project area where burrowing owls were relocated from and provide a reporting plan. The Plan will include maintenance of artificial burrows, three to four times during the year for a total of three years, as necessary.

Consistent with CDFW guidance, the Plan provides detailed methods and guidance for preconstruction surveys to help determine the number of burrowing owls onsite. The commenter goes on to state that Biology-4 is inadequate as it identifies 146 acres of habitat, but fails to identify that it is for acquisition. The additional proposed compensation lands are currently owned by the Project proponent, Biology-4 has been updated for clarity. Please refer to page 54 of the Errata in Response to Comments in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 13-7

The commenter states that there is no scientific evidence that passively relocating owls is a successful strategy for long-term survival of burrowing owl. The commenter also states relocation sites should be monitored to determine the effectiveness of that action.

See Response 12-58 regarding passive relocation, monitoring and the quality of the mitigation lands.

Response 13-8

The commenter states that a Mojave Fringe-toed Lizard Protection Plan should be required and that the 3:1 mitigation for impacts is less than what has been required on two other solar projects of which the commenter is aware of. This non-listed special-status species is known to occur along the gen-tie line corridors of the BMSP.

BLM developed mitigation ratios for the projects mentioned by the commenter to address the specific circumstances of those specific projects. The proposed Project and action alternatives present different circumstances requiring different responses.

The example provided by the commenter is the Desert Sunlight project. That project is located approximately 40 miles west of the proposed Project site, and further away from existing disturbed and developed lands than the Project. Also, the EIS for the Design Sunlight project did not impose a 5:1 mitigation ration for Mojave fringe-toed lizard impacts. The Desert Sunlight EIS required a 5:1 ratio for impacts to the Chuckwalla Desert Wildlife Management Area and Chuckwalla Critical Habitat Units per the NECO Plan requirements. It did not specify that the 5:1 ratio should be used for the Mojave Fringe-toed Lizard, and it does not discuss any occupation of habitat for which the 5:1 ratio is required (BLM 2010) and refer to Appendix H Habitat Conservation Plan of the (BLM 2011).

The mitigation for the proposed Project was developed to address the circumstances existing at the Project site. Biology Mitigation Measure 8, in Chapter 4, p. 4-145, states:

Biology-8 To mitigate for permanent habitat loss and direct impacts to Mojave fringe-toed lizards the Applicant shall provide compensatory mitigation at a 3:1 ratio, which may include compensation lands purchased in fee or in easement in whole or in part, for impacts to stabilized or partially stabilized desert dune habitat (i.e., dune, sand ramp, or fine-sandy wash habitat). The Mojave fringe-toed lizard occurs within Alternatives 1, 3 and 5 gen-tie corridors and has a high potential to occur within Alternative 4 gen-tie corridor. If compensation lands are acquired, the Applicant shall provide funding for the acquisition in fee title or in easement, initial habitat improvements and long-term maintenance and management of the compensation lands.

The 3:1 mitigation ratio for the proposed Project and action alternatives was developed by BLM for this particular project and project site. The ratio is based on the assessed biological value of the habitat that would be impacted by this Project, and existing activity in the habitat area, specifically use of the gen-tie corridor.

Measure Biology-8 was developed as only one piece of the mitigation for impacts to the lizard. In addition, Mitigation Measures Biology-1 (Monitor Construction Site for Biological Compliance) will protect the species during construction activities and Mitigation Measure Biology-7 (Development of a BBCS) will eliminate and avoid creation of perching sites for potential predators of the lizard.

Biology-1 The Project inspector shall monitor the work area bi-weekly during ground disturbing construction activities. The Project inspector shall conduct monitoring for any area subject to disturbance from construction activities that may impact biological resources. The Project inspector’s duties include minimizing impacts to special-status species, native vegetation, wildlife habitat, and unique resources. Where appropriate, the inspector will flag the boundaries of biologically sensitive areas and monitor any construction activities in these areas to ensure that ground disturbance activities and impacts occur within designated limits. The Project inspector will also be responsible for ensuring the BMPs shall be employed to prevent loss of habitat caused by Project-related impacts (e.g., grading or clearing for new roads) within the gen-tie line corridor. The resume of the proposed Project inspector will be provided to the BLM (as appropriate) for concurrence prior to onset of ground-disturbing activities. The Project inspector will have demonstrated expertise with the biological resources within the Project area.

Biology-7 If Project construction activities cannot occur completely outside the bird breeding season, then pre-construction surveys for active nests shall be conducted by a qualified biologist within 1,200 feet of the construction zone no more than seven days before the initiation of construction that would occur between February 1 and August 15. The qualified biologist will hold a current Memorandum of Understanding with the County of Riverside to conduct nesting bird surveys. If breeding birds with active nests are found, a biological monitor shall establish a species-specific buffer around the nests for ground-based construction activities, 250 feet or 1,200 feet for raptor nests. Extent of protection will be based on proposed management activities, human activities existing at the onset of nesting initiation, species, topography, vegetative cover, and other factors. When appropriate, a no-disturbance buffer around active nest sites will be required from nest-site selection to fledging. If for any reason a bird nest must be removed during the nesting season, written documentation providing concurrence from the USFWS and CDFW authorizing the nest relocation shall be obtained. All nest removals shall occur after the nest is demonstrated to be inactive by a qualified biologist and have been shown to not result in take as defined by the Migratory Bird Treaty Act (MBTA). A Bird and Bat Conservation Strategy (BBCS) will be developed for this Project and include additional protections for avian species. The BBCS would be based on specific recommendations from the USFWS and would provide:

- a statement of the Applicant’s understanding of the importance of bird and bat safety and management’s commitment to remain in compliance with relevant laws;
- documentation of conservation measures BMSP would implement through design and operations to avoid and reduce bird and bat fatalities at both solar generation facilities as well as the associated gen-tie line, including consideration of bird height and wingspan requirements and use of flight diverters, perch and nest discouraging material, etc.;
- consistent, practical and up-to-date direction to BMSP staff on how to avoid, reduce, and monitor bird and bat fatalities;
- establishment of accepted processes to monitor and mitigate bird and bat fatalities;
- establishment of accepted fatality thresholds that, if surpassed, would trigger adaptive changes to management and mitigation management;
- an adaptive management framework to be applied, if thresholds are surpassed; and

- A three year post-construction monitoring study.

The BBCS would be considered a "living document" that articulates the Applicant's commitment to develop and implement a program to increase avian and bat safety and reduce risk. As progress is made through the program or challenges are encountered, the BBCS may be reviewed, modified, and updated. The initial goals of this BBCS are to:

- provide a framework to facilitate compliance with federal law protecting avian species and a means to document compliance for regulators and the interested public;
- allow the Agent to manage risk to protected bird and bat species in an organized and cost-effective manner;
- establish a mechanism for communication between BMSP managers and natural resource regulators (primarily USFWS);
- foster a sense of stewardship with BMSP owners, managers, and field engineers; and
- articulate and cultivate a culture of wildlife awareness (specifically birds and bats) and the importance of their protection..

This combination of measures is deemed by the biological experts preparing this EIR and those at BLM to be adequate to reduce impacts to less than significant levels, rendering additional protections unnecessary.

Response 13-9

The commenter states that fencing and on-going operation and maintenance activities were not analyzed and that avoidance and minimization measures were not addressed.

The Biological Resources Section 4.2.4 of the Final EIR/EA has been updated to include a discussion of fencing, operation and maintenance activities effects on Mojave fringe-toed lizards. Please refer to pages 55 through 57 the Errata in Response to Comments in section of this Final EIR/EA document which reflects these changes to the text.

Response 13-10

The commenter states that the Draft EIR/EA failed to evaluate impacts of the proposed Project on Mojave fringe-toed lizards outside the Project site from edge effects as well as predation due to introduction of perching opportunities.

As outlined in the *Avian and Bat Protection Plan* Appendix C4 of the Final EIR/EA, the gen-tie line shall be designed to discourage their use by raptors for perching (e.g., by use of anti-perching devices). This design would minimize avian risk and would provide the added benefit of not increasing the potential for increased predation of special-statue species such as the Mojave fringe-toed lizard by not creating structures that enhance perching or nesting opportunities for ravens and other avian predators. The Biological Resources Section 4.2.4 of the Final EIR/EA has been updated to include a discussion of edge effects on Mojave fringe-toed lizards. Please refer to pages 57 and 58 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 13-11

The commenter states that the Draft EIR/EA fails to adequately discuss the desert kit fox in context of site fidelity and the challenges of passive relocation.

In response to the question relative to site fidelity, the Project has been unable to locate any peer-reviewed studies researching site fidelity in desert kit fox. Further confirming this is a 2006 article from the U.S. Forest Service stating "no specific information is available regarding site fidelity" in kit foxes (Meaney, et. al., 2006). As no potential kit fox burrows were located within the solar field area, there are no sites for the foxes to show fidelity to. Only one kit fox burrow was located along the Southern Alternative Gen-tie Line and one potential coyote or kit fox burrows was located along the Proposed Gen-tie Line. Mitigation Measure Biology-6 is designed to detect the species should foxes move into the Project area prior to construction.

Response 13-12

The commenter states that the Draft EIR/EA failed to estimate the number of desert kit fox or badgers and to analyze the impacts to them from the proposed Project. The commenter goes on to state that an American Badger and Desert Kit Fox Mitigation and Monitoring Plan would provide additional safeguards.

Based on the findings of the biological surveys, it is estimated that there is less than one individual kit fox within the Project area. The surveys revealed no signs located within the solar array footprint, one kit fox burrow was located along the Southern Alternative Gen-tie Line, and one potential coyote or kit fox burrow location was found along the Proposed Gen-tie Line. No confirmed kit fox burrows were located within one mile of the proposed solar arrays. Comparison to the McCoy Solar Energy Project is not appropriate given the large number of natal burrows and foxes occupying that project site, and given the negligible number of foxes associated with the Blythe Mesa Solar Project. The potential impacts to Kit Fox are discussed on page 4-103 of the Final EIR, and Mitigation Measures Biology-1 and Biology-6 are imposed to reduce impacts to less than significant. Please refer to Response 13-11 for a discussion on the American Badger and Desert Kit Fox Mitigation and Monitoring Plan.

Response 13-13

The commenter states that the State veterinarians' concerns as stated during a CEC proceeding should be considered.

These concerns tend to focus on the issue of distemper. The Project will reduce potential introduction of distemper by restricting pets onsite, coordination with CDFW if the species is encountered and documentation of kit fox mortality and collection if necropsy is justified. Distemper is addressed as part of Mitigation Measure Biology-6 as outlined below:

Biology-6 In areas identified as suitable habitat during the 2011 and 2012 surveys, biological monitors shall conduct pre-construction surveys for kit fox no more than 30 days prior to initiation of construction activities. Surveys shall also consider the potential presence of dens within 100 feet of the Project boundary (including utility corridors and access roads) and shall be performed for each phase of construction. If dens are detected each den shall then be further classified as inactive, potentially active, or definitely active. Inactive dens that would be directly impacted by construction activities shall be excavated by hand and backfilled to prevent reuse by kit fox. Potential dens that would be directly impacted by construction activities shall be monitored by the Biological Monitor for three consecutive nights using a tracking medium such as diatomaceous medium or fire clay and/or infrared camera stations at the entrance. If no tracks are observed in the tracking medium or no photos of the target species are captured after three nights, the den shall be excavated and backfilled by hand. If tracks are observed, the kit fox dens shall be fitted with the one-way trap doors to encourage kit fox to move off-site. After 48 hours post-installation, the den shall be excavated and collapsed, following the same protocol as with western burrowing owl burrows. These dens shall be collapsed prior to construction of the desert tortoise fence, to allow kit fox the opportunity to move off-site without impediment. If an active natal den is detected on the site, the CDFW shall be contacted within 24 hours. The course of action would depend on the age of the pups, location of the den site, status of the perimeter site fence, and the pending construction activities proposed near the den. A 500-foot no disturbance buffer shall be maintained around all active dens. Habitat-based mitigation or other appropriate mitigation as discussed previously for desert tortoise and western burrowing owl shall provide mitigation for impacts to non-listed special-status species that inhabit overlapping suitable habitat. The following measures are required to reduce the likelihood of distemper transmission:

- No pets shall be allowed on the site prior to or during construction;
- Any kit fox hazing activities that include the use of animal repellents such as coyote urine must be cleared through the CDFW prior to use; and
- Any documented kit fox mortality shall be reported to the CDFW and the BLM within 24 hours of identification. If a dead kit fox is observed, it shall be retained and protected from scavengers until the CDFW determines if the collection of necropsy samples is justified.

Letter 14: Colorado River Indian Tribes

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COLORADO RIVER INDIAN TRIBES

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Re: Comments of the Colorado River Indian Tribes on the Draft Environmental Impact Report and Draft Environmental Assessment for the Blythe Mesa Solar Power Project (CACA 053213)

Dear Messrs. McMenimen and Ross:

The Colorado River Indian Tribes ("CRIT" or "the Tribes") submit these comments on the County of Riverside and the Bureau of Land Management's Draft Environmental Impact Report and Draft Environmental Assessment ("DEIR/DEA") for the proposed Blythe Mesa Solar Project ("Project"). CRIT is a federally recognized Indian tribe whose members include Mohave, Chemehuevi, Navajo, and Hopi people. Renewable Resources Group, the Project Applicant, proposes to construct a solar photovoltaic electrical generating facility and 8.4-mile generation interconnection (gen-tie) line on 3,660 acres within the Tribes' ancestral homeland. The Project site is approximately 8 miles from the Colorado River Indian Reservation and located in the area of the traditional lands of the Mohave people. The ancestors of CRIT's members have lived, traveled, and conducted spiritual and religious practices in the Project area since time immemorial. CRIT members continue to use the areas surrounding the Project site to this day.

Because of the Tribes' past, present, and future connection to the land on which the Project is proposed, CRIT is gravely concerned about the Project's potential for significant impacts on its members' culture and way of life. CRIT members tell stories and sing songs related directly to the area where the Project is proposed, and they consider the plants, animals, and traditional gathering places that the Project would affect to be sacred. The petroglyphs, traditional song trails, and other archaeological sites that surround the area tell of their ancestors' existence. The destruction of these landscapes risks the desecration of sacred places and the severance of the Tribes' connection to their past. The unearthing of a likely cremation site and numerous buried cultural resources in and around the nearby Genesis Solar Energy Project underscores the need for caution in this sensitive environment.

The Blythe Mesa Solar Project is one of dozens of renewable energy projects that have been approved or are being considered in the area. The collective impact of this transformation of the desert cultural landscape has and will continue to have considerable adverse impacts on the Tribes and the cultural, spiritual, and religious practices of its members. CRIT is concerned that local governments, the State of California, and the federal government intend to approve all proposed renewable energy projects in this region—no matter what the cost to affected tribes, native plants and animals, and the unique ecosystem as a whole. The destructiveness of this strategy to cultural resources and the affected tribes is apparent from the experience at projects such as Genesis, Ocotillo, and Ivanpah, where cultural resources sacred to the Tribes were disturbed, harmed, and/or removed, even after tribes and members of the public brought their concerns to BLM's attention. 14-1

For these reasons, CRIT urges the County of Riverside and BLM not to approve the proposed Blythe Mesa Project. At the very least, the approving agencies must conduct a thorough review of the Project's impacts on cultural and other environmental resources and the affected tribes that satisfies the California Environmental Quality Act, Pub. Res. Code § 21000 et seq. ("CEQA"), and the National Environmental Policy Act, 42 U.S.C. 4321 et seq. ("NEPA"). The DEIR/DEA is woefully inadequate, particularly regarding its treatment of cultural resources. While this letter focuses on these specific deficiencies, a lack of comments on other sections of the DEIR/DEA does not indicate CRIT's approval of those sections or of the Project, and CRIT reserves the right to raise additional concerns later in the review process.

I. The DEIR/DEA's Discussion and Analysis of the Project's Impacts to Cultural Resources Is Inadequate.

As a preliminary matter, CRIT objects to the unsupported statement that "the Project is not considered to encompass specific areas of traditional cultural importance to Indian tribes." DEIR/DEA at 4-144. As the document acknowledges, the Project area is within tribal traditional ancestral homelands. *Id.* The Project site is also within the Prehistoric Trails Network Cultural Landscape area. *Id.* at 3-78. These lands have been used and occupied by tribal ancestors for thousands of years, and different areas have held significance in a variety of ways over time. Statements like the one above downplay the tribe's spiritual and cultural connection to the land as a whole and undercut the validity of the entire analysis. 14-2

Moreover, the DEIR/DEA also incorrectly asserts that "[n]o historic trails are documented within the proposed Project solar facility site or alternative gen-tie line ROWs." DEIR/DEA at 3-78. A map produced by the California Energy Commission staff as part of the siting proceedings for the Palen project shows numerous prehistoric trails in the area. Exhibit 1, 14-3

California Energy Commission, "Palen Solar Electric Generating System – Trails of the Chuckwalla Valley Portion of the PRGTL"; *see also* Exhibit 2, 1957 University of California Archaeological Survey Map (showing recorded trail running North/South through the Project site). Additionally, the traditional Salt Song Trails, sacred to CRIT's Chemehuevi members, connected to the Colorado River from the Salton Sea south of Blythe, and fanned out over the Palo Verde mesa. *See* Exhibit 3, Philip M. Klasky, "The Salt Song Trail Map: the sacred landscape of the Nuwuvi people" (2009). These incorrect baseline assertions about the cultural resources present on the Project site must be corrected in a revised DEIR/DEA that adequately portrays the likely impacts of the proposed construction. 14-3

A. The DEIR/DEA Should Include Other Methods—In Addition to the Archaeological Field Survey—to Determine the Existence and Location of Buried Cultural Resources.

In addition to fundamental misconceptions about the baseline state of the proposed Project site, the DEIR/DEA's analysis of cultural resources errs in other ways. First, the DEIR/DEA indicates that the field survey of the Project area included two BLM Class III archaeological and historic built environment surveys, which looked only at the presence of cultural resources on the *surface* of the Project site. DEIR/DEA at 4-142. While the DEIR/DEA acknowledges that "archaeological resources could be located subsurface and could be unearthed during construction," the DEIR/DEA concludes that mitigation measures would reduce any future discovery to less than significant levels. *Id.* at 4-149. However, CRIT's experience with the nearby Genesis project site shows that a high concentration of *buried* cultural artifacts can be found in areas with few surface finds, and that such discoveries are inherently painful for affected tribes and very difficult to appropriately mitigate. To provide necessary information about the likelihood of encountering buried cultural resources, a revised DEIR/DEA should incorporate data generated from the following activities: (1) an Ethnographic Assessment specific to the Project area; (2) consultation with tribal elders regarding the location of buried cultural resources; and (3) geomorphic studies to determine with greater accuracy the likelihood of buried cultural resources in the Project area. 14-4

Moreover, the DEIR/DEA must be more clear about the prior surface disturbance that has occurred at the Project site. The cultural resource analysis suggests that "most of the Project area has been previously disturbed by agricultural operations." DEIR/DEA at 4-144. However, no information is shared with the public about the extent of agricultural operations or the depth of disturbance. Without that data, it is impossible to assess whether it is likely that these operations have significantly "affected cultural resources on or near the ground surface," as asserted by the DEIR/DEA. *Id.* 14-5

B. The DEIR/DEA Omits Discussion of Impacts to Several Known Sites Containing Cultural Resources and Does Not Evaluate Them for Uniqueness.

The DEIR/DEA lists thirty-four known cultural resources within the APE, based on the POWER 2013a, 2013b survey report, in table format on pages 4-145 to 4-146. It discusses the specific impacts and effects associated with only nine of these known cultural resources. *Id.* at 14-6

4-146 to 148. The document provides no explanation or justification for failing to discuss impacts for the remaining twenty-five known cultural resources; it simply classifies them as "isolated finds" and dismisses them wholesale as ineligible for NRHP or CRHR listing. These include eight prehistoric resources, including ceramic sherds, a hammerstone, and other cultural artifacts. The DEIR/DEA should be revised to include a more detailed description of impacts to so-called "isolated" cultural resources, including those listed as Primary Numbers P-33-020013 to -17 (inclusive), P-33-019770, and P-33-021136. Moreover, archaeological resources that do not qualify as historical resources are nonetheless subject to special mitigation requirements (including in situ preservation) if they qualify as "unique archaeological resources" under the criteria provided in Pub. Res. Code § 21083.2(g). Neither the DEIR/DEA nor the POWER 2013a, 2013b survey report contains findings with respect to the uniqueness of the archaeological resources on the site. Instead, both documents conclude generally, and without applying the statutory criteria or supplying analysis, that none of the identified sites qualify as unique archaeological resources. This conclusion is without evidentiary support. The prehistoric cultural resources identified on the project site should be individually evaluated to determine whether they qualify as "unique archaeological resources" and the County and BLM's conclusions should be supported by substantial evidence in the record. 14-6

The DEIR/DEA also improperly dismisses the importance of site P-33-020001, a prehistoric Ceramic Scatter. DEIR/DEA at 4.148. The document asserts that "because of the limited number and range of artifacts and the level of agricultural disturbance," the site is automatically ineligible under the NRHP or the CRHR. However, as part of the analysis of eligibility, BLM and the County should first reach out to affected Tribes to gather additional information about the cultural importance of these artifacts. A determination of eligibility cannot be made until such consultation has occurred. 14-7

II. The DEIR/DEA's Discussion of Environmental Justice Impacts Should Include Meaningful Analysis of the Project's Disproportionate Impacts On the Tribes.

Given the significant environmental impacts created by the Project on resources and land that are uniquely important to the Tribes, and on which they have depended for centuries, the environmental justice analysis should be revised to acknowledge the significant and disproportionate effect of the Project's impacts on the Tribes. Under federal law, an environmental review document's environmental justice review should address the "disproportionately high and adverse [] environmental effects of [] programs, policies, and activities on minority populations and low-income populations." Federal Executive Order 12898, "Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations" (Feb. 11, 1994). As BLM has acknowledged, "[t]he spirit of this [environmental justice] policy—and not a mechanical threshold—should guide any analysis of disproportional impact." Bureau of Land Management, Final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwest States ("Solar PEIS"), 14-8

Response to Comments at 181.[1] The cost of cultural resource destruction from solar projects in the Mohave Desert is borne exclusively by the people who are indigenous to the area, including CRIT's members. This imbalanced allocation of costs and benefits disproportionately disadvantages the Tribe, a minority population who will receive little or no benefit from the project, and satisfies any recognized definition of environmental injustice. Nonetheless, the DEIR/DEA's environmental justice analysis is cursory, at best, and fails in two key ways.

First, it does not even mention the disproportionate effect of the Project's impacts to cultural resources on CRIT or other tribes. Instead it determines only that "the primary environmental justice issues typically would be potential air or water issues that could adversely affect the health of nearby populations." DEIR/DEA at 4-306. There is no evidentiary support or policy reason for limiting consideration of environmental justice issues strictly to air and water impacts, especially where, as here, the air and water impacts will be relatively small and the hardship from cultural resource impacts will be borne almost exclusively by tribal members. Second, the DEIR/DEA's environmental justice analysis is too geographically limited because it does not include the population on the nearby Colorado River Indian Reservation. The DEIR/DEA considers effects only on populations within a 6-mile radius from the Project site, apparently relying on the CEQ's 1997 Guidelines on Environmental Justice in support of its use of the 6-mile radius. *Id.* at 3-164. On that basis, it concludes that the Project could potentially affect minority populations in census tracts 461.02 and 462, as the proportion of minority residents in those tracts exceeds 50 percent, and estimates that those tracts are communities of concern for environmental justice effects. *Id.* at 4-306. It therefore paints an inaccurate picture of the population that will bear the burden from the project's impacts to cultural resources. 14-8

With respect to cumulative impacts, the document in one sentence summarily concludes that the project would have no environmental justice impacts. DEIR/DEA at 4-323. While it might be appropriate to focus certain environmental justice analyses on the effect on populations of impacts to air and water for other projects, the use of a 6-mile radius to determine the environmental justice effects of the Blythe Mesa Project is not supported by evidence in this case. The CEQ Guidelines do not mandate adherence to such a geographically constrained methodology for determining which populations will be considered in the environmental justice analysis. The DEIR/DEA should be revised to include analysis of the environmental justice effects on populations within the Colorado River Indian Reservation. At the very least, the DEIR/DEA must acknowledge that the adverse impacts to cultural resources from the proposed Project will fall squarely on the shoulders of CRIT and other tribal members in the region. 14-9

III. The DEIR/DEA's Analysis of Cumulative Impacts Must Be Revised.

Harms to cultural resources must be considered in the larger context of large scale industrial solar power development in the ancestral homelands of CRIT. Though the DEIR/DEA 14-10

[1] *Available at* http://solareis.anl.gov/documents/fpeis/index.cfm.

purports to consider impacts in conjunction with other solar projects taking place in the region, the cumulative impacts analysis for the proposed Project does not address these cumulative impacts in any detail. Under "geographic scope" the discussion merely refers to a table of other projects in the region (Table 4.1-1 "Cumulative Projects List"), and concludes that each of those projects would result in ground disturbance which could potentially affect cultural resources. DEIR/DEA at 4-160. The BLM's Solar PEIS provides a jumping-off point for a detailed and thorough analysis of cumulative impacts. For example, the Draft Solar PEIS's discussion of cumulative impacts to cultural resources in the SEZ acknowledges the spiritual importance of seasonal resources, connecting trails, surrounding mountains and natural formations. Draft Solar PEIS at 9.4-402. *See also id.* at 9.4-403 (specifically acknowledging Native American concerns, such as impacts to the Salt Song Trail, and the importance of evaluating impacts on "landscapes as a whole" within traditional tribal use areas). But the DEIR/DEA did not make use of the information available in the Solar PEIS, or even mention the document in its cumulative impacts analysis for cultural resources. 14-10

Moreover, under "temporal scope," the DEIR/DEA's considers the possibility that undiscovered cultural resources will be disturbed in the future. It concludes that "impacts [to cultural resources] could occur during any ground-disturbing activities during operation and maintenance and decommissioning." DEIR/DEA at 4-160. However, the likely disturbance of undiscovered cultural resources is a direct impact, not a cumulative impact. This is simply a rehashing of the *actual* impacts of the project, and not a substitute for a true cumulative impacts analysis. The cultural resources in the this region of the American Southwest are finite and irreplaceable. While this Project would occupy a total of 3,660 acres, when its impacts are combined with those of the many other projects in the region it is clear that the depletion and degradation of these resources is significant and severe. The DEIR/DEA should be revised to provide a thorough discussion of the impacts to cultural resources in the region as a whole, and of how the proposed Project's impacts will be felt by CRIT's members in this context. Additionally, the DEIR/DEA should clarify that future impacts to cultural resources within the Project site, whether known or unknown, are not themselves cumulative impacts, but are direct impacts of the Project. 14-11

Finally, Table 4.1-1 erroneously omits the EnviroMission Limited Solar Updraft Tower, proposed on private land located directly north of the Quartzsite Solar Energy Project (AZA 34666). This enormous project will have significant cultural resource impacts and must be included in a revised analysis. 14-12

IV. The DEIR/DEA's Baseline and No Project Alternative Are Flawed and as a Result, It Improperly Downplays the Project's Impacts.

The DEIR/DEA uses a CEQA baseline and NEPA "no project alternative" that is speculative and inflates the impacts expected in the absence of the Project, which in turn causes the actual impacts under the proposed Project to appear negligible. The DEIR/DEA claims that "in the absence of this Project, other renewable energy projects may be constructed to meet State mandates at other locations, and those projects would likely have similar impacts 14-13 as the proposed Project in those locations." DEIR/DEA at 4-150. This statement is entirely speculative, and the document provides no evidence in the record to suggest that if this approval were denied, other similar projects with similar or identical impacts would be approved. Even if it were to provide such evidence, CEQA requires that a project's impacts be compared against a baseline of environmental conditions as they exist *at the time of environmental review*, and not against hypothetical future conditions. CEQA Guidelines § 15125; *Neighbors for Smart Rail v. Exposition Metro Line Const. Authority*, 57 Cal. 4th 439, 447-48 (2013). The DEIR/DEA's approach creates a false sense of inevitability regarding the Project's impacts, which is antithetical to CEQA's and NEPA's goal of ensuring thoughtful and public consideration of whether a project's environmental costs outweigh its benefits. The effect of other proposed and possible future projects in the Riverside East Solar Energy Zone is relevant to a discussion of the Project's cumulative impacts to cultural resources and the tribes region-wide. But by using an improper baseline and no project alternative against which to compare the proposed Project's impacts, the DEIR/DEA understates these impacts. This misleadingly inflates the impacts expected under the "existing" environmental conditions and therefore causes the project's actual impacts to appear minimal by comparison. The DEIR/DEA's environmental baseline analysis must be revised to correct this deficiency. Only then can the document provide the public with useful information regarding the extent of the proposed Project's actual impacts, and allow it to compare the environmental and cultural costs of project approval against project denial. 14-13

The DEIR/DEA also claims that under the no project alternative, continued agricultural operations could result in disturbance to historic or archaeological resources. DEIR/DEA at 4-150. After explaining that the solar array facilities and gen-tie lines would not be constructed, the analysis simply concludes, "Current, ongoing operation and maintenance activities associated with the agricultural use of the Project site would continue." DEIR/DEA at 2-33. Although the DEIR/DEA states that much of the project area has been used for agricultural operations, site visits and aerial maps indicate much of the proposed project site is not currently in active agricultural use. There is no substantial evidence that such operations are certain to resume, continue, or intensify in these areas in ways that will further disturb archaeological resources. Furthermore, there is no evidence to suggest that even if agricultural operations took place on the project site in the future, they would result in the same type or amount of disturbances as the Project construction. CRIT requests that the no project alternative be revised to include a more reasoned and thorough description of the likely extent of continued agricultural operations on the project site and their likely impacts to cultural resources.

V. The DEIR/DEA's Proposed Mitigation Is Inadequate.

CRIT believes that no mitigation measures can ever adequately address the loss of cultural resources caused by utility-scale solar energy projects in the Mohave Desert. Nonetheless, CRIT would welcome an opportunity to discuss with the approving agencies and Project Applicants potential measures that address the unique impacts of the loss of cultural and ethnographic resources on its members. The mitigation measures currently proposed in the DEIR/DEA fail to meet the requirements of NEPA and CEQA in the following ways.

A. The Proposed Mitigation Measures for Cultural Impacts Are Ineffective and Defer Real Mitigation Until a Later Date.

The DEIR/DEA postpones actual, specific mitigation by relying on the future development of a variety of plans at later, unspecified dates. Under CEQA, the formulation of mitigation measures may not be deferred until some future time. CEQA Guidelines § 15126.4. Similarly, the omission of a reasonably complete discussion of possible mitigation measures undermines the "action forcing" function of NEPA. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989). Deferring the formulation of mitigation measures also prevents public participation and inhibits the public's and decision-makers' understanding of the project's impacts after mitigation. *See id; San Joaquin Raptor Rescue Center v. County of Merced*, 149 Cal. App. 4th 645, 672 (2007). CRIT notes that without access to the contents of key documents relied on to mitigate impacts, it is prevented from being able to comment fully on the ability of these measures mitigate the Project's significant impacts and to assess whether the Agencies have adequately supported their conclusions about significance. 14-14

The DEIR/DEA refers alternately to three apparently separate plans that will be developed and implemented in the future: a "long term management plan" (DEIR/DEA at 4-148), a "long-term cultural resource management plan" (*id.* at 6-9) and a "robust construction monitoring plan" (*id.* at 6-9). It is unclear whether the first two of these three documents are the same, and whether these are synonymous with the Cultural Resources Management Plan ("CRMP") identified in mitigation measure Cultural-3. *Id.* at 4-166. The DEIR/DEA should be revised to resolve this ambiguity. At any rate, none of these plans has yet been developed or distributed for review. Cultural-3 provides only that the Applicant "shall have" the Project Archaeologist prepare and submit for approval a CRMP that maps all cultural resources within the APE and details the "methods, consultation procedures, and timelines for implementing Mitigation Measures Cultural-1 and Cultural-2." *Id.* at 4-166. However, there is no requirement that the CRMP be submitted before ground disturbing activities commence. The DEIR/DEA offers no justification for this deferral of the formulation of a CRMP. The CRMP should be drafted and published alongside a revised DEIR/DEA, so that interested parties may review it and comment on it. The same holds true for the "robust construction monitoring plan," which is referred to only once in the entire document. At the very minimum, the DEIR/DEA should provide a detailed description of this plan, including but not limited to: what the timeline and procedures are for the plan's development, implementation, and approval; the plan's contents; how it will be enforced; and how it proposes to mitigate impacts from construction. The plan itself should be published with a revised DEIR/DEA. 14-15

By declining to discuss the specific and concrete mitigation measures in these plans that will be used to minimize or avoid impacts to cultural resources on the Project site, the DEIR/DEA fails to identify in sufficient detail the ways in which impacts to cultural resources will actually be avoided or minimized, and fails as an informational document. These crucial documents should be developed, in consultation with affected Tribes, *before* the project is approved. The DEIR/DEA's approach of deferring the details of specific mitigation measures means that CRIT and other interested parties currently have no way of determining what the mitigation measures will actually be, or, therefore, what the full extent of impacts will eventually be. The Tribes cannot submit meaningful comments on the impacts to cultural resources without a fuller understanding of how Riverside County, BLM, and the Applicant propose to avoid or minimize these impacts. 14-15

The problems caused by deferring the development of mitigation and monitoring plans have been strikingly illustrated at the McCoy Solar Energy Project. Despite requests from CRIT to provide the plans earlier, draft versions were not released until after Project approval. CRIT provided detailed comments on these plans. When BLM finally responded—nearly six months later—it was clear to CRIT that none of the Tribes' suggestions, including basic corrections, had been included. When CRIT attempted to engage on this point, BLM staff continually delayed communication and ultimately issued the Notice to Proceed with project construction without resolving any outstanding issues. Mitigation and monitoring plans *must* be developed in advance—with adequate time for tribal input—so that CRIT, the County, and BLM are not forced to address outstanding issues after construction has already begun. 14-16

B. Avoidance, and Where Necessary, In Situ Reburial Should Be the Preferred Methods of Addressing Newly Discovered Cultural Resources.

According to the cultural beliefs of CRIT members, the disturbance of cultural resources, including the discovery of buried cultural material during construction, is a significant cultural harm. For CRIT's Mohave members, such disturbances are considered taboo, with the consequences described as physically painful for some individuals. As a result, CRIT supports mitigation measures that recognize a strong preference for avoidance of both known and unknown resources. This approach is required by the CEQA Guidelines, which state that "[p]reservation in place is the preferred manner of mitigating impacts to archaeological sites." CEQA Guidelines § 15126.4(b)(3)(A); *see also Madera Oversight Coalition, Inc. v. County of Madera*, 199 Cal. App. 4th 48, 87 (2011) ("feasible preservation in place *must be adopted* to mitigate impacts to historical resources of an archaeological nature unless the lead agency determines that another form of mitigation is available and provides superior mitigation of the impacts.") (emphasis added). The County general plan also supports avoiding cultural resources. Riverside County General Plan (Effective Date 3-11-14), Policy OS 19.4 (policies to "prioritize the protection of cultural resources preserved in place or left in an undisturbed state."). The mitigation measures in the DEIR/DEA do not take this approach, and unfortunately do not specifically address any requirement for avoidance. In fact, avoidance is mentioned only once in the DEIR/DEA's mitigation for impacts to cultural resources: Cultural-2 provides, in part, that "The County Archaeologist and the BLM together shall determine the appropriate mitigation (documentation, evaluation, recovery, avoidance, etc.) for cultural resources on private lands." DEIR/DEA at 4-166. This measure must be revised to make it clear that avoidance of harms to cultural resources is the preferred approach, as required by California law, and that other approaches may be taken only where avoidance is infeasible—as 14-17 determined in infeasibility findings supported by substantial evidence. The mitigation measures should also elaborate on what specific avoidance measures shall be used, and how they will be implemented. 14-17

Although CRIT supports mitigation measures that recognize a strong preference for avoidance of known and unknown cultural resources, it acknowledges that in certain limited circumstances, avoidance is not feasible. In these cases, CRIT strongly prefers that newly discovered cultural resources be reburied in close proximity to the discovery site. The Project's mitigation measures contain no enforceable requirement that in situ burial be used, or even prioritized as an option, in the event that cultural resources are disturbed. The measures should be revised to: (a) clarify that in situ reburial is the preferred method for addressing newly discovered cultural resources in the case that avoidance is infeasible; (b) include concrete methods, standards, and procedures for reburial of cultural resources; and (c) require meaningful input and participation by tribal entities with respect to the reburial process. 14-18

CRIT is particularly concerned that data recovery is listed as a possible mitigation approach where new sites are discovered. DEA/DEIR at 4-166. Data recovery is not an adequate or appropriate mitigation measure to address cultural harms, and in fact *causes* direct cultural harm. For CRIT's Mohave members, the removal of artifacts involves both a loss of access to such resources, and also the loss of a direct connection between their ancestors and the cultural landscape. The experience at the Genesis Solar Energy Project site has taught CRIT's members firsthand how harmful and disruptive data recovery operations are in practice. There, CRIT witnessed BLM interpret mitigation measures to permit the project applicant to disturb thousands of buried cultural items uncovered during construction, and to ship the resources to distant facilities for curation. CRIT seeks to avoid a similar outcome here. As such, the proposed mitigation should be revised to clarify that recovery is not an acceptable mitigation technique for newly discovered cultural resources. 14-19

C. The DEIR/DEA's Mitigation Measures Must Incorporate the Cultural Resource "Design Features" Established in the Programmatic EIS for Six Southwestern States.

BLM issued its Solar PEIS, which established the Riverside East Solar Energy Zone ("SEZ") in 2012. The Solar PEIS includes, among other things, a suite of "Design Features" that address the broad range of direct and indirect impacts that may result from utility-scale solar energy development. These design features serve as a baseline of minimum mitigation requirements for individual projects, and are required for all utility-scale solar energy projects on BLM-administered lands within the SEZ. Solar PEIS at A-5. Portions of the Blythe Mesa Project are within the SEZ, DEIR/DEA at ES-S, and the Project's mitigation measures must therefore incorporate the Design Features contained in the Solar PEIS, including but not limited to Design Features for Cultural Resources, Native American Concerns, Socioeconomic Impacts, and Environmental Justice Impacts. However, the DEIR/DEA's discussion of mitigation measures for impacts to cultural resources and other resources fails even to mention the existence of these design features, let alone ensure that they are incorporated into the Blythe Mesa Project's own 14-20 mitigation. As one example, Design Feature ("DF") CR1-1(b) provides that determining cultural resource impacts shall include "training/educational programs for solar company workers to reduce occurrences of disturbances, vandalism, and harm to nearby historic properties." Solar PEIS at A-65 to 66. Similarly, DF NA2-1 provides that "Prior to construction, the project developer shall provide training to contractor personnel whose activities or responsibilities could affect issues and areas of concern to federally recognized Indian tribes." Solar PEIS at A-71. Yet the proposed mitigation for the Project does not itself propose any such training; instead it imposes the general requirement that the Applicant submit a CRMP that "shall include documentation of the required cultural/historical sensitivity training for the construction staff." DEIR/DEA at 4-166 (Cultural-5). This mitigation measure should be revised to clarify the type and purpose of the training that is required, with specific reference to the Design Features that require such training. More generally, the DEI5/DEA should explain the relationship between the Solar PEIS and the DEIR/DEA. It must also be revised to include discussion and incorporation by reference of all of the Design Features contained in the Solar PEIS, including those for Cultural Resources, Native American Concerns, Socioeconomic Impacts, and Environmental Justice Impacts. 14-20

D. The Mitigation Measures Should Ensure the Effective Use of Tribal Observers.

CRIT appreciates that the DEIR/DEA attempts to include tribal participation in mitigation to impacts on cultural resources through the use of monitors ("Tribal Observers") designated by tribal representatives. Although these efforts are well-intentioned, the tribal participation provided for in the DEIR/DEA is meaningless since the mitigation measures do not actually require the use of Tribal Observers, do not specify their roles or detail the extent of their participation and oversight, and do not provide them with the authority to halt project construction in the event that cultural resources are discovered. These deficiencies should be remedied, so that the Project mitigation involves effective and meaningful tribal participation. First, Mitigation Measure Cultural-4 should be revised to *require* the use of a Tribal Observer, rather than simply encouraging the practice by stating the Project Applicant must "make a good faith effort" to retain one. CRIT has taken an active role in working with solar energy project proponents to minimize impacts, and has a keen interest in ensuring that the region's cultural resources are adequately protected and conserved. CRIT representatives have served as designated tribal monitors for other nearby solar energy projects. There is no reason to believe that the project proponents will be unable to secure a Tribal Observer for this Project. The measure's "good faith effort" provision serves only to provide the Applicant with a means to avoid the use of a Tribal Observer. Second, the proposed mitigation measures should clearly specify the role that the Tribal Observer will take in implementing project mitigation. As written, the proposed mitigation is entirely silent regarding the Tribal Observer's role in monitoring construction activities. At the very least, it should require that no ground disturbing activities may take place without a Tribal Observer present, and that the Tribal Observer may halt ground disturbing activities in the case that new cultural resource sites are discovered. 14-21

VI. The County and BLM Did Not Conduct Adequate Government-to-Government Consultation With the Tribes.

The DEIR/DEA does not evidence that there has been actual government-to-government consultation between the County, BLM, and the Tribes. The government-to-government consultation requirement is not satisfied by merely sending form letters to area Tribes or providing an informal status update via telephone to tribal staff on behalf of one Tribe. Moreover, it is erroneous for BLM to assume, (b)ased on the (perceived) limited response . . . there are no TCPS within the Project area eligible under Criterion A of the NRHP for their traditional and cultural significance." DEIR/DEA at 6-9. The information provided in this comment letter contradicts the validity of such an assumption. In addition, it is dangerous for BLM to continue to make such assumptions given its knowledge of the presence of cultural resources at projects such as Genesis, Ocotillo, and Ivanpah. 14-22

For the foregoing reasons, CRIT disagrees there is evidence of adequate government-to-government consultation with the Tribes.

VII. The Project's Proposal to Enter Into, Then Cancel, Williamson Act Contracts Violates the Williamson Act.

In describing the Project, the DEIR/DEA states that "Approximately 1,485 acres, all south of I-10 and representing the land not planned to be developed immediately, would be placed into an agricultural preserve and in a Williamson Act contract . . . . As each portion of the site is developed for solar use, any Williamson Act Contract for that portion of the site and the agricultural preserve would be cancelled." DEIR/DEA at ES-4. This is a violation of the terms of the Williamson Act, which is intended to promote farmland conservation and ensure that such land will not be developed or otherwise converted to another use. Under the Act, landowners and local governments may enter into agreements restricting private land to agricultural, open space, or other compatible uses for a period of at least ten years. *See* Gov. Code § 51244. In exchange, landowners receive a lower assessed value for their property taxes. Landowners who successfully apply to cancel such contracts before the termination must pay cancellation penalties determined by the land's fair market value. To approve a tentative contract cancellation, a county or city must make specific findings that are supported by substantial evidence. In 2011, the Governor signed SB 618, which reduces Williamson Act contract cancellation penalties where landowners enter into "solar-use easements" and meet certain other criteria. However, nothing in SB 618 permits landowners to enter into Williamson Act contracts with the stated intention of cancelling them. Williamson Act contracts' restrictions are legally enforceable, including the termination dates. A development strategy that acknowledges up front that a landowner will be entering into Williamson Act contracts with the intention of cancelling before the termination date amounts to anticipatory breach of contract and is a bad faith abuse of the Act's property tax incentives. 14-23

VIII. The DEIR/DEA Did Not Properly Consider the Risk to Avian Species or Air Traffic of an Increase in Avian Wildlife In and Near the Project Area.

The nearby Colorado River and the Salton Sea support large populations of avian wildlife, and the Project is located along a major route for Northbound migratory birds. The experiences at the Ivanpah, Genesis, and Desert Sunlight solar projects indicate that birds are attracted in large numbers to solar energy facilities, including photovoltaic facilities like the Blythe Mesa Project. *See* Exhibit 4, National Fish and Wildlife Forensics Laboratory, "Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis." Birds can be attracted to the facilities because they mistake the reflective panels for lakes or other aquatic habitat, and also because the panels can attract large numbers of insects that serve as prey for birds. The DEIR/DEA rotely dismisses this concern, citing to a 2011 study to conclude that there is "no scientific evidence of fatality risk to birds associated with PV solar arrays." DEIR/DEA at 4-101. The DEIR/DEA must be revised to take into account the newest studies, particularly as systematic avian monitoring at utility-scale solar projects has begun only recently. 14-24

Moreover, given the Project's proximity to the Blythe Airport, an increase in avian wildlife would pose a hazard for air traffic landing and taking off from the airport. The DEIR/DEA should address this hazard and discuss measures that will be incorporated into the Project to mitigate it. 14-25

IX. Conclusion

Though the DEIR/EA concludes that the Project will not result in significant impacts to cultural resources, this conclusion is the result of a flawed analysis of the Project's impacts, a poorly-conceived No Project Alternative, and inadequate and currently non-existent mitigation. Riverside County should issue a revised EIR to address these issues, and to provide a realistic assessment of the true impacts of the Project on tribal members and the region's cultural resources, which are significant. Similarly, BLM should conduct a full environmental review of the Project in an Environmental Impact Statement. As CRIT has seen with respect to a number of solar energy projects throughout the region, analysis of cultural resource impacts is too often pushed further and further down the road, until it becomes an after-the-fact effort to acknowledge the significant detrimental effect of these projects. CRIT strongly objects to this tactic in general and to any project—including the Blythe Mesa Project—that is reviewed under such circumstances. 14-26

Sincerely,

Amelia Flores
Dennis Patch Acting
Chairman, Colorado River Indian Tribes

cc: CRIT Tribal Council
Wilene Fisher-Holt, CRIT Museum/Cultural Resources
Daphne Hill-Poolaw, Chairperson, Mohave Elders Committee

David Harper, Spokesman, Mohave Elders Committee

Enclosures:

Ex. 1: California Energy Commission, "Palen Solar Electric Generating System – Trails of the Chuckwalla Valley Portion of the PRGTL"

Ex. 2: 1957 University of California Archaeological Survey Map

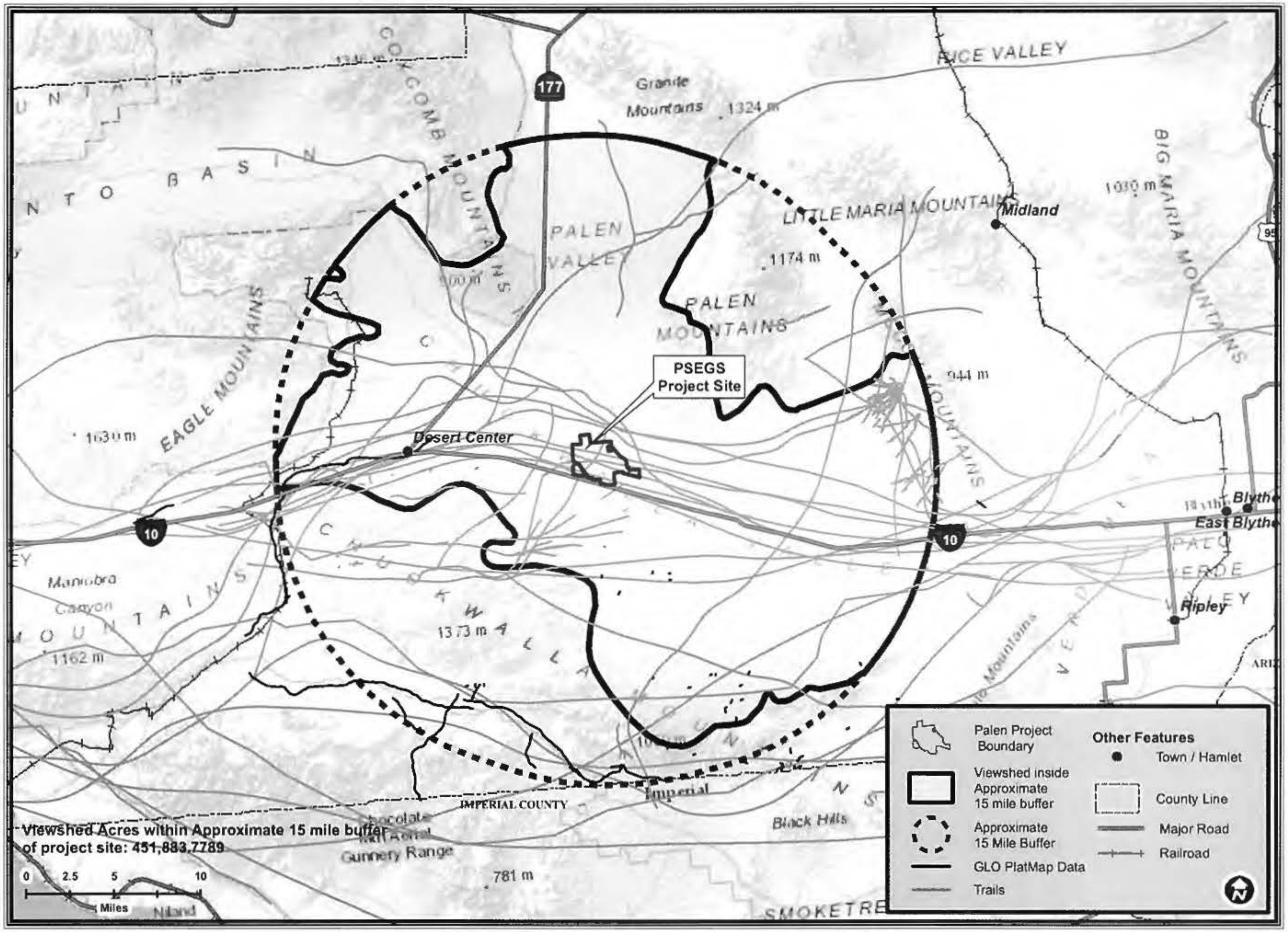
Ex. 3: Philip M. Klasky, "The Salt Song Trail Map: the sacred landscape of the Nuwuvi people" (2009)

Ex. 4: National Fish and Wildlife Forensics Laboratory, "Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis"

Exhibit 1

CULTURAL RESOURCES - FIGURE 10

Palen Solar Electric Generating System - Trails of the Chuckwalla Valley Portion of the PRGTL



CALIFORNIA ENERGY COMMISSION - SITING,TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: ESRI, Delorme, Tele Atlas

Exhibit 2

EXHIBIT 2:

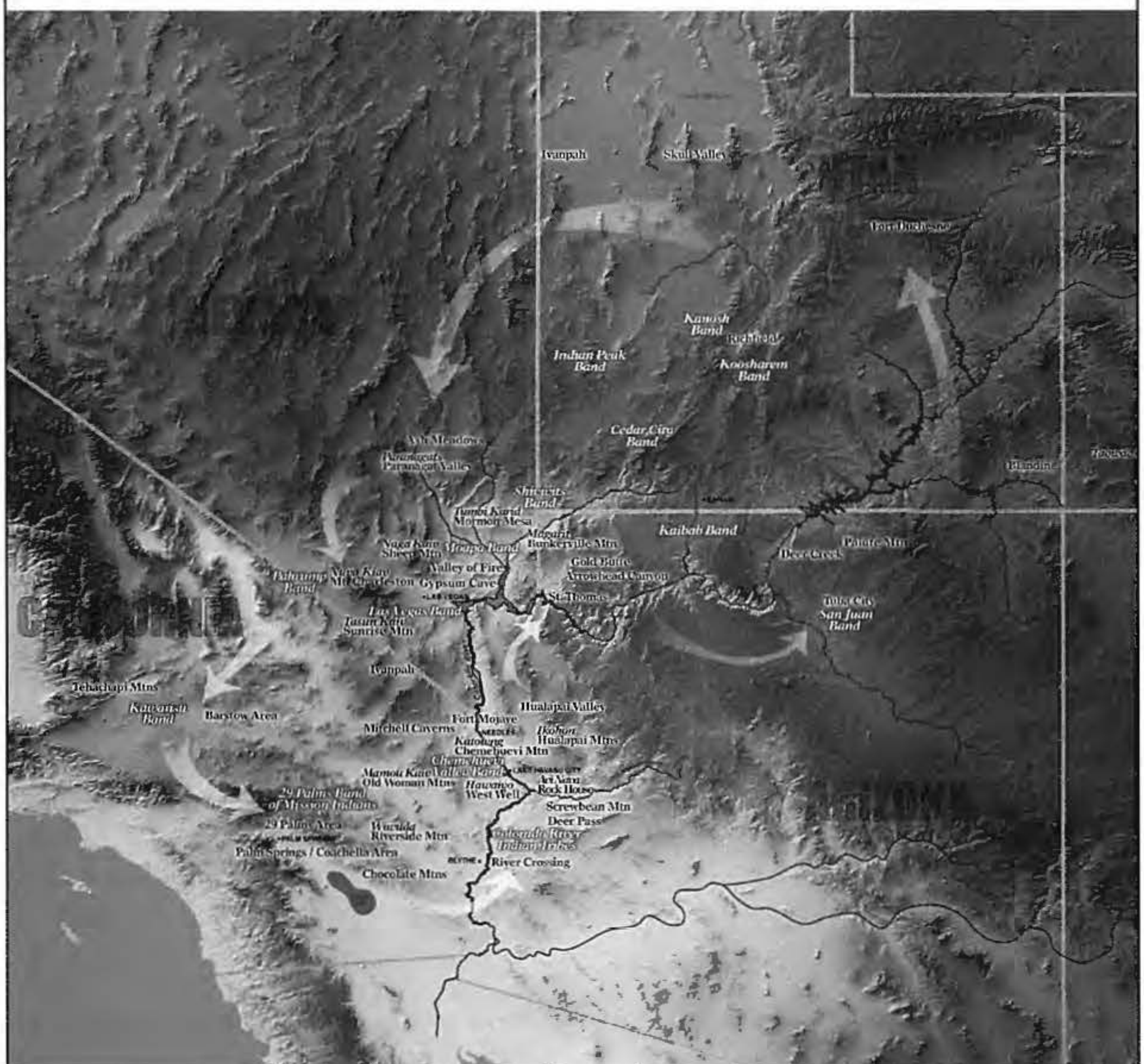
CONFIDENTIAL CULTURAL RESOUCES INFORMATION

NOT FOR PUBLIC DISTRIBUTION

ON FILE WITH THE COUNTY OF RIVERSIDE

Exhibit 3

Salt Song Trail Map of *Nuwuvi* (Southern Paiute) Sacred Landscapes, Culture Areas and Bands



This map shows *Nuwuvi* (Southern Paiute) holy lands spanning ocean and desert, mountains and rivers and across four states. These landmarks are described in the *Nuwuvi* Salt Songs and represent ancient villages, gathering sites for salt and medicinal herbs, trading routes, historic sites, sacred areas, ancestral lands and pilgrimages in a physical and spiritual landscape of stories and songs. The Salt Songs are a cultural and spiritual bond between the *Nuwuvi* and the land, and represent a renewal and healing of a *Nuwuvi's* spiritual journey.

The Salt Songs are sung at memorial ceremonies and follow a trail that begins at *Avi Nava/Ting-ai-ay* (Rock House), the sacred cave at the Bill Williams River, and travels to the Colorado River north to the Colorado Plateau, west to *Nuva Kaiv* (Mt. Charleston), through mountain passes to the Pacific Ocean and then back east through the desert to the Colorado River and to its place of origin.

The trail visits the fourteen bands of *Nuwuvi* people including: *Cedar City, Chemehuevi Valley, Colorado River Indian Tribes, Indian Peak, Kaibab, Kanosh, Kawaiisu, Kaiparowits, Las Vegas, Moapa, Koosharem, Pahrump, San Juan, Shivwits, and Twentynine Palms Band of Mission Indians.*

For more information, copies of this poster and the film *The Salt Song Trail* contact Philip M. Klasky, director of The Storyscape Project of The Cultural Conservancy at www.nativeland.org, (415) 561-6594, Salt Song Trail directors Matthew Leivas (760) 858-4049 and Vivienne Jake (928) 643-7210.

Design by Dana F. Smith and Philip M. Klasky

Exhibit 4

Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis

Rebecca A. Kagan, Tabitha C. Viner, Pepper W. Trail, and Edgard O. Espinoza
National Fish and Wildlife Forensics Laboratory

Executive Summary

This report summarizes data on bird mortality at three solar energy facilities in southern California: Desert Sunlight, Genesis, and Ivanpah. These facilities use different solar technologies, but avian mortality was documented at each site. Desert Sunlight is a photovoltaic facility, Genesis employs a trough system with parabolic mirrors, and Ivanpah uses a power tower as a focal point for solar flux.

Findings

Trauma was the leading cause of death documented for remains at the Desert Sunlight and Genesis sites. Trauma and solar flux injury were both major causes of mortality at the Ivanpah site. Exposure to solar flux caused singeing of feathers, which resulted in mortality in several ways. Severe singeing of flight feathers caused catastrophic loss of flying ability, leading to death by impact with the ground or other objects. Less severe singeing led to impairment of flight capability, reducing ability to forage and evade predators, leading to starvation or predation. Our examinations did not find evidence for significant tissue burns or eye damage caused by exposure to solar flux.

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

These solar facilities appear to represent "equal-opportunity" hazards for the bird species that encounter them. The remains of 71 species were identified, representing a broad range of ecological types. In body size, these ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders

(swallows) to strictly aquatic feeders (grebes) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species, and nocturnal as well as diurnal species were represented. Although not analyzed in detail, there was also significant bat and insect mortality at the Ivanpah site, including monarch butterflies. It appears that Ivanpah may act as a "**mega-trap**," attracting insects which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

			Foraging Zone			Residency Status	
SITE	No. Remains	Identifiable Remains	Air	Terr	Water	Resident	Migrant
Ivanpah	141	127	28	85	14	63	64
Genesis	31	30	12	12	6	20	10
Desert Sun	61	56	7	22	27	18	38
TOTALS	233	213	47	119	47	101	112

Conclusions and Recommendations

In summary, three main causes of avian mortality were identified at these facilities: impact trauma, solar flux, and predation. Birds at all three types of solar plants were susceptible to impact trauma and predators. Predation was documented mostly at the photovoltaic site, and in many cases appeared to be associated with stranding or nonfatal impact trauma with the panels, leaving birds vulnerable to resident predators. Solar flux injury, resulting from exposures to up to 800° F, was unique to the power tower facility. Our findings demonstrate that a broad ecological variety of birds are vulnerable to morbidity and mortality at solar facilities, though some differential mortality trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present; and insectivores at Ivanpah, where insects are attracted to the solar tower.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions should include:

Monitoring/detection measures:

1) Install video cameras sufficient to provide 360 degree coverage around each tower to record birds (and bats) entering and exiting the flux

2) For at least two years (and in addition to planned monitoring protocol), conduct daily surveys for birds (at all three facilities), as well as insects and bats (in the condenser building at Ivanpah) around each tower at the base of and immediately adjacent to the towers in the area cleared of vegetation. Timing of daily surveys can be adjusted to minimize scavenger removal of carcasses as recommended by the TAC. Surveys in the late afternoon might be optimal for bird carcasses, and first light for bat carcasses.

3) Use dogs for monitoring surveys to detect dead and injured birds that have hidden themselves in the brush, both inside and outside the perimeter of the facility

4) To decrease removal of carcasses, implement appropriate raven deterrent actions

Bird Mortality Avoidance Measures:

1) Increase cleared area around tower at Ivanpah to decrease attractive habitat; at least out to fence

2) Retrofit visual cues to existing panels at all three facilities and incorporate into new panel design. These cues should include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other

3) Suspend power tower operation during peak migration times for indicated species

4) Avoid vertical orientation of mirrors whenever possible, for example tilt mirrors during washing

5) Properly net or otherwise cover ponds

6) Place perch deterrent devices where indicated, eg. on tower railings near the flux field

7) Employ exclusionary measures to prevent bats from roosting in and around the condenser facility at Ivanpah.

It must be emphasized that we currently have a very incomplete knowledge of the scope of avian mortality at these solar facilities. Challenges to data collection include: large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; rapid degradation of carcass quality hindering cause of death and species determination; and inconsistent documentation of carcass history.

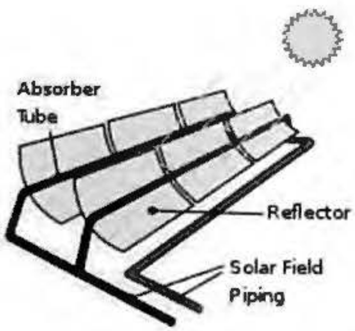
To rectify this problem, video cameras should be added to the solar towers to record bird mortality and daily surveys of the area at the base of and immediately adjacent to the towers should be conducted. At all the facilities, a protocol for systematic, statistically-rigorous searches for avian remains should be developed, emphasizing those areas where avian mortality is most likely to occur. Investigation into bat and insect mortalities at the power tower site should also be pursued.

Finally, there are presently little data available on how solar flux affects birds and insects. Studies of the temperatures experienced by objects in the flux; of the effects of high temperatures on feather structure and function; and of the behavior of insects and birds in response to the flux and related phenomena (e.g. "light clouds") are all essential if we are to understand the scope of solar facility effects on wildlife.

Introduction

The National Fish and Wildlife Forensics Laboratory was requested to determine cause of death for birds found at facilities that generate electricity from solar energy. Solar generating facilities can be classified into three major types: photovoltaic sites, trough systems and solar power towers. There is much written about these systems so this report will not include any technical details, but simply mention the differences and their potential impact on birds.

1) **Photovoltaic systems** directly convert the sun's light into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the photovoltaic cells. An example of this type of solar power plant is Desert Sunlight Solar Farm (AKA First Solar).



2) **Trough systems** are composed of parabolic mirrors which focus and reflect the sun to a tube that converts the heat from the sun into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the trough structures. An example of this type of solar power plant is Genesis Solar Energy Project.

3) **Solar power towers** use thousands of mirrors to reflect the solar energy to a tower, where water in a boiler is converted to steam, generating the electricity. The perceived threat to birds is associated traumatic impact with the mirrors and the danger associated with the heat produced by the mirrors. An example of this type of solar power plant is Ivanpah Solar Electric Generating System.

Methods

Carcasses were collected at the different solar power plant sites by either US Fish and Wildlife Service employees or by energy company staff. The collection of the carcasses was opportunistic; that is, not according to a pre-determined sampling schedule or protocol. There was no attempt to quantify the number of carcasses that scavengers or predators removed from the solar facilities' grounds, or to compare the distribution of carcasses inside and outside the boundaries of the solar facility sites.

Additionally, three USFWS/-OLE staff, including two Forensics Lab staff (EOE and RAK), visited the Ivanpah Solar plant from October 21 – 24, 2013. Their on-site observations are included in this report.

A total of 233 birds collected from three different facilities were examined; 141 from a solar thermal power tower site (Ivanpah, Bright Source Inc.), 31 from a parabolic trough site (Genesis, NextEra Energy Inc.) and 61 from a photovoltaic (PV) panel site (Desert Sunlight, First Solar Inc.). Nine of the Ivanpah birds were received fresh; 7 of those were necropsied during a site visit by a Forensics Laboratory pathologist (RAK). The rest of the birds were received frozen and allowed to thaw at room temperature prior to species identification and necropsy. Species determination was made by the Forensics Laboratory ornithologist (PWT) for all birds either prior to necropsy or, for those necropsied on-site, from photos and the formalin-fixed head. All data on carcass history (location of the carcass, date of collection and any additional observations) were transcribed, although these were not available for all carcasses.

As part of the gross pathological examination, whole carcasses were radiographed to help evaluate limb fractures and identify any metal foreign bodies. Alternate light source examination using an Omnichrome Spectrum 9000+ at 570 nm with a red filter helped rule in or out feather burns by highlighting subtle areas of feather charring (Viner et al., 2014). All birds or bird parts from Ivanpah without obvious burns were examined with the alternate light source, as well as any bird reportedly found near a power line and a random sub-sample of the remaining birds from Genesis and Desert Sunlight (Viner, T. C., R. A. Kagan, and J. L. Johnson, 2014, Using an alternate light source to detect electrically singed feathers and hair in a forensic setting. Forensic Science International, v. 234, p. e25-e29).

Carcass quality varied markedly. If carcasses were in good post mortem condition, representative sections of heart, lung, kidney, liver, brain and gastrointestinal tract as well as any tissues with gross lesions were collected and fixed in 10% buffered formalin. Full tissue sets were collected from the fresh specimens. Formalin-fixed tissues were routinely processed for histopathology, paraffin-embedded, cut at 4 µm and stained with hematoxylin and eosin. Tissues from 63 birds were examined microscopically: 41 from Ivanpah, 1 from Genesis and 21 from Desert Sunlight.

Birds with feather burns were graded based on the extent of the lesions. Grade 1 birds had curling of less than 50% of the flight feathers. Grade 2 birds had curling of 50% or more of the flight feathers. Grade 3 birds had curling and visible charring of contour feathers (Figure 1).

Figure 1: Three grades of flux injury based on extent and severity of burning. Grade 1 (top); Yellow-rumped Warbler with less than 50% of the flight feathers affected (note sparing of the yellow rump feathers). Grade 2 (middle); Northern Rough-winged Swallow initially found alive but unable to fly, with greater than 50% of the flight feathers affected. Grade 3 (bottom); MacGillivray's Warbler with charring of feathers around the head, neck, wings and tail.

Bird Species Recovered at Solar Power Facilities

Tables 1-4 and Appendix 1 summarize 211 identifiable bird remains recovered from the three solar facilities included in this study. These birds constitute a taxonomically diverse assemblage of 71 species, representing a broad range of ecological types. In body size, these species ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders (e.g. swifts and swallows) to strictly aquatic feeders (pelicans and cormorants) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species. Nocturnal as well as diurnal species were represented.

In Tables 1-4 and Appendix 1, bird species are categorized into very general ecological types by foraging zone and residency status. Foraging Zones were "air" (a significant portion of foraging activity performed in the air), "terrestrial" (including foraging both in vegetation and on the ground), and "water" (foraging associated with water, including waders as well as aquatic birds). Residency Status was "resident" (for breeding or year-round residents) and "migrant" (for both passage migrants and non-breeding-season residents). For a number of species, the appropriate classification for residency status was uncertain, due to a lack of detailed knowledge of the sites. The present classification is based on published range maps, and is subject to revision as more information becomes available.

This dataset is not suitable for statistical analysis, due to the opportunistic and unstandardized collection of avian remains at the facilities, and the lack of baseline data on bird diversity and abundance at each site. Nevertheless, a few conclusions can be noted. First, these data do not support the idea that these solar facilities are attracting particular species. Of the 71 bird species identified in remains, only five species were recovered from all three sites. These five were American Coot, Mourning Dove, Lesser Nighthawk, Tree Swallow, and Brown-headed Cowbird, again emphasizing the ecological variety of birds vulnerable to mortality at the solar facilities. Over two-thirds (67%) of the species were found at only a single site

(Appendix 1). That being said, the Desert Sunlight facility had particularly high mortality among waterbirds, suggesting a need to render the ponds at that site inaccessible or unattractive to these species.

The diversity of birds dying at these solar facilities, and the differences among sites, suggest that there is no simple "fix" to reduce avian mortality. These sites appear to represent "equal-opportunity" mortality hazards for the bird species that encounter them. Actions to reduce or mitigate avian mortality at solar facilities will need to be designed on a site-specific basis, and will require much more data on the bird communities at each site, and on how mortality is occurring. Carefully-designed mortality studies might reveal significant patterns of vulnerability that are not evident in these data.

Table 1. Summary data on avian mortality at the three solar sites included in this study. See summary for discussion of Foraging Zone and Residency Status categories.

				Foraging Zone			Residency Status	
SITE	**No. Species**	**No. Remains**	**Identifiable Remains**	**Air**	**Terr**	**Water**	**Resident**	**Migrant**
Ivanpah	49	141	127	26	85	14	63	64
Genesis	15	31	30	12	12	6	20	10
Desert Sun	33	61	56	7	22	27	18	38
TOTALS	71	233	213	47	119	47	101	112

Table 2. Species identified from avian remains at the Desert Sunlight photovoltaic solar facility. MNI = minimum number of individuals of each species represented by the identifiable remains. In some cases (e.g. Cinnamon/Blue-winged Teal), closely related species could not be distinguished based on the available remains, but the Foraging Zone and Residency Status could still be coded, due to the ecological similarities of the species involved. Total identified birds = 56.

DESERT SUNLIGHT		Zone	Residency	MNI
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	1
Eared Grebe	*Podiceps nigricollis*	water	migrant	3
Sora	*Porzana carolina*	water	migrant	1
American Avocet	*Recurvirostra americana*	water	migrant	1
Cinnamon/Blue-winged Teal	*Anas discors/clypeata*	water	migrant	1
Western Grebe	*Aechmophorus occidentalis*	water	migrant	9
Brown Pelican	*Pelecanus occidentalis*	water	migrant	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	2
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	1
Yuma Clapper Rail	*Rallus longirostris*	water	resident	1
American Coot	*Fulica americana*	water	migrant	5
Mourning Dove	*Zenaida macroura*	terr	resident	3
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
Costa's Hummingbird	*Calypte costae*	air	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Black-throated/Sage Sparrow	*Amphispiza sp.*	terr	resident	1
Black Phoebe	*Sayornis nigricollis*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	2
Common Raven	*Corvus corax*	terr	resident	1
Horned Lark	*Eremophila alpestris*	terr	migrant	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	1
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	1
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	1
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
Western Tanager	*Piranga ludoviciona*	terr	migrant	2
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1

Table 3. Species identified from avian remains at the Genesis trough system solar facility. Total identified birds = 30.

GENESIS		Zone	Residency	MNI
Eared Grebe	*Podiceps nigricollis*	water	migrant	2
Great Blue Heron	*Ardea herodias*	water	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Ring-billed Gull	*Larus delawarensis*	water	migrant	2
California Gull	*Larus californianus*	water	resident	1
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Say's Phoebe	*Sayornis saya*	air	resident	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	5
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	1
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Chipping Sparrow	*Spizella passerina*	terr	resident	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	6

Table 4. Species identified from avian remains at the Ivanpah power tower solar facility. Total identified birds = 127

IVANPAH		Zone	Residency	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	4
Cooper's Hawk	*Accipiter cooperii*	air	migrant	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Peregrine Falcon	*Falco peregrinus*	air	resident	1
American Coot	*Fulica americana*	water	migrant	7
Sora	*Porzana carolina*	water	migrant	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	2
Greater Roadrunner	*Geococcyx californianus*	terr	resident	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	1
Mourning Dove	*Zenaida macroura*	terr	resident	11
Barn Owl	*Tyto alba*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	3
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
White-throated Swift	*Aeronautes saxatalis*	air	resident	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	1
Northern Flicker	*Colaptes auratus*	terr	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	3
Warbling Vireo	*Vireo gilvus*	terr	migrant	1
Common Raven	*Corvus corax*	terr	resident	2
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Verdin	*Auriparus flaviceps*	terr	resident	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	1
American Pipit	*Anthus rubescens*	terr	migrant	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	1
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	14
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Yellow Warbler	*Setophaga petechia*	terr	migrant	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	2
Lazuli Bunting	*Passerina amoena*	terr	migrant	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	3
Chipping Sparrow	*Spizella passerina*	terr	resident	3
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	3
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	2
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	6

IVANPAH		Zone	Residency	MNI
Pine Siskin	*Spinus pinus*	terr	migrant	1
House Finch	*Carpodacus mexicanus*	terr	resident	13
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	3

Cause of Death of Birds Found at the Solar Power Plants

Photovoltaic facility (Desert Sunlight):

Sixty-one birds from 33 separate species were represented from Desert Sunlight. Due to desiccation and scavenging, a definitive cause of death could not be established for 22 of the 61 birds (see Table 5). Feathers could be examined in all cases, however, and none of the 61 bird remains submitted from the PV facility had visible evidence of feather singeing, a clear contrast with birds found at Ivanpah.

Blunt force impact trauma was determined to have been the cause of death for 19 Desert Sunlight birds including two Western Grebes (*Aechmophorus occidentalis*) and one each of 16 other species. Impact (blunt force) trauma is diagnosed by the presence of fractures and internal and/or external contusions. In particular, bruising around the legs, wings and chest are consistent with crash-landings while fractures of the head and/or neck are consistent with high-velocity, frontal impact (such as may result from impacting a mirror).

Predation was the immediate cause of death for 15 birds. Lesions supporting the finding of predation included decapitation or missing parts of the body with associated hemorrhage (9/15), and lacerations of the skin and pectoral muscles. Eight of the predated birds from Desert Sunlight were

Figure 2: Predation trauma (top) resulting in traumatic amputation of the head and neck (American Avocet) and impact trauma (bottom) causing bruising of the keel ridge of the sternum (Brown Pelican).

grebes, which are unable to easily take off from land. This suggests a link between predation and stranding and/or impact resulting from confusion of the solar panels with water (see Discussion).

Parabolic trough facility (Genesis):

Thirty-one birds were collected from this site. There were 15 species represented. Those found in the greatest numbers were Brown-headed Cowbirds and Cliff Swallows, though no more than 6 individuals from any given species were recovered. Overall, carcass quality was poor and precluded definitive cause of death determination in 17/31 birds (Table 5). Identifiable causes of death consisted of impact trauma (6/31) and predation trauma (2/31). Necropsy findings were similar to those at Desert Sunlight with fractures and hemorrhage noted grossly. Predation trauma was diagnosed in two birds, a Cliff Swallow and a Ring-billed Gull.

Power tower facility (Ivanpah):

Ivanpah is the only facility in this study that produces solar flux, which is intense radiant energy focused by the mirror array on the power-generating tower. Objects that pass through this flux, including insects and birds, encounter extreme heat, although the extent of heating depends on many variables, including the duration of exposure and the precise location in the flux beam.

From Ivanpah, 141 birds were collected and examined. Collection dates spanned a period of one year and five months (July 2012 to December 2013) and included at least seven months of construction during which time the towers were not actively fluxing (2013). There were 49 species represented (Table 4). Those found in the greatest numbers were Yellow-rumped Warblers (*Setophaga coronata;* 14), House Finches (*Carpodacus mexicanus*; 13), Mourning Doves (*Zenaida macroura*; 11) and American Coots (*Fulica americana*; 7). Yellow-rumped Warblers and House Finches were found exclusively at the power tower site.

Solar flux injury was identified as the cause of death in 47/141 birds. Solar flux burns manifested as feather curling, charring, melting and/or breakage and loss. Flight feathers of the tail and/or wings were invariably affected. Burns also tended to occur in one or more of the following areas: the sides of the body (axillae to pelvis), the dorsal coverts, the tops and/sides of the head and neck and the dorsal body wall (the back). Overlapping portions of feathers and light-colored feathers were often spared (Figures 3 and 4).

Figure 3: contour feather from the back of a House Finch with Grade 3 solar flux injury. The feather has curling and charring limited to the exposed tip.

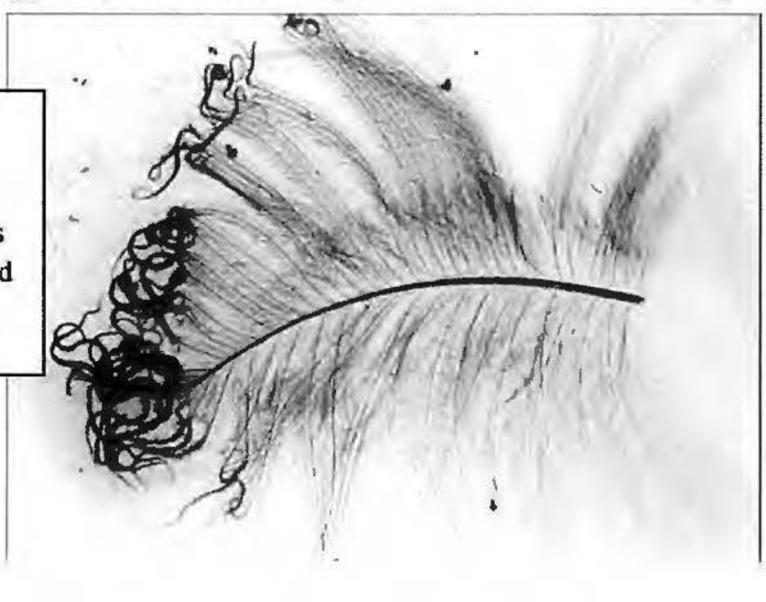


Figure 4: Feather from a Peregrine Falcon with Grade 2 solar flux injury. Note burning of dark feather bands with relative sparing of light bands.

The yellow and red rumps of Yellow-rumped Warblers and House Finches respectively remained strikingly unaffected (See Figure 1). Charring of head feathers, in contrast, was generally diffuse across all color patterns. A pattern of spiraling bands of curled feathers across or around the body and wings was often apparent.

Table 5. Cause of death (COD) data

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

Eight birds were assigned a feather damage Grade of 1 with curling of less than 50% of the flight feathers. Six of these had other evidence of acute trauma (75%). Five birds were Grade 2, including three birds that were found alive and died shortly afterwards. Of these birds, 2 (the birds found dead) also had evidence of acute trauma. Twenty-eight birds were Grade 3; with charring of body feathers. Of these birds, 21/28

(28%) had other evidence of acute trauma. Remaining carcasses (6) were incomplete and a grade could not be assigned.

Twenty-nine birds with solar flux burns also had evidence of impact trauma. Trauma consisted of skull fractures or indentations (8), sternum fractures (4), one or more rib fractures (4), vertebral fractures (1), leg fracture (3), wing fracture (1) and/or mandible fracture (1). Other signs of trauma included acute macroscopic and/or microscopic internal hemorrhage. Location found was reported for 39 of these birds; most of the intact carcasses were found near or in a tower. One was found in the inner heliostat ring and one was found (alive) on a road between tower sites. The date of carcass collection was provided for 42/47. None were found prior to the reported first flux (2013).

Figure 5: The dorsal aspect of the wing from a Peregrine Falcon (the same bird as shown in Figure 4) with Grade 2 lesions. Note extensive curling of feathers without visible charring. This bird was found alive, unable to fly, emaciated and died shortly thereafter. These findings demonstrate fatal loss of function due to solar flux exposure in the absence of skin or other soft tissue burns.

Among the solar flux cases, a variety of bird species were affected though all but one (a raptor) was a passerine (Appendix 2). House Finches and yellow-rumped Warblers were most often represented (10/47 and 12/47 respectively). For the birds in which species could be determined (41/47), insects were a major

dietary component in all but two species. These were an unidentified hummingbird (*Selasphorus*) species (known to include insects in the diet) and a Peregrine Falcon (a species that feeds on small birds).

Four birds were reportedly found alive and taken to a wildlife rehabilitation center where they died one to a few days later (exact dates were not consistently provided). Three had Grade 2 feather burns and one had Grade 3 feather burns. None had other evidence of trauma. Body condition was reduced in all of the birds (two considered thin and two emaciated) based on a paucity of fat stores and depletion of skeletal muscling. The four birds were of four different species and consisted of three passerines and one raptor.

The second most commonly diagnosed cause of death at the Ivanpah facility was impact (or blunt force) trauma (24/141 birds). Necropsy findings were as previously described at the Desert Sunlight facility. Impact marks were reported on heliostat mirrors adjacent to the carcasses in 5 cases and mirrors were described as being vertically-oriented in 5 cases. Specific carcass locations were reported for 18 of the birds. Those birds were found in a variety of areas: below heliostats (8/18), in or near tower and powerblock buildings (4/18), on roads (2/18), below power lines (2/18), in the open (1/18) and by a desert tortoise pen (1/18).

Predation was determined to be the cause of death for five of the birds. A coot and a Mourning Dove were found with extensive trauma and hemorrhage to the head and upper body consisting of lacerations, crush trauma and/or decapitation. One of the birds (an American Coot) was found near a kit fox shelter site. One bird (Northern Mockingbird) was found near the fence line and the third (a Mourning Dove) in an alley way. Two more birds (an unidentified sparrow and an American Pipit) were observed being eaten by one of the resident Common Ravens.

Discussion of Cause of Death of Birds Found at the Solar Power Plants

Impact trauma:

Sheet glass used in commercial and residential buildings has been well-established as a hazard for birds, especially passerines (Klem 1990, 2004, 2006; Loss et al. 2014). A recent comprehensive review estimated that between 365-988 million birds die annually by impacting glass panels in the United States alone (median estimate 599 million; Loss et al. 2014). Conditions that precipitate window strike events include the positioning of vegetation on either side of the glass and the reflective properties of the window. Glass panels that reflect trees and other attractive habitat are involved in a higher number of bird collisions.

The mirrors and photovoltaic panels used at all three facilities are movable and generally directed upwardly, reflecting the sky. At the Ivanpah facility, when heliostats are oriented vertically (typically for washing or installation, personal communication, RAK) they appear to pose a greater risk for birds. Of the eight birds reported found under a heliostat, heliostats were vertically-oriented in at least 5 cases. (D Klem Jr., DC Keck, KL Marty, AJ Miller Ball, EE Niciu, and CT Platt. 2004. Effects of window angling, feeder placement, and scavengers on avian mortality at plate glass. Wilson Bulletin, 116(1):69-73; D Klem Jr. 2006. Glass: A deadly conservation issue for birds. Bird Observer 34(2):73-81; D Klem Jr. 1990.

Collisions between birds and windows: mortality and prevention. Journal of Field Ornithology 61:120–128; Loss, S.R., T. Will, S.S.Loss, and P.P. Marra. 2014. Bird-building collisions in the United States: Estimates of annual mortality and species vulnerability. Condor 116: 8-23). Studies with aquatic insects have found that vertically-oriented black glass surfaces (similar to solar panels) produced highly polarized reflected light, making them highly attractive (Kriska, G., P. Makik, I. Szivak, and G. Horvath. 2008. Glass buildings on river banks as "polarized light traps" for mass-swarming polarotactic caddis flies. Naturwissenschaften 95: 461-467).

A desert environment punctuated by a large expanse of reflective, blue panels may be reminiscent of a large body of water. Birds for which the primary habitat is water, including coots, grebes, and cormorants, were over-represented in mortalities at the Desert Sunlight facility (44%) compared to Genesis (19%) and Ivanpah (10%). Several factors may inform these observations. First, the size and continuity of the panels differs between facilities. Mirrors at Ivanpah are individual, 4 x 8' panels that appear from above as stippling in a desert background (Figure 6). Photovoltaic panels at Desert Sunlight are long banks of adjacent 27.72 x 47.25" panels (70 x 120 cm), providing a more continuous, sky/water appearance. Similarly, troughs at Genesis are banks of 5 x 5.5' panels that are up to 49-65 meters long.

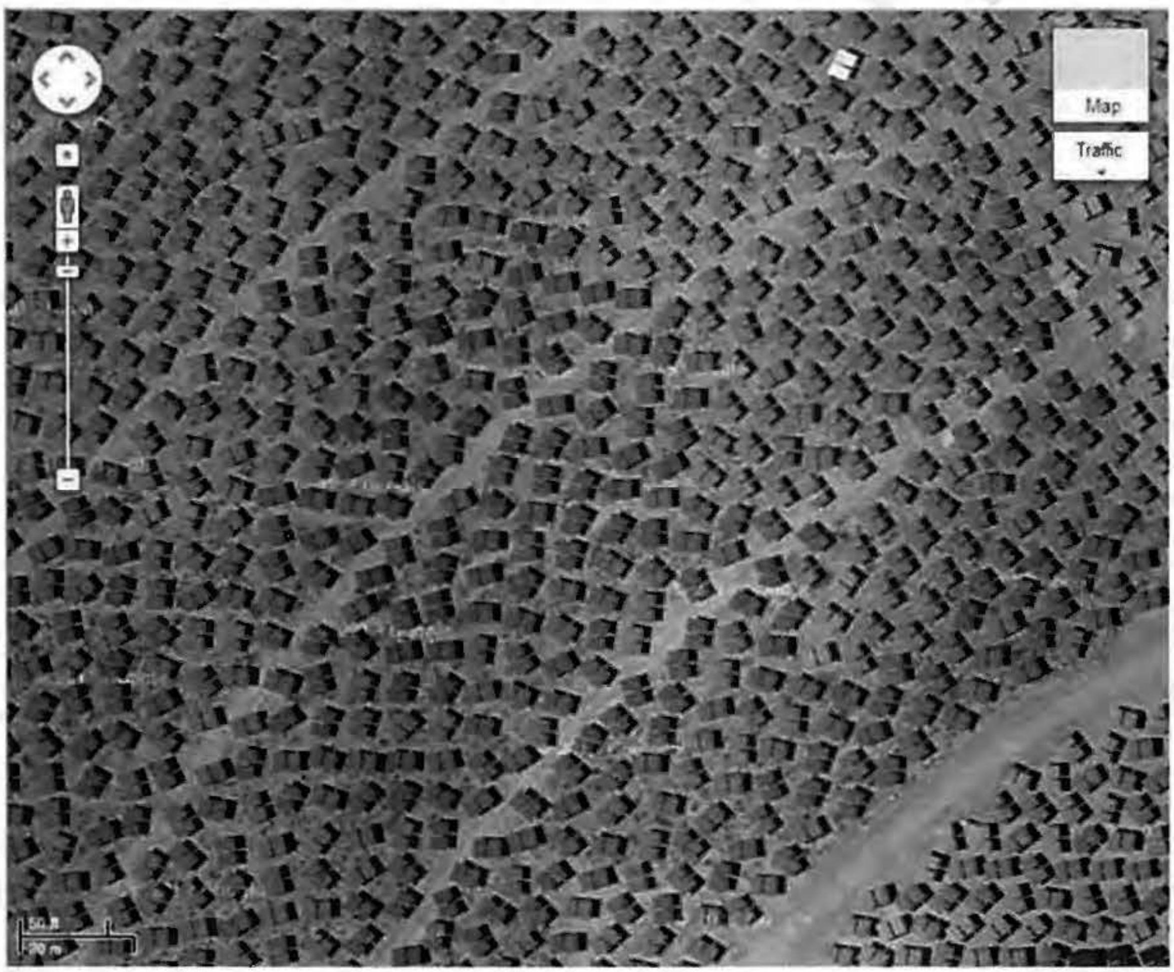


Figure 6: The Ivanpah Solar Electric Generating System as seen via satellite. The mirrored panels are 5 x 8 feet.

There is growing concern about "polarized light pollution" as a source of mortality for wildlife, with evidence that photovoltaic panels may be particularly effective sources of polarized light in the environment (see Horvath et al. 2010. Reducing the maladaptive attractiveness of solar panels to polarotactic insects. Conservation Biology 24: 1644-1653, and ParkScience, Vol. 27, Number 1, 2010; available online at: http://www.nature.nps.gov/parkscience/index.cfm?ArticleID=386&ArticleTypeID=5; as well as discussion of this issue in the Desert Sunlight Final Environmental Impact Statement, Chapter 4, pp. 14-15).

Variables that may affect the illusory characteristics of solar panels are structural elements or markings that may break up the reflection. Visual markers spaced at a distance of 28 cm or less have been shown to reduce the number of window strike events on large commercial buildings (City of Toronto Green Development Standard; Bird-friendly development guidelines. March 2007). Mirrors at the Ivanpah facility are unobscured by structures or markings and present a diffuse, reflective surface. Photovoltaic panels at Desert Sunlight are arranged as large banks of small units that are 60 x 90 cm. The visually uninterrupted expanse of both these types of heliostat is larger than that which provides a solid structure visual cue to passerines. Parabolic troughs at Genesis have large, diffusely reflective surfaces between seams that periodically transect the bank of panels at 5.5' intervals. Structures within the near field, including the linear concentrator and support arms, and their reflection in the panels and may provide a visual cue to differentiate the panel as a solid structure.

The paper by Horvath et al cited above provides experimental evidence that placing a white outline and/or white grid lines on solar panels significantly reduced the attractiveness of these panels to aquatic insects, with a loss of only 1.8% in energy-producing surface area (p. 1651). While similar detailed studies have yet to be carried out with birds, this work, combined with the window strike results, suggest that significant reductions in avian mortality at solar facilities could be achieved by relatively minor modifications of panel and mirror design. This should be a priority for further research.

Finally, ponds are present on the property of the Desert Sunlight and Genesis facilities. The pond at Genesis is netted, reducing access by migratory birds, while the pond at Desert Sunlight is open to flighted wildlife. Thus, birds are both attracted to the water feature at Desert Sunlight and habituated to the presence of an accessible aquatic environment in the area. This may translate into the misinterpretation of a diffusely reflected sky or horizonal polarized light source as a body of water.

Stranding and Predation:

Predation is likely linked to panel-related impact trauma and stranding. Water birds were heavily over-represented in predation mortalities at Desert Sunlight. Of the 15 birds that died due to predation, 14 make their primary habitat on water (coots, grebes, a cormorant, and an avocet). A single White-winged Dove was the only terrestrial-based predation mortality in the submitted specimens. This is in contrast to blunt trauma mortalities at Desert Sunlight in which 8 of the 19 birds determined to have died of impact trauma were water species.

Locations of the birds when found dead were noted on several submissions. Of the birds that died of predation for which locations were known, none were located near ponds. The physiology of several of

these water birds is such that locomotion on land is difficult or impossible. Grebes in particular have very limited mobility on land and require a run across water in order to take off (Jehl, J. R., 1996. Mass mortality events of Eared Grebes in North America. Journal of Field Ornithology 67: 471-476). Thus, these birds likely did not reach their final location intentionally. Ponds at the PV and trough sites are fenced, prohibiting terrestrial access by predators. Birds on the water or banks of the pond are inaccessible to resident predators. Therefore, it is unlikely that the birds were captured at the pond and transported by a predator into the area of the panels. Attempts to land or feed on the panels because of their deceptive appearance may have injured the birds to the point that they could not escape to safety, or inadvertently stranded the birds on a substrate from which they could not take flight. We believe that an inability to quickly flee after striking the panels and stranding on the ground left these birds vulnerable to opportunistic predators. At least two types of predators, kit foxes and ravens, have been observed in residence at the power tower and PV facilities and ravens have been reported at the trough site (personal communication and observation, RAK). Additionally, histories for multiple birds found at the tower site document carcasses found near kit fox shelters or being eaten or carried by a raven.

Solar Flux:

Avian mortality due to exposure to solar flux has been previously explored and documented (McCrary, M. D., McKernan, R. L., Schreiber, R. W., Wagner, W. D., and Sciarrotta, T. C. Avian mortality at a solar energy power plant. Journal of Field Ornithology, 57(2): 135-141). Solar flux injury to the birds of this report, as expected, occurred only at the power tower facility. Flux injury grossly differed from other sources of heat injury, such as electrocution or fire. Electrocution injury requires the bridging of two contact points and is, therefore, seen almost exclusively in larger birds such as raptors. Contact points tend to be on the feet, carpi and/or head and burns are often found in these areas. Electrocution causes deep tissue damage as opposed to the surface damage of fire or solar flux. Other sequelae include amputation of limbs with burn marks on bone, blood vessel tears and pericardial hemorrhage. Burns from fires cause widespread charring and melting of feathers and soft tissues and histopathologic findings of soot inhalation or heat damage to the respiratory mucosa. None of these were characteristics of flux injury. In the flux cases small birds were over-represented, had burns generally limited to the feathers and internal injuries attributable to impact. Flux injury inconsistently resulted in charring, tended to affect feathers along the dorsal aspects of the wings and tail, and formed band-like patterns across the body (Divincenti, F. C., J. A. Moncrief, and B. A. Pruitt. 1969. Electrical injuries: a review of 65 cases. The Journal of Trauma 9: 497-507).

Proposed mechanisms of solar flux-related death follow one or a combination of the following pathways:

- impact trauma following direct heat damage to feathers and subsequent loss of flight ability
- starvation and/or thermoregulatory dysfunction following direct heat damage to feathers
- shock
- soft tissue damage following whole-body exposure to high heat
- ocular damage following exposure to bright light.

Necropsy findings from this study are most supportive of the first three mechanisms.

Loss of feather integrity has effects on a bird's ability to take off, land, sustain flight and maneuver. Tail feathers are needed for lift production and maneuverability, remiges are needed for thrust and lift and feathers along the propatagium and coverts confer smoothness to the avian airfoil. Shortening of primary flight feathers by as little as 1.6 cm with loss of secondary and tertiary remiges has been shown to eliminate take-off ability in house sparrows further demonstrating the importance of these feathers (Brown, R. E., and A. C. Cogley, 1996. Contributions of the propatagium to avian flight: Journal of Experimental Zoology 276: 112-124). Loss of relatively few flight feathers can, therefore, render a bird unable or poorly-able to fly. Birds encountering the flux field at Ivanpah may fall as far as 400 feet after feather singeing. Signs of impact trauma were often observed in birds with feather burns and are supportive of sndden loss of function (Beaufrere, H., 2009. A review of biomechanic and aerodynamic considerations of the avian thoracic limb. Journal of Avian Medicine and Surgery 23: 173-185).

Birds appear to be able to survive flux burns in the short term, as evidenced by the collection of several live birds with singed feathers. Additionally, Forensic Lab staff observed a falcon or falcon-like bird with a plume of smoke arising from the tail as it passed through the flux field. Immediately after encountering the flux, the bird exhibited a controlled loss of stability and altitude but was able to cross the perimeter fence before landing. The bird could not be further located following a brief search (personal observation, RAK and EOE). Birds that initially survive the flux exposure and are able to glide to the ground or a perch may be disabled to the point that they cannot efficiently acquire food, escape predators or thermoregulate. Observations of emaciation in association with feather burns in birds found alive is supportive of debilitation subsequent to flux exposure. More observational studies and follow-up are required to understand how many birds survive flux exposure and whether survival is always merely short-term. As demonstrated by the falcon, injured birds (particulary larger birds), may be ambulatory enough to glide or walk over the property line indicating a need to include adjacent land in carcass searches.

There was evidence of acute skin burns on the heads of some of the Grade 3 birds that were found dead. But interestingly, tissue burn effects could not be demonstrated in birds known to have survived short periods after being burned. Hyperthermia causing instantaneous death manifests as rapid burning of tissue, but when death occurs a day or later there will be signs of tissue loss, inflammation, proteinic exudate and/or cellular death leading to multisystemic organ failure. The beginnings of an inflammatory response to injury can be microscopically observed within one to a few hours after the insult and would have been expected in any of the four birds found alive. Signs of heat stroke or inhalation of hot air should have been observable a day or more after the incident. Rather, in these cases extensive feather burns on the body largely appeared to be limited to the tips of the feathers with the overlapping portions insulating the body as designed. This, in conjunction with what is likely only a few seconds or less spent in the flux, suggests that skin or internal organ damage from exposure to high temperatures in solar flux may not be a major cause of the observed mortality.

Ocular damage following light exposure was also considered but could not be demonstrated in the submitted birds. In the four birds that initially survived, there were no signs of retinal damage, inflammation or other ocular trauma. Given the small sample size, this does not preclude sight impairment as a possible sequela but clinical monitoring of survivors would be needed to draw more definitive conclusions.

Other/Undetermined:

Powerline electrocution was the cause of death for one bird (a juvenile Common Raven) at the Ivanpah facility. Electrocution at these solar facilities is a potential hazard but, thus far, appears to be an uncommon cause of death.

Smashed birds (13/233) were found at all three locations. Detailed carcass collection information was provided for 6; all were found on roads. Though poor carcass quality in all cases precluded definitive cause death determination, circumstances and carcass condition suggest vehicle trauma as the cause of deaths. The relatively low numbers of vehicle collisions may be attributed to slow on-site vehicle speeds and light traffic. Vehicle collisions, therefore, do not appear to be a major source of mortality and would be expected to decrease as construction ends.

There was a large number of birds (85/233) for which a cause of death could not be determined due to poor carcass condition. The arid, hot environment at these facilities leads to rapid carcass degradation which greatly hinders pathology examination. Results were especially poor for birds from the Genesis facility, where the cause of death(s) for 23/31 (74%) could not be determined. These results underscore the need for carcasses to be collected soon after death. More frequent, concerted carcass sweeps are advised.

Insect mortality and solar facilities as "mega-traps"

An ecological trap is a situation that results in an animal selecting a habitat that reduces its fitness relative to other available habitats (Robertson, B.A. and R.L. Hutto. 2006. A framework for understanding ecological traps and an evaluation of existing evidence. Ecology 87: 1075-1085; Robertson, B.A., J.S. Rehage, and Sih, A. 2013. Ecological novelty and the emergence of evolutionary traps. Trends in Ecology and Evolution 28: 552-560).

A wide variety of circumstances may create ecological traps, ranging from subtle (songbirds attracted to food resources in city parks, where they are vulnerable to unnaturally high populations of predators) to direct (birds are attracted to oil-filled ponds, believing it to be water, and become trapped). It appears that solar flux facilities may act as "**mega-traps,**" which we define as artificial features that attract and kill species of multiple trophic layers. The strong light emitted by these facilities attract insects, which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

OLE staff observed large numbers of insect carcasses throughout the Ivanpah site during their visit. In some places there were hundreds upon hundreds of butterflies (including monarchs, *Danaus plexippus*) and dragonfly carcasses. Some showed singeing, and many appeared to have just fallen from the sky. Careful observation with binoculars showed the insects were active in the bright area around the boiler at the top of the tower. It was deduced that the solar flux creates such a bright light that it is brighter than the surrounding daylight. Insects were attracted to the light and could be seen actively flying the height of the tower. Birds were also observed feeding on the insects. At times birds flew into the solar flux and ignited. Bird carcasses recovered from the site showed the typical singed feathers. The large populations of insects

may also attract indigenous bat species, which were seen roosting in structures at the base of the power tower.

Monarch butterflies in North America – both east and west of the Rocky Mountains – have been documented to be in decline (see the North American Monarch Conservation Plan, available at: http://www.mlmp.org/Resources/pdf/5431_Monarch_en.pdf). Proposed causes include general habitat loss and specific loss of milkweed, upon which the butterflies feed and reproduce. Considering the numerous monarch butterfly carcasses seen at the Ivanpah facility, it appears that solar power towers could have a significant impact on monarch populations in the desert southwest. Analysis of the insect mortality at Ivanpah, and systematic observations of bird/insect interactions around the power tower, is clearly needed.

Bird species affected by solar flux include both insectivores (e.g. swallows, swifts, flycatchers, and warblers) and raptors that prey on insect-feeding birds. Based on observations of the tower in flux and the finding of large numbers of butterflies, dragonflies and other insects at the base of the tower and in adjacent buildings it is suspected that the bright light generated by solar flux attracts insects, which in turn attracts insectivores and predators of insectivores. Waterbirds and other birds that feed on vegetation were not found to have solar flux burns. Birds were observed perching and feeding on railings at the top of the tower, apparently in response to the insect aggregations there.

Further, dead bats found at the Ivanpah site could be attracted to the large numbers of insects in the area. Nineteen bats from the condenser area of the power tower facility have been submitted to NFWFL for further evaluation. These bats belong to the Vespertilionidae and Molossidae families, which contain species considered by the Bureau of Land Management to be sensitive species in California. Preliminary evaluation revealed no apparent singing of the hair, and analysis is ongoing.

Solar flux and heat associated with solar power tower facilities

Despite repeated requests, we have been unsuccessful in obtaining technical data relating to the temperature associated with solar flux at the Ivanpah facility. The following summarizes the information we have gathered from other sources.

The Ivanpah solar energy generating facility consists of mirrors that reflect sunlight to a tower. In the tower sits a boiler that generates steam which then powers a turbine.

Figure 7 Ivanpah solar power facilities http://ivanpahsolar.com/about

At the top of a 459 foot tall tower sits a boiler (solar receiver) that is heated by the sun rays reflected by 300,000 mirrors, called solar heliostats. When the concentrated sunlight strikes the boiler tubes, it heats the water to create superheated steam. The high temperature steam is then piped from the boiler to a turbine where electricity is generated (http://ivanpahsolar.com/about visited on 01/20/2014).

If all the solar heliostats are focused on the solar tower the beams multiply the strength of sunlight by 5000 times, and this generates temperatures at the solar tower in excess of 3600° Fahrenheit (> 1982° Celsius). Since steel melts at 2750° Fahrenheit (1510° Celsius), only a percentage of heliostats are focused on the solar receiver so that) the optimal temperature at the tower is approximately 900° Fahrenheit (~482° Celsius) ("How do they do it" Wag TV for Discovery Channel, Season 3, Episode 15, "Design Airplane Parachutes, Create Solar Power, Make Sunglasses" Aired August 25, 2009).

Figure 8: Seville solar power facility (http://inhabitat.com/sevilles-solar-power-tower)

A solar steam plant in Coalinga that also uses heliostat technology for extracting oil is on record stating that the steam generator is set to about 500° Celsius.
(http://abclocal.go.com/kDSn/story?section=news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Temperatures measured by the authors at the edge of the solar complex on the surface of a heliostat were approximately 200° Fahrenheit (~93° Celsius). Therefore, there is a gradient of temperature from the edge of the solar field to the tower that ranges from 200° to 900° Fahrenheit.

There is a phenomenon that occurs when the heliostats are focused on the tower and electricity is being generated. The phenomenon can be described as either a circle of clouds around the tower or, at times, a cloud formed on the side that is receiving the solar reflection. It appears as though the tower is creating clouds. Currently we propose two hypotheses of why this "cloud" is formed. The first hypothesis is simply the presumption that the high heat associated with towers is condensing the air, and forming the

Figure 9: Tower 1 (bright white) is shown under power. Tower 2 (black) is not operating.

clouds. The second hypothesis is that this phenomenon does not represent clouds at all rather it is a place in space where the heliostats that are not being used to generate heat are focused. Under this scenario, it is a place where the mirrors focus the excess energy not being used to generate electricity.

Ivanpah employees and OLE staff noticed that close to the periphery of the tower and within the reflected solar field area, streams of smoke rise when an object crosses the solar flux fields aimed at the tower. Ivanpah employees used the term "streamers" to characterize this occurrence.

When OLE staff visited the Ivanpah Solar plant, we observed many streamer events. It is claimed that these events represent the combustion of loose debris, or insects. Although some of the events are likely that, there were instances in which the amount of smoke produced by the ignition could only be explained by a larger flammable biomass such as a bird. Indeed OLE staff observed birds entering the solar flux and igniting, consequently becoming a streamer.

OLE staff observed an average of one streamer event every two minutes. It appeared that the streamer events occurred more frequently within the "cloud" area adjacent to the tower. Therefore we hypothesize that the "cloud" has a very high temperature that is igniting all material that traverses its field.
One possible explanation of this this phenomenon is that the "cloud" is a convergent location where heliostats are "parked" when not in use. Conversely it undermines the condensation hypothesis, given that birds flying through condensation clouds will not spontaneously ignite.

Temperatures required to burn feathers

Many of the carcasses recovered from the Ivanpah Solar plant after the plant became operational showed singing of feathers as shown in Figure 10.

Figure 10: Singed feathers from a Northern Rough-winged Swallow

In order to investigate at what temperature feathers burn/singe, we exposed feathers to different air temperatures. Each feather was exposed to a stream of helium and air for 30 seconds. The results indicate that at 400° Celsius (752° Fahrenheit) after 30 seconds the feather begins to degrade. But at 450° and

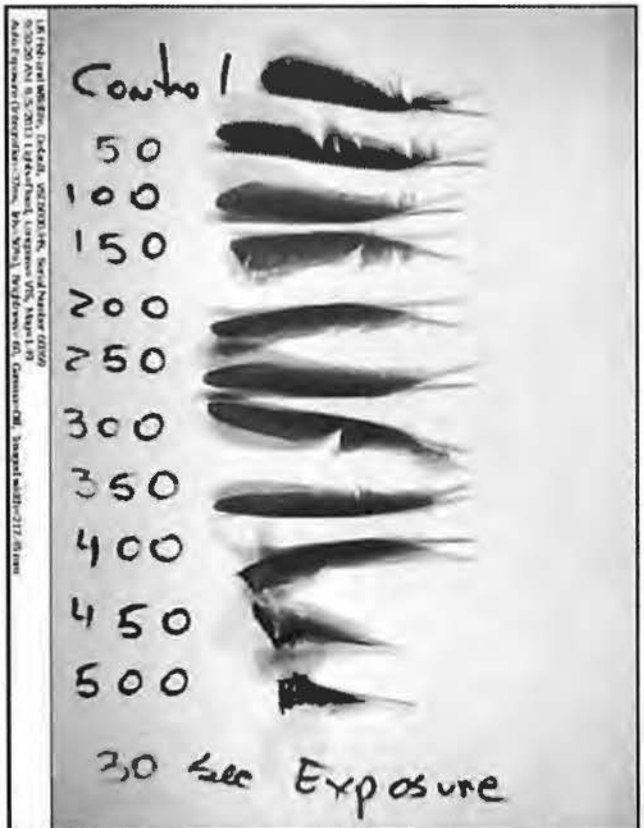


Figure 11: Results of exposing feathers to different temperatures (in degrees Celsius)

500° Celsius (842° and 932° Fahrenheit respectively) the feathers singed as soon as they made contact with the superheated air (Figure 11). Therefore, when singed birds are found, it can be inferred that the temperatures in the solar flux at the time a bird flew through it was at least 400° Celsius (752° Fahrenheit). This inference is consistent with the desired operating temperature of a power tower solar boiler (482° Celsius).

The fact that a bird will catch on fire as it flies through the solar flux has been confirmed by a Chevron engineer who works at the Coalinga Chevron Steam plant, a joint venture of Chevron and BrightSource Solar. (http://abclocal.go.com/kDSn/story?section= news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Conclusions and Recommendations

In summary, three main causes of avian mortality were identified at these facilities: impact trauma, predation and solar flux. Birds at all three types of solar plants were susceptible to impact trauma and predators. Solar flux injury was unique to the power tower facility. Solar facilities, in general, do not appear to attract particular species, rather an ecological variety of birds are vulnerable. That said, certain mortality and species trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions include placing perch-guards on power tower railings near the flux field, properly netting or otherwise covering ponds, tilting heliostat mirrors during washing and suspending power tower operation at peak migration times.

Visual cues should be retrofitted to existing panels and incorporated into new panel design. These cues may include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other. This arrangement has been shown to significantly reduce the number of passerines hitting expanses of windows on commercial buildings. Spacing of 10 cm eliminates window strikes altogether. Further exploration of panel design and orientation should be undertaken with researchers experienced in the field (Daneil Klem Jr. of Muhlenberg College) to determine causes for the high rate of impact trauma, and designs optimized to reduce these mortalities.

Challenges to data collection included rapid degradation of carcass quality hindering cause of death and species determination; large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; and inconsistent documentation of carcass history. Searcher efficiency has been shown to have varying influences on carcass recovery with anywhere from 30% to 90% detection of small birds achieved in studies done at wind plants (Erickson et al., 2005). Scavengers may also remove substantial numbers of carcasses. In studies done on agricultural fields, up to 90% of small bird carcasses were lost within 24 hours (Balcomb, 1986; Wobeser and Wobeser, 1992). OLE staff observed apparently resident ravens at the Ivanpah power tower. Ravens are efficient scavengers, and could remove large numbers of small bird carcasses from the tower vicinity. (Erickson, W. P., G. D. Johnson, and D. P. Young, Jr., 2005, A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions: U S Forest Service General Technical Report PSW, v. 191, p. 1029-1042; Balcomb, R., 1986, Songbird carcasses disappear rapidly from agricultural fields: Auk, v. 103, p. 817-820; Wobeser, G., and A. G. Wobeser, 1992, Carcass disappearance and estimation of mortality in a simulated die-off of small birds: Journal of Wildlife Diseases, v. 28, p. 548-554.)

Given these variables it is difficult to know the true scope of avian mortality at these facilities. The numbers of dead birds are likely underrepresented, perhaps vastly so. Observational and statistical studies to account for carcass loss may help us to gain a better sense of how many birds are being killed. Complete histories would help us to identify factors (such as vertical placement of mirrors) leading to mortalities. Continued monitoring is also advised as these facilities transition from construction to full operation. Of especial concern is the Ivanpah facility which was not fully-functioning at the time of the latest carcass submissions. In fact, all but 7 of the carcasses with solar flux injury and reported dates of collection were found at or prior to the USFWS site visit (October 21-24, 2013) and, therefore, represent flux mortality from a facility operating at only 33% capacity. Investigation into bat and insect mortalities at the power tower site should also be pursued.

ACKNOWLEDGMENTS

We wish to acknowledge the invaluable assistance and insights of S.A. Michael Clark and S.A. Ed Nieves.

Appendix 1. List of all 71 species recovered from the three solar energy sites. In this table, remains of closely related taxa that could not be definitively identified (e.g. Cinnamon/Blue-winged Teal and Black-throated/Sage Sparrow) are assigned to the biogeographically more likely taxon. In all such cases, the possible taxa are ecologically similar. All of these species are MBTA-listed.

SPECIES		Zone	Residency	Sites	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	DS,IV	5
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	DS	1
Western Grebe	*Aechmorphorus occidentalis*	water	migrant	DS	9
Eared Grebe	*Podiceps nigricollis*	water	migrant	DS,GN	5
Brown Pelican	*Pelecanus occidentalis*	water	migrant	DS	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	DS	2
Great Blue Heron	*Ardea herodias*	water	migrant	GN	1
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	DS	1
Cooper's Hawk	*Accipiter cooperii*	air	migrant	IV	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	IV	1
American Kestrel	*Falco sparverius*	air	resident	GN,IV	2
Peregrine Falcon	*Falco peregrinus*	air	resident	IV	1
American Coot	*Fulica americana*	water	migrant	DS, IV	12
Yuma Clapper Rail	*Rallus longirostris yumanensis*	water	resident	DS	1
Sora	*Porzana carolina*	water	migrant	DS,IV	2
American Avocet	*Recurvirostra americana*	water	migrant	DS	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	IV	2
Ring-billed Gull	*Larus delawarensis*	water	migrant	GN	2
California Gull	*Larus californianus*	water	resident	GN	1
Greater Roadrunner	*Geococcyx californianus*	terr	resident	IV	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	IV	1
Mourning Dove	*Zenaida macroura*	terr	resident	DS, IV	14
White-winged Dove	*Zenaida asiatica*	terr	resident	DS,GN	2
Barn Owl	*Tyto alba*	terr	resident	IV	1
Lesser nighthawk	*Chordeiles acutipennis*	air	resident	DS,GN,IV	7
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	DS,IV	2
White-throated Swift	*Aeronautes saxatalis*	air	resident	IV	1
Costa's Hummingbird	*Calypte costae*	air	resident	DS	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	IV	1
Northern Flicker	*Colaptes auratus*	terr	resident	IV	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	DS,IV	2
Say's Phoebe	*Sayornis saya*	air	resident	GN	2
Black Phoebe	*Sayornis nigricollis*	air	resident	DS	1
Loggerhead shrike	*Lanius ludovicianus*	terr	resident	DS,IV	5
Warbling Vireo	*Vireo gilvus*	terr	migrant	IV	1
Common Raven	*Corvus corax*	terr	resident	DS,IV	3
Horned Lark	*Eremophila alpestris*	terr	migrant	DS	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	DS,GN,IV	5

SPECIES		Zone	Residency	Sites	MNI
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	GN	5
No. Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	IV	2
Verdin	*Auriparus flaviceps*	terr	resident	IV	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	IV	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	IV	1
American Pipit	*Anthus rubescens*	terr	migrant	IV	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	IV	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	IV	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	IV	14
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	IV	1
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	GN	1
Townsend's warbler	*Setophaga townsendi*	terr	migrant	DS,IV	4
Yellow Warbler	*Setophaga petechia*	terr	migrant	IV	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	IV	1
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	IV	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	DS,IV	4
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	DS	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	DS,IV	4
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	DS,GN	2
Lazuli Bunting	*Passerina caerulea*	terr	migrant	IV	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	IV	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	IV	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	IV	3
Chipping Sparrow	*Spizella passerina*	terr	resident	GN,IV	4
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	DS,IV	4
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	DS,IV	3
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	IV	6
Pine Siskin	*Spinus pinus*	terr	migrant	IV	1
House Finch	*Carpodacus mexicanus*	terr	resident	IV	13
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	DS,IV	5
Brown-headed Cowbird	*Molothrus ater*	terr	resident	DS,GN,IV	8
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	DS	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	GN	2

Species recovered from one site: 47
two sites: 18
three sites: 5

Appendix 2. Species with solar flux burns

Common Name	Scientific name	
Yellow-rumped warbler	*Setophaga coronata*	12
House finch	*Carpodacus mexicanus*	10
Chipping sparrow	*Spizella passerina*	2
Unidentified warbler	*Parulidae*	2
Verdin	*Auriparus flaviceps*	2
Great-tailed grackle	*Quiscalus mexicanus*	2
Lucy's warbler	*Oreathlypis luciae*	1
Wilson's warbler	*Cardellina pusilla*	1
MacGillivray's warbler	*Oporornis tolmei*	1
Black-throated gray warbler	*Setophaga nigrescens*	1
Townsend's warbler	*Setophaga townsendi*	1
Orange-crowned warbler	*Oreothlypis celata*	1
Blue-gray gnatcatcher	*Polioptila caerulea*	1
Unidentified swallow	*Hirundinidae*	1
Northern rough-winged swallow	*Stelgidopteryx serripennis*	1
Warbling vireo	*Vireo gilvus*	1
Unidentified hummingbird	*Selasphorus sp.*	1
Unidentified passerine	Passeriformes	1
Unidentified finch	*Carpodacus sp.*	1
Lazuli bunting	*Passerina caerulea*	1
Unidentified sparrow	*Spizella species*	1
Unidentified blackbird	*Icteridae*	1
Peregrine falcon	*Falco peregrinus*	1

Response to Letter 14

Response 14-1

The commenter states that the environment of the project area is sacred to tribal members and that the cultural resource sections of the Draft EIR/EA is inadequate.

For the purposes of fulfilling State, Federal, and County guidelines, a cultural resources analytical document written to support the Final EIR/EA is required to establish whether or not cultural resources of significance under CEQA (*historical resources*) and whether or not cultural resources of significance under NEPA and NHPA (*historic properties*)will be negatively affected by the Project. The process of identifying and evaluating cultural resources that could be impacted by construction was undertaken with the full knowledge and concurrence of County of Riverside Archaeologist Leslie Mouriquand, M.A., her replacement at the County, and BLM archaeologists. Any prehistoric cultural resources bearing State and/or Federal significance will be avoided, and impacts to certain historic-era resources will be mitigated for. Consequently, the County and BLM believe that the analysis is adequate for the purposes of compliance.

Response 14-2

The commenter states that the Project site is in an area of traditional cultural importance to Indian tribes because it is located within an ancestral homeland, and that certain language in the document is unsupported.

The language included in *Section 4.2.5 Alternative 1/Analysis of Direct and Indirect Impacts/Construction, Paragraph 1* is culturally insensitive: that sentence is underlined below. The portion of the Final EIR/EA paragraph referenced by Letter 14 Section 14-1 currently reads as follows:

> …..These activities could directly displace or damage prehistoric and historic archaeological resources that may be on the surface or hidden below grade and could physically remove surface remnants of the World War II-era Blythe Army Air Base (BAAB). <u>Though the Project area is not considered to encompass specific areas of traditional cultural importance to Indian tribes</u>, it is within Tribal traditional ancestral homelands: consultation with interested tribes is necessary. In addition, indirect effects such as increasing public access to sensitive resources resulting in increased vandalism could potentially occur in some cases, although for the Project, public access to the solar facility site will be restricted.

This section of the paragraph has been changed to read as follows:

> …..These activities could directly displace or damage prehistoric and historic archaeological resources that may be on the surface or hidden below grade and could physically remove surface remnants of the World War II-era Blythe Army Air Base (BAAB). In addition, indirect effects such as increasing public access to sensitive resources resulting in increased vandalism could potentially occur in some cases, although for the Project, public access to the solar facility site will be restricted.

Please refer to pages 59 of the Errata in Response to Comments in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 14-3

The commenter states that baseline data written to support cultural resource interpretations in the Final EIR/EA is flawed and that important data is not discussed.

The potential for ancestral trails in this region was thoroughly addressed in the Final EIR/EA and in the technical report.

The map of the 1957 University of California archaeological survey cited by the commenter showing the locations of certain trails has been posted on-line by the CEC (CEC 2010). This document demonstrates that the trail in question skirts the Project area, as this trail is located to the north and northwest of the main junction of McCoy Wash and the Project area.

Both the County and the BLM recognize that ancestors' trails have existed in the region for millennia and were used up to very recent times, as is detailed by Laylander and Schaefer (2010). These scientists note that certain environments, such as desert pavement, allow for good preservation of trails in this region. Plowed farmland does not. The biological analysis written in support of the Final EIR/EA stated that only 6 acres of the 3200 acres that could hold passive solar panels lies on undisturbed and unfarmed ground; the remainder is located on ground previously disturbed by agricultural activity via farm-related plowing or on an active farm. The cultural background research, which was carefully reviewed by the County Archaeologist, showed that no known trails lie in the solar array field. Much of the proposed transmission line linking the solar array field to the substation, which is under the jurisdiction of the BLM, is located on undisturbed ground of the dune/blow sand type. No trails are known to cross the transmission line corridor. For these reason, the cultural resource background data underlying the analysis is considered adequate.

Response 14-4

The commenter states that more data are needed regarding potential subsurface cultural resources.

Both the County and the BLM believe that the methodology used during the creation of the archaeological technical report is compliant and adequate. The BLM has sought concurrence from the State Historic Preservation Office specifically with regard to significance assessments recommended for each site in the APE by POWER archaeological staff. SHPO has concurred with the BLM that none of the known prehistoric cultural resources in the project area are significant: meaning that none of the known sites are eligible for inclusion on the National Register. Because trails are a cultural resource, and because none were identified in the Project area, the whole of the analysis is considered accurate.

With regard to buried cultural resources, please note that the land that consists of plowed farmland, and the Project has not been precisely designed. See response to comment 12-10. Accordingly, subsurface testing could only be undertaken in random locations that may or may not prove relevant, and that subsurface testing would itself cause impacts to buried resources that the mitigation measure is intended to avoid. This is, in part, why the County and BLM will require monitoring during construction, which will ensure that only those areas proposed for excavation need be disturbed for testing, and that excavation plans can be adjusted appropriately as monitoring reveals a need to do so. The County has issued draft Conditions of Approval associated with CUP03685 (This is the County permit number assigned to this Project) on the County's TLMA website, which confirm that the mitigation will be made an enforceable condition of approval. Elements of the draft Conditions of Approval of the CUP mandate that prior to receiving grading permits a professional archaeologist must generate a project-specific mitigation monitoring plan with language in that plan requiring archaeological monitoring during construction (CUP03685: 60. PLANNING.001), a special interest monitor for potential impacts to historic-era cultural resources (CUP03685:60. PLANNING.002), and tribal monitoring representation

(CUP03685: 60. PLANNING.006). These specialists will help ensure that sensitive, but otherwise unknown cultural resources encountered during construction can be mitigated for in a respectful and sensitive manner. See Response 14-14.

Response 14-5

The commenter asserts that not enough data has been provided that describes to what degree the solar array field has been previously disturbed.

The biological section of the Final EIR/EA provides tables discussing the ratios of farming-related disturbed land to undisturbed land for both the solar array field of the Project and the transmission line section of the Project. These, as well as the supporting biological survey report for the solar array field, demonstrate that 78.22 of 3672.95 acres (2.1 percent) consist of unfarmed land, which the rest is disturbed land. The biological section of the Final EIR/EA demonstrate that the disturbed lands have been plowed for the purpose of irrigated crop growth. On the other hand, the biological survey report produced for the transmission line alternative(s) section of the Project demonstrates that over 99 percent of the land along the pole corridor is undisturbed and covered with native vegetative communities. With these data in hand, the cultural resources technical report noted that in those areas exhibiting cultural resources, the vast majority of the entire Project, as well as all prehistoric cultural resources within it, have been heavily disturbed by farming.

Response 14-6

The commenter asserts that the DEIR/EA provides no basis for concluding that no significant impacts could occur to the isolated finds.

The evidence supporting the conclusion that the isolated finds are not associated with significant impacts is set forth in Section 6.2.1 of Appendix D1, which describes each isolated find in detail. Also, as noted on page 4-150 of the Final EIR/EA,

> Table 4.2.5-1 below shows that a portion of one proposed historic district, five historic-era archaeological sites, two historic-era built resources, 16 historic-era isolates, five prehistoric isolates, and one isolate with historic and prehistoric elements were identified within the footprint of the Alternative 1 (refer to Appendix D1). In addition, POWER found two historic-era isolates and one prehistoric isolate identified within the proposed foorprint of the Alternative 1 gen-tie line (refer to Appendix D2) for a combined total of 34 cultural resources within this Alternative. As noted in Section 6.7 of this EIS/EIR, the BLM consulted with SHPO in 2013 and 2014 with regard to the formal findings and effects of the proposed Project on the sites located in the entire Project area, including each of the Alternatives (see BLM 2013, 2014 and SHPO 2013, 2014), and the NRHP eligibility determination column in Table 4.2.5-1 is derived from these documents. Given this, none of the sites located in the footprint of the Alternatives are considered historic properties pursuant to Section 106 of the NHPA and both the BLM and SHPO do not consider isolated artifacts eligible for the NRHP. Therefore, both the BLM and SHPO have concurred that the implementation of Alternative 1 as the Project would result in no adverse effects to historic properties pursuant to 36 CFR 800.5(b).

The isolated finds do not meet the criteria for inclusion in the NRHP or the CRHR, nor are they considered unique archaeological resources. This is because isolated artifacts do not carry enough information to pass the threshold of significance for listing on the NRHP and the CRHR. The isolates:

1) do not make a significant contribution to the broad patterns of history (NRHP Criterion A/CRHR Criterion 1);
2) are not associated with the lives of significant persons (NRHP Criterion B/CRHR Criterion 2);
3) do not embody the distinctive characteristics of a type, period, or methods of construction, or represent the work of a master, or possess high artistic value (NRHP Criterion C/CRHR Criterion 3); and
4) additional future study would not obtain prehistoric or historic information important in prehistory or history (NRHP Criterion D/CRHR Criterion 4).

Unique archaeological resources are those defined in PRC 21083.2(g) and (h). As quoted therein:

(g) As used in this section, "unique archaeological resource" means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:
  (1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
  (2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.
  (3) Is directly associated with a scientifically recognized important prehistoric or historic event or person.
  (h) As used in this section, "nonunique archaeological resource" means an archaeological artifact, object, or site which does not meet the criteria in subdivision (g). A nonunique archaeological resource need be given no further consideration, other than the simple recording of its existence by the lead agency if it so elects.

SHPO and the BLM agree with this conclusion regarding the isolated finds in the project area. No cultural resources were removed from the Project site during cultural resources surveys.

The cultural resource surveys (refer to Appendix D1 and D2) did not find any of the isolated artifacts to be “unique” because they did not meet the uniqueness threshold as noted above in PRC Section 21083.2(g)(1,2 and 3). The isolated artifacts are considered “nonunique” and no further mitigation for effect is required.

Response 14-7

The commenter asserts that the evaluation of site P33-020001 must include consultation with affected Tribes before the analysis of eligibility is confirmed.

Resource P33-20001 is an isolated potdrop. All the artifacts at this location were found to belong to one partial vessel and were located in one small location on plowed soil. As such, it was recorded and assessed as an isolate utilizing County and federal methods and procedures. BLM did consult with tribes following Section 106 guidelines and that the results of that consultation were provided to SHPO. SHPO concurred with the BLM on the list of sites considered not eligible. BLM also considered P33-20001 to be an isolate, therefore, no evaluation for significance was necessary. See Response 14-6 regarding isolates.

Response 14-8

The commenter contends the Project would result in significant impacts to land that is uniquely important to the Tribe and the proposed Project would have a disproportionate effect on cultural resources on Colorado River Indian Tribes (CRIT) or other Tribes.

The analysis in the Final EIR/EA, Section 4.2.13, *Population, Housing, Public Services, Utilities, and Socioeconomics,* includes an analysis of the impacts of the Project and Alternatives on environmental justice issues and follows guidelines described in the CEQ's Environmental Justice Guidance under NEPA (CEQ 1997). The approach to determine potential adverse and significant impacts relative to environmental justice considers two factors: 1) assessment of whether impacts associated with construction and operation of the proposed Project would result in a high potential for adverse human health or environmental impacts; and 2) for impacts that are high and adverse, determination as to whether these impacts would disproportionately affect minority and low-income populations.

As discussed in Final EIR/EA, Section 4.2.13, operation and maintenance activities would not adversely affect any particular population, including minority or low-income populations. The Project would not result in significant air quality impacts or impacts to surrounding communities from emissions of toxic air contaminants. The Project would not involve wastewater discharges that could affect drinking water supplies or other water bodies during operation and maintenance activities. As such, there would be no direct or indirect adverse health or environmental effects associated with construction and operations and maintenance activities. Furthermore, operation of the proposed Project would have positive impacts on the local economy through the creation of local employment opportunities and through local expenditures for supplies and services. In addition to the jobs directly related to construction and operation of the Project, additional indirect and induced jobs would be provided by construction and operation of the Project. These impacts would occur on an annual basis for the duration of Project operation.

The Final EIR/EA, Section 4.2.5, *Cultural Resources*, states that within the solar facility site and gen-tie line, 32 archaeological resources (both historic and prehistoric), including BAAB and isolated finds, were documented within the Project's APE. None of these resources have been determined eligible to the CRHR and none qualify as unique archaeological resources. Therefore, the Project would not cause a substantial adverse change in the significance of an archaeological resource.

It is acknowledged that the possibility exists that archaeological resources could be located subsurface and could be unearthed during construction. The potential for inadvertent discovery of archaeological resources is considerable and a potentially significant impact of the Project. The disturbance could not feasibly be avoided because the likelihood of undiscovered resources exists throughout the Project area; reconfiguring the Project area would not reduce the impact. The Project would incorporate a monitoring program to discover and evaluate previously undiscovered resources found during construction (Mitigation Measures Cultural-2, Cultural-3, and Cultural-5). Implemented, these measures would reduce the impact to less than significant.

Response 14-9

The commenter states that the CEQ Guidelines do not mandate adherence to the use of a six mile radius to determine environmental justice effects of the Project.

For the purposes of the environmental justice analysis in the Final EIR/EA, screening, race, ethnic origin, and poverty status were obtained for the Project area and surrounding area, including the City of Blythe and the County of Riverside. The CEQ has oversight responsibility for the federal government's compliance. The CEQ, in consultation with the EPA and other agencies, has developed environmental justice guidance to assist federal agencies with NEPA administration. The guidelines suggest a demographic screening process analyze the census block group demographics within a six-mile radius around a proposed site, then determine if the population within this radius can be considered an "environmental justice population," i.e., if within that radius the population is greater than fifty percent minority or low income (CEQ 1997). The environmental justice study area is illustrated in Figure 3.2.13-2 of the Final EIR/EA (page 3-161).

The “affected area” for determining environmental justice impacts for the proposed Project includes the geographic area surrounding the site within which adverse human health or environmental impacts could potentially be experienced. While the analysis in the Final EIR/EA followed the CEQ guidelines to identify populations within the six mile radius, cultural resources were analyzed within a larger context. Section 4.2.5, *Cultural Resources*, analyzed the direct, indirect, and cumulative impacts of the proposed Project on cultural resources. Page 4-170 describes the geographic and temporal scopes of the cumulative analysis:

> **Geographic Scope**
>
> The past, present, and reasonably foreseeable projects considered to be the cumulative scenario for this Project are listed in Table 4.1-1. The geographic extent of these projects in relation to the BMSP is shown in Figure 4.1-1, which includes a number of the large-scale renewable energy projects and related transmission lines and also includes some small-scale land development projects. Each of these projects would result in ground disturbance, primarily during Project construction that could damage or destroy archaeological sites; however, ground-disturbing activities during operation and maintenance and decommissioning could also potentially affect cultural resources.
>
> **Temporal Scope**
>
> Cultural resources are non-renewable; any loss or physical damage to these resources is permanent. They would be subject to direct impacts primarily during Project construction; however, impacts could occur during any ground-disturbing activities during operation and maintenance and decommissioning. For purposes of the cumulative analysis, the temporal impact scope is the life of the Project.

The scope of the cultural resources analysis did not encompass the CRIT Reservation because the nearest tribal reservation land is located approximately 11 miles east-northeast of the Project area and three miles north of Ehrenberg, AZ. CRIT lands are therefore is too far away for the purposes of the cultural resources or the environmental justice analysis The analysis in the Final EIR/EA determined that the construction, operation and maintenance, and decommissioning of the proposed Project would not affect any historic properties under Section 106 of the NHPA nor would the proposed Project impact resources under NEPA. Under CEQA, the proposed Project would not impact any known historical resources, unique archaeological resources or human remains. Unanticipated impacts/effects could occur to previously undiscovered cultural resources, but these impacts would be reduced by implementing monitoring and other procedures.

The Final EIR/EA states (page 4-172) that, of the projects listed in Table 4.1-1, some projects could adversely affect eligible prehistoric habitation sites, quarries, or trails, and some projects could directly or indirectly adversely affect prehistoric and historic landscapes and resources of special importance to Native American groups. Though the implementation of cumulative projects could collectively impact cultural resources in the geographic area, the proposed Project’s contribution to this cumulative impact would be relatively minor because no known eligible resources would be impacted by the proposed Project.

Because the Final EIR/EA, Section 4.2.5, *Cultural Resources,* determined that the Project would not cause a substantial adverse change in the significance of an archaeological resource nor would it result in a considerable contribution to a cumulative impact, the proposed Project would not result in an adverse environmental justice impact relative to Native American groups. It is acknowledged that the less than significant impacts of the proposed Project and action alternatives would affect local tribes.

Response 14-10

The commenter states that the Project harms cultural resources and the Draft EIR/EA must consider the larger context of large scale industrial solar development in the ancestral homeland of CRIT and the analysis in the document does not address cumulative impacts in detail.

The analysis in Section 4.2.5, *Cultural Resources,* provides a detailed cumulative analysis relative to cultural resources. The past, present, and reasonably foreseeable projects considered to be the cumulative scenario for this Project are listed in Table 4.1-1 in the Final EIR/EA (page 4-7). The geographic extent of these projects in relation to the proposed Project is shown in Figure 4.1-1 of the Final EIR/EA (page 4-11). The cumulative project list includes a number of the large-scale renewable energy projects and related transmission lines and also includes some small-scale land development projects. Each of these projects would result in ground disturbance, primarily during Project construction that could damage or destroy archaeological sites; however, ground-disturbing activities during operation and maintenance and decommissioning could also potentially affect cultural resources.

The cumulative analysis in the Final EIR/EA acknowledges that it is likely that some of projects listed in Table 4.1-1 could adversely affect cultural resources including some projects that could adversely affect eligible prehistoric habitation sites, quarries, or trails, and some projects could directly or indirectly adversely affect prehistoric and historic landscapes and resources of special importance to Native American groups. However, as stated in the Final EIR/EA, while implementation of cumulative projects could collectively impact cultural resources in the geographic area, the proposed Project's contribution to this cumulative impact would be relatively minor because no known eligible resources would be impacted by the proposed Project and, to the extent previously undiscovered resources could be unearthed by various ground-disturbing activities, as noted on Final EIR/EA page 4-156, impacts to those resources would be mitigated by Measures Cultural-2, Cultural-3 and Cultural-5.

Because the Final EIR/EA, Section 4.2.5, *Cultural Resources,* determined that the Project would not cause a substantial adverse change in the significance of an archaeological resource nor would it result in a considerable contribution to the cumulative effects of all these projects listed in Table 4.1-1, the proposed Project would not result in an adverse environmental justice impact relative to Native American groups.

Response 14-11

The commenter states the Draft EIR/EA needs to provide a thorough discussion of impacts to cultural resources in the region as a whole.

As stated above in Response to 14-10, the cumulative analysis in Section 4.2.5, *Cultural Resources*, provides a detailed cumulative analysis relative to cultural resources. The cumulative project list includes a number of the large-scale renewable energy projects and related transmission lines and also includes some small-scale land development projects. Each of these projects would result in ground disturbance, primarily during Project construction that could damage or destroy archaeological sites; however, ground-disturbing activities during operation and maintenance and decommissioning could also potentially affect cultural resources.

The Final EIR/EA does acknowledge that cultural resources are non-renewable; any loss or physical damage to these resources is permanent. Impacts to cultural resources could occur during any ground-disturbing activities during construction, operation and maintenance and decommissioning. For that reason the cumulative analysis in the Final EIR/EA considers the temporal impact scope as the life of the Project.

The cumulative analysis in Section 4.2.5, *Cultural Resources*, acknowledges that it is likely that some of projects listed in Table 4.1-1 could adversely affect cultural resources including some projects that could adversely affect eligible prehistoric habitation sites, quarries, or trails, and some projects could directly or indirectly adversely affect prehistoric and historic landscapes and resources of special importance to Native American groups. However, as stated in the Final EIR/EA, while implementation of cumulative projects could collectively impact cultural resources in the geographic area, the proposed Project's contribution to this cumulative impact would be relatively minor because no known eligible resources would be impacted by the proposed Project.

Response 14-12

The commenter states the Draft EIR/EA omits the EnviroMission Limited Solar Updraft Tower from the cumulative impact analysis (shown on Table 4.1-1 in the Final EIR/EA).

The EnviroMission Limited Solar Updraft Tower project does not currently have an application for development on file with the County of La Paz (Camacho 2014); therefore, EnviroMission Limited Solar Updraft Tower does not constitute a "probable future project."

Response 14-13

The commenter asserts that the Draft EIR/EA treated construction of another solar project as the baseline and/or "No Project" alternative , and also that the discussion of continued agricultural use of the Project site as the No Project alternative is based upon speculation. The commenter states the No Project Alternative discussion must be revised to accurately portray what could happen if the project is not built.

The Final EIR/EA does not treat another solar project as either the baseline or the No Project scenario. As stated in the Final EIR/EA the commenter cites (page 4-157): "Alternative 2, the No Project Alternative, assumes that the proposed Project would not be constructed and that existing agricultural operations would continue." The No Project alternative is therefore not another solar project, but a continuation of existing baseline circumstances, i.e. continued agricultural use. The conclusion that with the No Project Alternative, agriculture is likely to continue is based upon this history of agricultural use of the Project site, the lack of any facilities onsite for other uses, existing zoning requirements, and the location of the site within the service area of the Palo Verde Irrigation District, which has Priority 3b rights to the Colorado River water for agricultural purposes. Additionally, there is an application to enroll 1,485 acres into Williamson Act, and to change the zoning from W-2 to Agriculture. The fact that the Project proposes agricultural uses as interim uses pending conversion to solar facilities further supports that conclusion.

The commenter references another statement on page 4-157 of the Final EIR/EA relating to the potential for other solar projects. The entirety of that statement, in context, reads as follows:

> Under the No Project Alternative, there would be no new impacts to cultural resources relative to any CEQA significance criteria. However, continued agricultural operations could result in disturbance to historic or archaeological resources. Also, in the absence of this Project, other renewable energy projects may be constructed to meet State mandates at other locations, and those projects would likely have similar impacts as the proposed Project in those locations.

The quoted language merely notes that, while the baseline and No Project scenarios consist of existing and continued agricultural uses, it is conceivable that another solar project could be built.

As explained in the Final EIR/EA, the baseline used for both CEQA and NEPA analysis is the conditions existing around the time of issuance of the Notice of Preparation in November 2011 (see Final EIR/EA, page 1-21). Around that time, approximately 1,951 acres of the 7,377 acre-area that comprises the solar facility site and a surrounding 0.25-mile buffer, were in agricultural production (see Final EIR/EA, page 3-20). This circumstance describes the baseline circumstances. As the commenter notes, current aerial photographs show less of the site in agricultural production, since some production ceased due to anticipated change in ownership, potential development of the solar facility, and lack of a comprehensive program to revive agricultural use. The Applicant for the proposed Project now proposes to bring all of the project site under one ownership, and to implement a program to enhance and revive agricultural uses on portions of the site not needed for immediate solar development (see Final EIR/EA, page 1-2). This further indicates that agriculture remains a viable and likely use of the site. Based upon the evidence referenced above, it is projected that the extent of agricultural use that existed in baseline circumstances would be reinstated under the No Project scenario.

As noted in Response 14-5, agricultural activities have disturbed nearly all topsoil in the solar array field, and this has severely damaged the observed historical and prehistoric sites. This is the thrust of the cultural resource technical analysis for the No Project Alternative in the Final EIR/EA and in the supporting archaeological report. No clarifying language is needed because the conclusion, that further agricultural activity will further damage the already-damaged sites, is accurate.

Response 14-14

The commenter asserts that the cultural resource mitigation measures in the Draft EIR/EA are, in part, deferred mitigation under CEQA Guidelines and that such deference prevents full public review of the mitigation measures.

Because the Final EIR/EA is a joint document, the BLM has reviewed the mitigation measures and helped to structure specific mitigation measure language. County imposed (CEQA) cultural resource mitigation measures for specific sites are not needed when the sites identified are not historical resources. However, mitigation measures for impacts due to the potential to uncover unknown (buried) cultural resources are needed because the Final EIR/EA recognized that there is a chance that buried significant cultural resources will be encountered during construction. The type, location and quantity of such resources cannot be specifically anticipated. See Response 14-4.

When an EIR is prepared, CEQA Guidelines allow the County to adopt general rather than specific mitigation measures. There are tests that must be met before general measures can be adopted. General mitigation measures include: 1) specific future actions that must be accomplished; 2) performance standards that must be met; and 3) methods for accomplishing the mitigation. The mitigation measures in an EIR can be more general than specific when: 4) full information necessary to develop measures is not currently available; 5) mitigation involves technical design that is not currently available; and 6) the general mitigation measure will lead to specific mitigation results.

For the purposes of the cultural resource analysis in the Final EIR/EA, each of the abovementioned tests have been met: 1) a Cultural Resource Management Plan (CRMP) must be developed; 2) performance standards are detailed in Cultural-1 and Cultural-2 and in BMP-13 and BMP-14; 3) the methods for accomplishing the mitigation are found in Cultural–5, Cultural-1 and Cultural-2; 4) specific project-related construction designs detailing the actual depth and horizontal location of construction down to the nearest centimeter relative to existing cultural resource sites cannot be created until the general project design is provided to the builder and surveyors who win the construction contract; 5) buried or otherwise unknown significant cultural resources cannot be anticipated until they are uncovered during project-related subsurface earthmoving; and 6) specific mitigation results will be detailed by a report written to fulfill measure Cultural–5.

The phrase *Prior to obtaining the project-related grading permit from the County of Riverside* has been added prior to the beginning of the paragraph in Mitigation Measure Cultural-3. Please refer to page 59 of the Errata in Response to Comments in Response to Comments section of this Final EIR/EA which reflects these changes to the text.

Response 14-15

The commenter asserts that the phrases "long term management plan", "long-term cultural resource management plan", and "robust construction monitoring plan" are confusing because these seem to represent three different management plans. The commenter states the Draft EIR/EA should provide a copy of the plan before the Draft EIR/EA is approved.

In the Final EIR/EA, the abovementioned phrases have been replaced with the phrase "cultural resource management plan", and acronym CRMP, where appropriate. Please see Responses 14-4 and 14-14 for additional information explaining why it is appropriate to develop further specifics once construction plans have been developed and when and if unknown cultural resources are discovered on the site.

Please refer to page 59 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

Response 14-16

The commenter asserts that project approval without publication of a CRMP may force the County and the BLM to address outstanding issues related to unanticipated cultural finds after construction has already begun.

The discovery of unanticipated finds are addressed in Measure Cultural–2, with the Projects' tribal representative specifically identified as an active member of the monitoring team and a stakeholder in the communication process. Once identified, further construction related impact at the location of the find cannot continue until appropriate preservation or further mitigation is delineated. The BLM shall be the lead authority of BLM-managed land, while the County shall be the lead authority on Non-federal land. See Responses 14-4, 14-14 and 14-15.

Response 14-17

The commenter states that avoidance of cultural resources is the preferred choice during CEQA compliance reviews. The commenter asserts that avoidance of such resources is downplayed by the Draft EIR/EA.

As noted in Section 4.2.5, *Cultural Resources*, appropriate sites would be designated Environmentally Sensitive areas and avoided by design. This section also notes that the County and BLM are legally required to avoid and/or minimize whenever feasible significant cultural resources (i.e. Historical Resources under CEQA Guidelines and Historic Properties under NEPA Guidelines) identified during the analysis. As detailed in Mitigation Measure Cultural-3, the Cultural Resources Management Plan (CRMP) shall map all cultural resources within the APE, as described in the Final EIR/EA. The CRMP shall also detail how resources, if any, are determined eligible or resources that are unevaluated but avoided by Project design, would be marked and protected as Environmentally Sensitive Areas during construction. The CRMP shall also map additional areas that are considered to be of high sensitivity for discovery of buried significant cultural resources, including burials, cremations, or sacred features.

The County advocates avoidance as the preferred choice; however, if the impact cannot be avoided, due to unknown or undetectable cultural resources, or mitigated for prior to the start of construction, Tribal stakeholders will be included in the decision-making process through the implementation of Mitigation Measure Cultural–4. The Applicant would make a good faith effort to enter into a contact with and retain monitors designated by Tribal representatives known as the Tribal Observer for the Project. Both the County and BLM believe that the inclusion of this measure gives the tribal community a voice in how work should occur if significant cultural resources are unearthed. Because there is the possibility that previously undiscovered archaeological resources could be unearthed by various ground-disturbing activities, Mitigation Measures Cultural-2, Cultural-3, and Cultural-5 (on pages 4-176 and 4-177 of the Final EIR/EA) would provide for monitoring and disposition of any artifacts unearthed during construction.

Additionally, Mitigation Measure Cultural-2 has been revised in the Final EIR/EA to include the statement, "<u>The County advocates avoidance as the preferred choice."</u> This change represents a correction to the Final EIR/EA which does not alter or change the conclusion of the Project's environmental analysis. Section 4.2.5, *Cultural Resources*, (page 4-176) of the Draft EIR/EA is hereby revised. Please refer to pages 60 and 61 of the Errata in Response to Comments section of this Final EIR/EA.

Because avoidance of significant cultural resources has been thoroughly addressed, there is no need to revise the analysis in the cultural resource section in the Final EIR/EA.

Response 14-18

The commenter states that the Tribe (CRIT) would like to see reburial as part of the mitigation measures if avoidance cannot be achieved.

Unknown or undetectable cultural resources may be encountered during construction, and, Tribal Observer(s) will be included in the decision-making process through the addition of Mitigation Measure Cultural–4. If resources are encountered that the Tribal stakeholder believes should be reburied *insitu*, the Tribal stakeholder can assert this need during the consultation process discussed in Mitigation Measure Cultural–2. Both the County and BLM believe that the inclusion of this measure gives the tribal community a voice in how work should occur if significant resources are unearthed. Should prehistoric human remains be encountered, Mitigation Measure Cultural–1 must apply to the discovery.

Response 14-19

The commenter states that data recovery is not an acceptable mitigation technique for newly discovered cultural resources

The County and the BLM recognize that avoidance of significant cultural resources during construction of the Project is preferred. However, if it is not feasible, data recovery is a legal option under CEQA Guidelines (Article 9, Section 15126.4(b)(C) and a negotiable issue within the BLM 8110 Handbook, Section 106 regulations, and 36 CFR Part 800.13. The Project Archaeologist may choose to excavate the exposed resource for the purpose of salvage data recovery, but that choice would be made after the opinions of all stakeholders are heard within the context of Mitigation Measure Cultural-2.

Response 14-20

The commenter states that portions of the Project are within the Riverside East Solar Energy Zone (SEZ) and therefore the Draft EIR/EA must include the "Design Features" from the BLM Programmatic Environmental Impact Statement (PEIS) for the SEZ to mitigate certain cultural resource-related impacts.

Only a small portion of the Project area lies within a Solar Energy Zone (SEZ). A portion of the gen-tie line for the proposed action (and alternatives) that would traverse BLM-managed lands. These lands are within the area governed by the CDCA Plan, as amended and within the Riverside East SEZ. Figure 1-4 (Chapter 1) in the Final EIR/EA illustrates the portion of the Project's gen-tie line that would traverse BLM-managed lands within the CDCA. Approximately 4.8 miles would extend outside of the solar facility and would be placed within a 125-foot-wide ROW and occupy 73 acres. Of this, 3.8 miles would traverse BLM-managed lands with 53 acres within the Riverside East (SEZ).

Thus, the land within the SEZ does not comprise the full-scale solar development upon which the PEIS focuses, but rather is the site of only a portion of the gen-tie line proposed to serve development outside the SEZ. Also, the BLM-managed lands within the Project area are designated Multiple-Use Class M (Moderate) which allows and contemplates energy and utility development. Appendix A, of the Riverside East SEZ PEIS list design features that would apply to solar energy projects submitted to the BLM for consideration. Appendix A notes, that due to site-specific circumstances, some features of the PEIS recommendations may not apply to all projects and further notes that the BLM develops specific design features on a project-by-project basis. In short, there are no blanket design measures that apply uniformly to all aspects of all projects in all circumstances, but rather that measures are addressed to fit the circumstances presented.

As noted Appendix A of the Riverside East SEZ PEIS lists certain design features as follows.

9) *Design Feature: The use of previously disturbed lands, rather than pristine lands, shall be encouraged.*

    Project Implementation of Design Measure: The gen-tie line corridors would pass through BLM lands and other private lands mainly comprised of desert scrub habitat and disturbed lands associated with existing infrastructure.

10) *Design Feature: The BLM will consult with the appropriate SHPOs, the ACHP, and affected Native American governments and notify the public early in the planning process to identify issues and areas of concern regarding any proposed solar energy project. Such consultation is required by the NHPA and other authorities.*

    Project Implementation of Design Measure: Section 6.7.2 in the Final EIR/EA provides details on the status of consultations as of the date of the document. The BLM formally invited fifteen (listed in first bullet below) federally recognized tribes to consult on a government-to-government basis for the Blythe Mesa Gen-tie Project, as provided in the Executive Memorandum of April 29, 1994, Executive Order 13175, and Sections 101 and 106 of the National Historic Preservation Act (NHPA):

    - Aqua Caliente Band of Cahuilla Indians, Augustine Band of Cahuilla Indians, Cabazon Band of Mission Indians, Cahuilla Band of Mission Indians, Chemehuevi Indian Tribe, Cocopah Indian Tribe, Colorado River Indian Tribes, Fort Mojave Indian Tribe, Fort Yuma Quechan Tribe, Morongo Band of Mission Indians, Ramona Band of Mission Indians, San Manuel Band of Mission Indians, Soboba Band of Luiseno Indians, Torres-Martinez Desert Cahuilla Indians, Twenty-Nine Palms Band of Mission Indians.
    - All of the federally recognized tribes were invited to be consulting parties as provided in 36 C.F.R. Part 800, the implementing regulations for Section 106 of the NHPA.
    - The BLM has received formal responses from four Indian tribes regarding their interest in the project, comments on the EA, and/or requests to consult in a government-to-

government manner, including: Aqua Caliente Band of Cahuilla Indians, Augustine Band of Cahuilla Indians, Colorado River Indian Tribes, and Soboba Band of Luiseno Indians.

Consistent with policy, the BLM notified and formally requested consultation with Indian tribes at the earliest stages of the project planning and review by letter on March 12, 2012, and has formally reiterated requests to consult in all subsequent correspondence. The BLM formally notified Indian tribes of its determinations of eligibility and finding of no adverse effect to historic properties for the Project by letter on August 8, 2013. The BLM Field Manager and staff have actively responded to all requests to meet with tribal leaders and staff at tribal offices throughout project review.

The BLM sent a letter on August 7, 2013 to the California SHPO regarding the proposed Project. The purpose of the letter was to notify the SHPO of the Project and to initiate formal consultation on the Blythe Mesa Solar Project. The letter also requested that the SHPO combine consultation on the identification efforts with consultation on the determinations of eligibility and findings of effects. The letter then described Identification Efforts, Evaluation Efforts, Analysis of Effects, Agency Determinations of Eligibility, and Agency Finding of Effect. The BLM found that there would be no historic properties adversely affected by the undertaking.

On October 21, 2013, the BLM received a response from the SHPO requesting more information on the BLM's determinations and findings on the Blythe Army Air Base and the remnant historic features located within the APE (i.e., hospital facility, barracks, fire station, and warehouses). The BLM sent this additional information to the SHPO in January 2014.

The BLM sent a letter on August 7, 2013 to the ACHP regarding the proposed Project. In this letter, the BLM invited the ACHP to participate in the Section 106 process in accordance with 36 CFR Part 800.2(b)(1). On August 14, 2013, the ACHP sent a letter to the BLM electing not to participate in the Section 106 process.

11) *Design Feature: Project developers shall conduct a records search of published and unpublished literature for past cultural resource finds in the area; coordinate with researchers working locally in the area; and, depending on the extent of existing information, develop a survey design in coordination with the BLM and SHPO and complete a Class III cultural resources inventory. The inventory shall be conducted according to the standards set forth in the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716); BLM Handbook H-8110: Guidelines for Identifying Cultural Resources, and revised BLM Manual 8110. All inventory data must be provided to the BLM in digitized format that meets the BLM accuracy standards, including shape files for surveyed areas.*

Project Implementation of Design Measure: Records searches were conducted at the Eastern Information Center, housed at the University of California, Riverside on April 7, 2011 and May 31, 2012. California Historical Resources Information System records were reviewed to determine the location of previously recorded archaeological and historic architectural resources and the locations of prior cultural resource surveys within one mile of the area of potential effects (APE). The APE is defined for this Project as the land within the boundaries of the proposed solar facility site and land within a 300-foot corridor along each of the gen-tie alternatives. In this section, APE is used interchangeably with "Project area." Also consulted were the NRHP, National Park Service (NPS) Focus CRHR, California Historic Landmarks (CHL) lists, and California Points of Historic Interest. In addition, the online BLM General Land Office patent information was consulted. Also consulted were Art Wilson, a local historian, the General George S. Patton Memorial Museum and the Palo Verde Historical Museum and Society.

12) *Design Feature: A phased sampling strategy, beginning with a Class II inventory to assess various alternative development areas, is recommended prior to the selection of individual project locations. The Class II inventory shall meet the standards set forth in the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation, BLM Handbook H-8110, and revised BLM Manual 8110.*

Project Implementation of Design Measure: An intensive BLM Class III archaeological and historic built environment survey was conducted of the area that could potentially experience direct impacts from construction and operation of the proposed Project and Alternatives. The survey covered, not only the land within the SEZ, but the entire APE, defined as the solar array site boundary and a 150-foot area on each side of the centerline of the proposed and alternative gen-tie routes. The APE included privately owned lands and public lands managed by the BLM. During the surveys, archaeologists walked parallel transects, using 15-meter (50-foot) intervals, to locate archaeological and architectural resources within the APE. The ground surface was visually examined for evidence of prehistoric or historic archaeological materials and historical structures. Ground visibility was excellent. Visible ground surfaces were examined, including fence lines, drainage channels, and other exposures. No subsurface surveys (e.g., shovel test pits) were conducted. A sub-meter GPS was used to document the location of each cultural resource.

The archaeological field survey was conducted in five sessions between April and June, 2011, and between June and July, 2012. Isolated finds were recorded at the time of discovery by collecting GPS data, photographs, and measurements of the artifact. The archaeological sites were point-located when discovered and later recorded during a later session. Overview photographs of survey areas and comprehensive field notes were also taken. In addition, a site visit of selected areas of the solar generation site was conducted by County Archaeologist Leslie Mouriquand and Riverside County Historic Preservation Officer Keith Herron on November 22, 2011.

13) *Design Measure: If significant or NRHP-eligible cultural resources are present at the site and would be adversely affected, or if areas with a high potential to contain additional cultural material have been identified, a formalized agreement will be required to address management and mitigation options in the form of various planning documents (such as a monitoring and mitigation plan, data recovery plan, historic treatment plan, etc.). The agreement shall be developed in consultation with the SHPO, appropriate federally recognized Tribes, and any consulting parties. The agreement also shall identify measures to prevent potential looting/vandalism or erosion impacts and address the education of workers and the public to make them aware of the consequences of unauthorized collection of cultural resources on public land.*

Project Implementation of Design Measure: No NRHP-eligible cultural resources are present within the footprint of the portion of the Project within the SEZ. Mitigation measures associated with potential impacts to buried historic properties have been proposed and have been made part of the Final EIR/EA.

14) *Design Measure: To protect historic properties, sacred sites, and portions of historic trails that are potentially eligible for listing on the NRHP from visual intrusion and to maintain the integrity of the historic cultural setting, the BLM could require that surface disturbance be restricted or prohibited within the viewshed of a historic property, sacred site, or trail segment for which eligibility is tied to*

the visual setting. These types of adverse effects will be minimized, avoided, or mitigated through the Section 106 consultation process.

Project Implementation of Design Measure: No NRHP-eligible cultural resources will be visually affected by the Project.

Design Measure: In cases where there is a probability of encountering cultural resources during construction that could not be fully detected during a Class III inventory, cultural field monitors (appropriate for the resource anticipated) shall be employed to monitor ground-disturbing activities. Development of a monitoring plan is recommended.

Project Implementation of Design Measure: Mitigation Measure Cultural-3 of the Final EIR/EA requires the development of a Cultural Resources Management Plan (CRMP) and requires the use of qualified cultural resource monitors during construction. Mitigation Measure Cultural-3 will be modified to include a pre-construction education program that must be presented to all construction personnel prior to ground breaking. Please refer to pages 61 and62 the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

15) *Design Measure: The unexpected discovery of cultural resources during construction shall be brought to the attention of the responsible BLM authorized officer immediately. Work shall be halted in the vicinity of the find. The area of the find shall be protected to ensure that resources are not removed, handled, altered, or damaged while they are being evaluated and to ensure that appropriate mitigation measures are being developed.*

Project Implementation of Design Measure: If any significant resources are encountered during construction, Mitigation Measures Cultural-1 and -2 have been devised to require that work stop while the discovery is being investigated. The mitigation measures for the Project also include the development of a CRMP which must include the procedural development of a stop-work in the case of significant finds.

16) *Design Measure: The use of management practices, such as training/education programs for workers and the public, shall be implemented to reduce occurrences of human-related disturbances to nearby cultural sites. The specifics of these management practices shall be established in project-specific consultations between the applicant and the BLM as well as with the SHPO and Tribes, as appropriate.*

Project Implementation of Design Measure: Mitigation Measure Cultural-3 requires that prior to construction, a CRMP must be prepared by a qualified archaeologist, submitted to the County of Riverside and the BLM, and the CRMP must be approved by both Agencies. Mitigation Measure Cultural-3 will be modified to include a pre-construction education program that must be presented to all construction personnel prior to ground breaking.

17) *Design Measure: The BLM shall consult with Native American governments early in the planning process to identify issues and areas of concern regarding any proposed solar energy project. Such consultation is required by the NHPA and other authorities and is necessary to determine whether construction and operation of the project are likely to disturb Tribally sensitive resources, impede access to culturally important locations, disrupt traditional cultural practices, affect movements of animals important to Tribes, or visually affect culturally important landscapes. It may be possible to*

negotiate a mutually acceptable means of minimizing adverse effects to resources important to Tribes.

Project Implementation of Design Measure:As detailed above, the BLM notified and formally requested consultation with Indian tribes at the earliest stages of the project planning and review.

18) *Design Measure: The importance of any Native American archaeological or other culturally important sites identified in archaeological inventories in project areas shall be determined and validated through consultation with appropriate Native American governments and cultural authorities. Appropriate mitigation steps, such as avoidance, removal, repatriation of Native American human remains and associated items of cultural patrimony, or curation, shall be determined during this consultation.*

    Project Implementation of Design Measure: Archaeological isolates were detected by cultural resource specialists, reported to the BLM and SHPO, and were found to be not significant. The BLM has reported these facts to Native American tribes as part of the government-to-government consultation as part of the Project.

19) *Design Measure: Visual intrusion on sacred areas shall be avoided to the extent practical through the selection of the solar facility location and solar technology. When avoidance is not possible, timely and meaningful consultation with the affected Tribe(s) shall be conducted to formulate a mutually acceptable plan to mitigate or reduce the adverse effect.*

    Project Implementation of Design Measure: No known important cultural resource will be visually intruded upon once the Project has been constructed.

20) *Design Measure: Tribal burial sites shall be avoided. A contingency plan for encountering unanticipated burials and funerary goods during construction, maintenance, or operation of a solar facility shall be developed as part of a formalized agreement to address management and mitigation options for significant cultural resources in consultation with the appropriate Tribal governments and cultural authorities well in advance of any ground disturbances. The contingency plan shall include consultation with the lineal descendants or Tribal affiliates of the deceased, and human remains and objects of cultural patrimony shall be protected and repatriated according to NAGPRA statutory procedures and regulations.*

    Project Implementation of Design Measure: No known tribal burial sites are known on or near the Project. Such resources, if encountered, must either be avoided or mitigated for as detailed in the CRMP (refer to Mitigation Measure Cultural-1 Consultation with the descendants or affiliates of the deceased has been made part of Mitigation Measure Cultural-1.

21) *Design Measure: Springs and other water sources that are or may be sacred or culturally important shall be avoided whenever possible. If it is necessary for construction, maintenance, or operational activities to take place in proximity to springs or other water sources, appropriate measures, such as the use of geotextiles or silt fencing, shall be taken to prevent silt from degrading water sources. The effectiveness of these mitigating barriers shall be monitored. Measures for preventing water depletion impacts on springs shall also be employed. Particular mitigations shall be determined in consultation with the appropriate Native American Tribe(s).*

    Project Implementation of Design Measure: There are no known culturally important springs are other natural water sources on or near the Project. Section 4.2.9, Hydrology and Water Quality provides an analysis of Project related impacts to water resources and provides for mitigation measures to reduce impacts.

22) *Design Measure: Culturally important plant species shall be avoided when possible. When it is not possible to avoid these plant resources, consultations shall be undertaken with the affected Tribe(s). If the species is available elsewhere on agency managed lands, guaranteeing access may suffice. For rare or less common species, establishing (transplanting) an equal amount of the plant resource elsewhere on agency-managed land accessible to the affected Tribe may be acceptable.*

    Project Implementation of Design Measure: There are no known culturally sensitive plant species within the solar facility site. Section 4.2.4, *Biological Resources*, provides an analysis of Project related impacts to plant species and provides for mitigation measures to reduce impacts.

23) *Design Measure: Culturally important wildlife species and their habitats shall be avoided. When it is not possible to avoid these habitats, solar facilities shall be designed to minimize impacts on game trails, migration routes, and nesting and breeding areas of Tribally important species. Mitigation and monitoring procedures shall be developed in consultation with the affected Tribe(s).*

    Project Implementation of Design Measure: There are no known culturally sensitive animal species within the solar facility site. Section 4.2.4, *Biological Resources*, provides an analysis of Project related impacts to animal species and provides for mitigation measures to reduce impacts.

24) *Design Measure: Archaeological sites created by ancestral Native American populations shall be avoided whenever possible. However, when archaeological excavations are necessary, affiliated Tribe(s) shall be consulted, and the concerns of the affected descendant Native American population shall be taken into account when developing a data recovery strategy. Possible mitigations include scientific excavation; monitoring or participation in excavations by Tribal representatives; and repatriation or approved curation of artifacts.*

    Project Implementation of Design Measure: There are no prehistoric archaeological sites in the Project footprint. Should any archaeological site be encountered during construction, all stakeholders including Native Americans and the BLM, must be consulted with before any removal of the sensitive find and/or data recovery can take place in accordance with Mitigation Measures Cultural-1 through Cultural-5.

25) *Design Measure: Rock art (panels of petroglyphs and/or pictographs) shall be avoided whenever possible. These panels may be just one component of a larger sacred landscape, in which avoidance of all impacts may not be possible. Mitigation plans for eliminating or reducing (minimizing) potential impacts on rock art shall be formulated in consultation with the appropriate Tribal cultural authorities.*

    Project Implementation of Design Measure: There are no prehistoric rock art panels on or near the Project area. It is extremely unlikely that any rock art panels will be uncovered during construction.

26) *Design Measure: Standard noise design features shall be employed when solar facilities would be located near sacred sites to minimize the impacts of noise on culturally significant areas.*

    Project Implementation of Design Measure: Standard noise design features, including those implemented during the construction phase and the post-construction phase of the Project are included in Section 3.2.11 of the Final EIR/EA.

27) *Design Measure: Health and safety design features for the general public shall be employed when solar facilities are located near Native American traditional use areas in order to minimize potential health and safety impacts on Native Americans.*

    Project Implementation of Design Measure: There are no known Native American traditional use areas in the Project area. Standard health and safety requirements, including those implemented during the construction phase and the post-construction phase of the project are included and described in the Section 4.2.8, Hazards and Hazardous Materials of the Final EIR/EA.

28) *Design Measure: Prior to construction, training shall be provided to contractor personnel whose activities or responsibilities could affect resources of significance to Native Americans during construction.*

    Project Implementation of Design Measure: Cultural resources Mitigation Measure Cultural–3 will be modified to include a worker-training program. Please refer to page 57 of the Errata in Response to Comments section of this Final EIR/EA document which reflects these changes to the text.

29) *Design Measure: When there is a reasonable expectation of encountering previously unidentified cultural resources during construction, monitoring of construction by a qualified cultural resource specialist shall be considered to minimize impacts on resources of significance to Tribes to the extent possible.*

    Project Implementation of Design Measure: Mitigation Measure Cultural-2 requires that qualified archaeological monitors be employed to inspect construction-related earthmoving under the direction of a Project Archaeologist.

    The analysis in Section 4.2.5, *Cultural Resources,* has been prepared to satisfy all applicable laws, including CEQA, NEPA, and Section 106 of the National Historic Preservation Act (NHPA), relative to identifying cultural resources and assessing potential impacts to, or effects on, such resources by the proposed Project. In particular, Section 106 of the NHPA requires that a federal agency take into account the effects of undertakings on historic properties, defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP), and to afford the Advisory Council on Historic Preservation (ACHP) and other parties a reasonable opportunity to comment. The following steps, consistent with the requirements of Section 106 of the NHPA and of CEQA, have been taken to evaluate the potential cultural resource impacts of the proposed Project: (1) coordination by RRG on the scope of the assessment with federal and local lead agencies (BLM and County of Riverside); (2) identification of cultural resources within the area potentially affected by the proposed Project through both archival research and field survey; (3) communication with the Native American Heritage Commission (NAHC) and with potentially affected Indian tribes about resources or values that could be affected; (4) formal government-to-government consultation by the BLM with American Indian tribes; (5) evaluation of the eligibility of identified cultural resources for the NRHP and CRHR; (6) consultation by the BLM with the California State Historic Preservation Office (SHPO) and ACHP; (7) assessment of the proposed Project's potential effects or impacts on NRHP- or CRHR-eligible cultural resources; and (8) resolution of any adverse effects/impacts.

The following mitigation measures have been prepared in consultation with the County of Riverside and the BLM:

Cultural-1 The BLM and the County of Riverside shall ensure that any human remains encountered during the course of construction are treated in a respectful manner and consistent with applicable law. No construction activities will be allowed within 100 feet of the discovery site of human remains until a Notice to Proceed is provided by the BLM or the County as appropriate.

In the case where human remains are inadvertently uncovered on federal land, the BLM will consult in accordance with 36 CFR 800.13. Reasonable and good faith efforts shall be made by the BLM to identify the appropriate Native American Indian tribes, group(s) and individuals, or other ethnic group(s) and individuals, related to the burial, and consult with them concerning the treatment of the remains. Native American human remains, associated grave goods, or objects of cultural patrimony discovered on federal lands will be treated in accordance with the requirements of NAGPRA. The BLM will direct its consultation regarding Native American human remains to specified federally recognized tribes with cultural affiliation to the project area. The BLM may invite consultation with non-federally recognized tribes, groups and individuals at its discretion. Regarding the disposition of human remains, Native American Concurring Parties will be consulted regarding the removal (if necessary) and reburial of the remains. Tribal elders, Most Likely Descendants and other persons identified by tribes will be consulted to determine what options are acceptable to Native Americans. It is understood that such options will be generally consistent with applicable state and federal laws, depending on jurisdiction.

If human remains are discovered on non-federal lands, the County of Riverside shall ensure that the human remains will be treated in accordance California Health and Safety Code Section 7050.5 and any other applicable state law. No construction activities will be allowed within 100 feet of the discovery until a Notice to Proceed is provided by County environmental department lead(s). The County will consult with the California Native American Heritage Commission to seek the advice of the Commission in such matters as determining which tribes, groups and individuals have standing as cultural participants or as Most Likely Descendants. Should any dispute arise the County will request that the NAHC act to mediate the dispute.

Cultural-2 The County advocates avoidance as the preferred choice, and the BLM requires that the development of a discovery plan (see Cultural–3) must occur prior to project construction. If, during ground disturbance activities associated with construction, operation and maintenance, or decommissioning, archaeological sites are discovered that were not identified and evaluated in the archaeological survey reports or the Final EIR/EA conducted prior to Project approval, and the following procedures shall be followed.

1) All ground disturbance activities within 100 feet of the discovered archaeological resource shall be halted until a meeting is convened between the developer, the Project archaeologist, the Native American tribal representative, the BLM, and (on non-federal land) the County archaeologist to discuss the significance of the find.
2) At the meeting, the significance of the discoveries shall be discussed in consultation with the Native American tribal representative and the Project archaeologist. The BLM alone shall determine the appropriate treatment for cultural resources on BLM-managed lands. The County Archaeologist and the BLM together shall determine the appropriate mitigation (documentation, evaluation, recovery, avoidance, etc.) for cultural resources on private lands. In determining the appropriate treatment on private land, the BLM shall follow requirements of 36 CFR 800.13 for post-review discoveries and the County Archaeologist shall implement CEQA Guidelines Section

15126.4(b) regarding mitigation related to impacts on historical resources and CEQA Guidelines Section 15064.5(c) and 21083.2(g) regarding archaeological resources.

3) Further ground disturbance shall not resume within the area of the discovery until a meeting is convened with the aforementioned parties and a decision is made with the concurrence of the BLM and (on private land) the County Archaeologist as to the appropriate preservation or mitigation measures. The Applicant shall comply with the determinations of the County Archaeologist and BLM.

Cultural-3 Prior to obtaining the Project-related grading permit from the County of Riverside, the Applicant shall have the Secretary of the Interior Qualified/County-approved Project Archaeologist prepare and submit for approval to the BLM and the County of Riverside a CRMP. The CRMP shall map all cultural resources within the APE, as described in this Final EIR/EA. The CRMP must conform with BLM Measure #5, #6, #7 and #8 as found in the determination and findings document provided to SHPO dated August 7, 2013 (BLM 2013). The CRMP shall also detail how resources, if any, are determined eligible or resources that are unevaluated but avoided by Project design, would be marked and protected as Environmentally Sensitive Areas during construction. The CRMP shall also map additional areas that are considered to be of high sensitivity for discovery of buried significant cultural resources, including burials, cremations, or sacred features. The CRMP shall detail provisions for monitoring construction in these high-sensitivity areas. It shall also detail procedures for halting construction, making appropriate notifications to agencies, officials, and Native American tribes, and assessing NRHP and CRHR eligibility in the event that unknown archaeological resources are discovered during construction. For all post-review discoveries, the CRMP shall detail the methods, consultation procedures, and timelines for implementing Mitigation Measures Cultural-1 and Cultural-2. The CRMP shall be presented to all construction personnel, with Native American Participants in attendance, in the form of a worker education program by the Project Archaeologist prior to commencement of groundbreaking. During subsequent Safety Meetings on the job site, the Project Archaeologist and/or his qualified representative shall inform all new construction personnel of the cultural resources issues associated with the Project.

Cultural-4 Prior to any ground disturbances within the Project area, the Applicant shall, for a period of at least 60 days, make a good faith effort to enter into a contract with and retain monitors designated by Tribal representatives. This measure must result in and conform with BLM Measure #6 as found in the determination and findings document provided to SHPO dated August 7, 2013 (BLM 2013). These monitors shall be known as the Tribal Participants for this Project. The developer shall notify the appropriate Tribe of all new phases of development. The Tribal Participants shall be required on-site during all construction-related ground-disturbing activities. The developer shall submit the signed contract between the appropriate Tribe and the developer. The Project Archaeologist shall include in the report any concerns or comments the Tribal Participant has regarding the Project and shall include as an appendix any written correspondence or reports prepared by the Tribal Participants.

Cultural-5 Prior to the final inspection of the first building permit, the Applicant shall prompt the Project Archaeologist to submit one (1) wet-signed hard copy and one (1) CD of a Cultural Resources Monitoring Report that meets BLM Manual requirements and also complies with the current Riverside County Planning Department’s requirements for Phase IV Cultural Resource Monitoring Reports. The report shall include documentation of the required cultural/historical sensitivity training for the construction staff held during the pre-grade meeting, which shall include the BLM and County Archaeologist's attendance. The BLM and County Archaeologist shall review the report to determine adequate mitigation compliance. The accepted report shall be submitted to the BLM, County, Eastern Information Center, the Patton Memorial Museum, and interested tribes.

Response 14-21

The commenter asserts that the inclusion of tribal observers is meaningless and that the measure is ineffective as to the future role the observer should play.

A Cultural Resources Management Plan (CRMP), required by Mitigation Measure Cultural-3, must be written by a qualified archaeologist and approved by the BLM and the County of Riverside. It must include certain identification and procedural elements, including obtaining input from Native American observers, and the resulting mitigation must meet the performance standards discussed in response to comment 14-14. Because the CRMP must describe construction-specific processes associated with construction-related discoveries, the CRMP must be generated for County and BLM review before construction begins. In the event previously unidentified cultural resources are uncovered, the Project Archaeologist must convene a meeting regarding the discovery with certain stakeholders including the Native American observer. In this way, the concerns of Native American observers must be addressed.

Given this process, the input of tribal observers and representatives is crucial to the fulfillment of Mitigation Measures Cultural-1 through Cultural-5 (pages 4-175 through 4-177 of the Final EIR/EA).

Response 14-22

The commenter asserts that no evidence of government-to-government consultation is provided in the Draft EIR/EA and that the BLM effort in this regard is not effective.

Section 6.7.2 in the Final EIR/EA provides details on the status of consultations as of the date of the document. See Response 9-1 regarding ongoing consultation efforts and the good faith efforts BLM is making to obtain and respond appropriately to Tribal input.

Response 14-23

The commenter states that the Draft EIR/EA, at ES-4, is a violation of the terms of the Williamson Act, which is intended to promote farmland conservation and ensure that such land will not be developed or otherwise converted to another use.

The Project would promote agricultural resources by including protections that do not exist in baseline circumstances. The Project would establish a Williamson Act preserve and Williamson Act contracts on approximately 1,485 acres of land that are not currently subject to those protections. The land would be protected by, and would be subject to, all applicable provisions of the Williamson Act. The protections offered by the Williamson Act include provisions that preclude early cancellation of a contract absent proof of certain limited circumstances. The limited circumstances that justify cancellation include cancellation in the public interest, and that there is no proximate noncontract land which is both available and suitable for the proposed solar use, or that development of the contracted land would provide more contiguous patterns of urban development than development of proximate noncontracted land. The Project would comply fully with these provisions and therefore would not present a violation of the Williamson Act.

Moreover, the focus of this document is impacts on the environment and not abstract conformance with laws. The environmental impacts of cancellation are fully addressed in the Final EIR/EA. The Final

EIR/EA acknowledges that the Project could include cancellation of Williamson Act contracts, which would result in cancellation of the protection of agricultural resources that those contracts offer. The Final EIR/EA takes a conservative, environmentally protective approach to addressing potential cancellation; even though the Williamson Act protections do not exist in baseline circumstances, the Final EIR/EA addresses the potential for cancellation as a potentially significant impact, and imposes mitigation in the form of Mitigation Measure Agriculture-1. Mitigation Measure Agriculture-1 would ensure that the Project would provide or contribute to protections for agricultural resources that are equivalent to or better than the protections offered by the Williamson Act, resulting in less than significant impacts. Accordingly, the Project as mitigated, including its Williamson Act-related attributes, would not have a significant impact on agricultural resources.

Response 14-24

The comment states that the Draft EIR/EA dismisses the concern of avian mortality at solar energy facilities. The comment further states the Draft EIR/EA must be revised to take into account the newest studies, particularly as systematic avian monitoring at utility-scale solar projects has begun only recently.

See Responses 3-5, 10-11 and 11-5. Exhibit 4 provided by commenter reports on the same information that was reviewed and analyzed for that the Final EIR/EA. As discussed on page 6 of 28 in Exhibit 4 "the data does not support the idea that these solar facilities are attracting particular species." Potential impacts from polarized light pollution (PLP) on a cumulative scale cannot be fully known. The Blythe Solar Power Project EIS/EIS identified that some migratory birds may be affected from collisions with solar panels or other infrastructure but such impacts could not be known with certainty. Post-construction monitoring data that is available from the Genesis Solar Energy Project and the Desert Sunlight Project document avian mortality. The Desert Sunlight Project recorded a total of 19 waterfowl mortalities. Only one was confirmed as caused by collision with a solar panel. Three waterfowl drowned or were reported caught in pond netting, there was one reported case of illness as a cause of death, two waterfowl deaths were caused by predation, and there were 11 unknown causes of mortality (Ironwood Consulting, Inc., 2012). The California Energy Commission (CEC) website publishes information about a total of 93 avian fatalities that were reported at the Genesis Solar Energy Project from July 2013 through October 2013 (AECOM 2014). Of the 93 fatalities reported from July through October, two species are listed as California Department of Fish and Wildlife (CDFW) species of special concern and one species is listed as a CDFW fully protected species. No federally or State listed species were reported among the avian mortalities for the July-October 2013 monthly compliance reports. No fatalities of any bird species, including waterfowl, were reported as a result of collision with the solar trough mirrors (AECOM 2014). Given the little data to support PLP and collision risk, the potential cumulative impact from PLP can only be speculative at this time.

PV solar facilities can cover large areas of the landscape. Habitat fragmentation would clearly be an important consideration for solar developments proposed to occur within large, intact, contiguous natural vegetation communities. The Project array areas are sited on agricultural land (irrigated crops and orchards) and disturbed land with very little breeding and foraging habitat suitable for avian or bat species (except as noted above). The gen-tie line traverses more natural habitats of desert scrub and some displacement of breeding or foraging bird could occur during construction. However, permanent habitat loss would be minimal within the gen-tie ROW because once completed, the transmission lines would be passive structures and would not restrict avian or bat use in the area. Some potential for habitat fragmentation exists at the Project site, such as the southwestern most parcel, but the potential risk does not appear to be high, due to the nature of the development and the history of land use in the area (i.e., agricultural land, residential development, interstate highway, transmission line corridor, and energy development).

Appendix C4 of the Final EIR/EA includes a Bird and Bat Conservation Strategy (BBCS). The BBCS has been developed with consideration and guidance from the data and suggestions presented in the USFWS Region 8 Interim Guidelines for the Development of a Project-specific Avian and Bat Protection Plan for Solar Energy Plants and Related Transmission Facilities and the Avian Power Line Interaction Committee's Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Avian Protection Plan Guidelines, and Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. The USFWS provided additional details on the interim guidelines for bird mortality monitoring. As part of the adaptive management process outlined in the BBCS, Appendix C4 of the Final EIR/EA, BBCSs are considered "living documents" that articulate a power producer's commitment to develop and implement a program to increase avian and bat safety and reduce risk. As progress is made through the program or challenges are encountered, the BBCS may be reviewed, modified, and updated.

Response 14-25

The comment states that with the Project's proximity to the Blythe Airport, an increase in avian wildlife would pose a hazard for air traffic landing and taking off from the airport due to an increase in avian wildlife. Refer to Response 14-24. The BMSP has a long history of human use and disturbance with dominant land uses consisting of agricultural fields and citrus orchards. The surrounding area consists of residences, Blythe Municipal Airport, Blythe Energy Center, electrical transmission lines, an interstate highway, and commercial businesses. Within this matrix of human development and disturbance some patches of open desert habitat remain in the form of creosote bush scrub and desert riparian wash. However, the solar facility associated with this Project would be situated within agricultural land or otherwise disturbed land (primarily former agriculture and military training).The BMSP site does not include water features and relatively few areas of the existing BMSP site provide habitat for avian species. As a result, fewer birds would be expected to use the BMSP site in the future than would occur if the site were natural, undisturbed land prior to development as a solar facility.

Despite limited scientific evidence of fatality risk to birds associated with PV solar arrays (RSPB 2011), potential PLP impacts will be mitigated and include Mitigation Measures Biology-1 (Monitor Construction Site for Biological Compliance) and Biology-7 (Protect breeding birds) and as a part of Biology-7 a BBCS, would be implemented to help reduce potential impacts during construction, operation and maintenance of the gen-tie line and solar array facility. The BMSP BBCS includes baseline surveys, a three-year mortality and injury monitoring program, adaptive management, and care and transport for injured birds and bats. As a living document the BMSP BBCS will implement an adaptive management process in which impact minimization and mitigation measures are continuously reevaluated in order to improve them.

Response 14-26

The commenter asserts that the Draft EIR/EA is flawed, poorly conceived, and should be re-analyzed as a Draft EIR/EA in part because the cultural resource analysis is flawed and inadequate

County of Riverside and BLM cultural resource specialists have determined all significant known cultural resources have been avoided, active monitoring for the purpose of ensuring that buried significant resources are protected, and unanticipated discoveries can either be avoided or mitigated. In addition, Native Americans must be included during all aspects of the construction-related earthmoving process.

Letter 15: Bennett Family

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From: Bennett Family
To: Ross, Larry
Subject: Fw:
Date: Monday, July 21, 2014 8:08:37 PM

On Monday, July 21, 2014 7:53 PM, Bennett Family <benape11@yahoo.com> wrote:

Hi my name is mark bennett i live at 16531 west hobson way i have lived here for
three years or so i never knew that there was plans for this proposed solar project
until a month ago when i got the letter from the blm, when i opened it and saw the
map i almost went into shock i have spent the last 15 years looking for the wright
place to live in this valley where i could have my horses and goats cats and dog i also
do a lot of offroading around here i want to know who did the study on humans who 15-1
live in the middle of a solar field like do they put off heat or radiation will there be
reflection coming of of these things? i remember not to long ago when verizon had to
make there towers look like palm trees so what makes this any different instead of
one little tower were talking thousands of the ugliest things on the planet, i am e
mailing you photos of my view from my front yard that will be lost to this project i also
would like to bring up the fact that not one person that i have talked to would buy a
house in the middle of or next to a solar farm so i am pretty sure that what ever equity
i have in my house will be lost and i would be stuck with a house that i could never
sell. now i have one other problem my wifes mother and my mother were planing on 15-2
living with us in the near future and i have been working on this house to make it safe
and comfortable for two older people to live i think this project would make it a living
hell right here on earth so we are begging you please do not let them do this. i will not
live here and will be forced to move if this project is approved. thankyou.


ARMY
XP


DAD
PRO HAULER
YAMAHA

Response to Letter 15

Response 15-1

The commenter expresses concern regarding health effects of heat or radiation from the solar array field. The commenter also questions if there will be reflection from the solar panels and expresses an opinion regarding the project's visual effects.

As noted in Section 2.1.2, *Insolation*, on page 2-1 of the Final EIR/EA, the panels themselves would become hot to the touch, resulting in temperatures about 68 degrees Fahrenheit above ambient temperatures. However, the heat increase would be limited to the solar panel itself and would dissipate within inches of the panels, resulting in the temperature below the panels being nearly the same as ambient temperatures in other shaded areas. Accordingly, heat is not projected to travel beyond property boundaries. The panels do not emit any radiation (McCoy 2012).

There is no evidence to suggest that the proposed photovoltaic solar panels would reflect significant amounts of heat resulting in a change in atmospheric conditions. The concerns regarding increased temperature are speculative and CEQA does not require the Lead Agency to study every possible concern when they are not substantiated by evidence in the record.

The Final EIR/EA provides visual analysis including light and glare, during construction, operation and maintenance, and decommissioning of the Project. Based on the analyses in Chapter 4, Environmental Consequences, Section 4.2.1, *Aesthetics*, *Visual Resources*, *and Reflection* potential significant visual Project impacts would be reduced to a level considered less than significant.

Response 15-2

The commenter expresses concern regarding the visual effects of the proposed Project and provides photographs of his property and also expresses concern about losing equity in his home as a result of Project implementation.

See Section 4.2.1, *Aesthetics*, *Visual Resources*, *and Reflection* of the Final EIR/EA for a discussion of the aesthetic impacts of the proposed Project and action alternatives. Please see section 4.2.13 regarding socioeconomic impacts associated with the proposed Project and action alternatives. The economic consequences to the commenter's property are not physical impacts on the environment. The comment does not raise any question the sufficiency of the environmental analysis in the Final EIR/EA; therefore, no further response is required. Cal. Pub. Res. Code § 21091(d)(2)(B); 14 C.C.R. §§ 15088(c), 15132(d), 15204(a). However, the comment will be provided to the Riverside County Board of Supervisors and the BLM for their review and consideration.

Letter 16: Art Wilson

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14 JUL 22 PM 12: 37

Art Wilson
590 Seville Lane
Blythe CA 92225

July 21, 2014

Mr. Frank McMenimen, Project Manager
BLM Palm Springs – South Coast Field Office
1201 Bird Center Drive
Palm Springs CA 92262

Reference: Blythe Mesa Solar Project
EIR No. 529

Dear Mr. McMenimen:

It is requested that you consider the following comments in connection with the review of this project:

Reference is made to Volume I of the Draft Environmental Impact Report, Table 3.2.5-1, primary number P-33-018837 on page 3-87. Listed are several remains related to the former Blythe Army Air Base. Not included is a rock and masonry structure on the western edge of the "hospitalization area." It is my opinion that this may be an anatomical furnace associated with the base hospital.

I have included a map depicting the exact location of this structure. I am also forwarding two photographs of the resource. You will note that one photographs bears the inscription "April 1943 Pt. Carmine Tortorello." In my book *Runways in the Sand, the World War II history of Blythe Army Air Base,* I describe research that indicates Army Private Tortorello was assigned to an Army hospital in California according to a relative (page 98.) 16-1

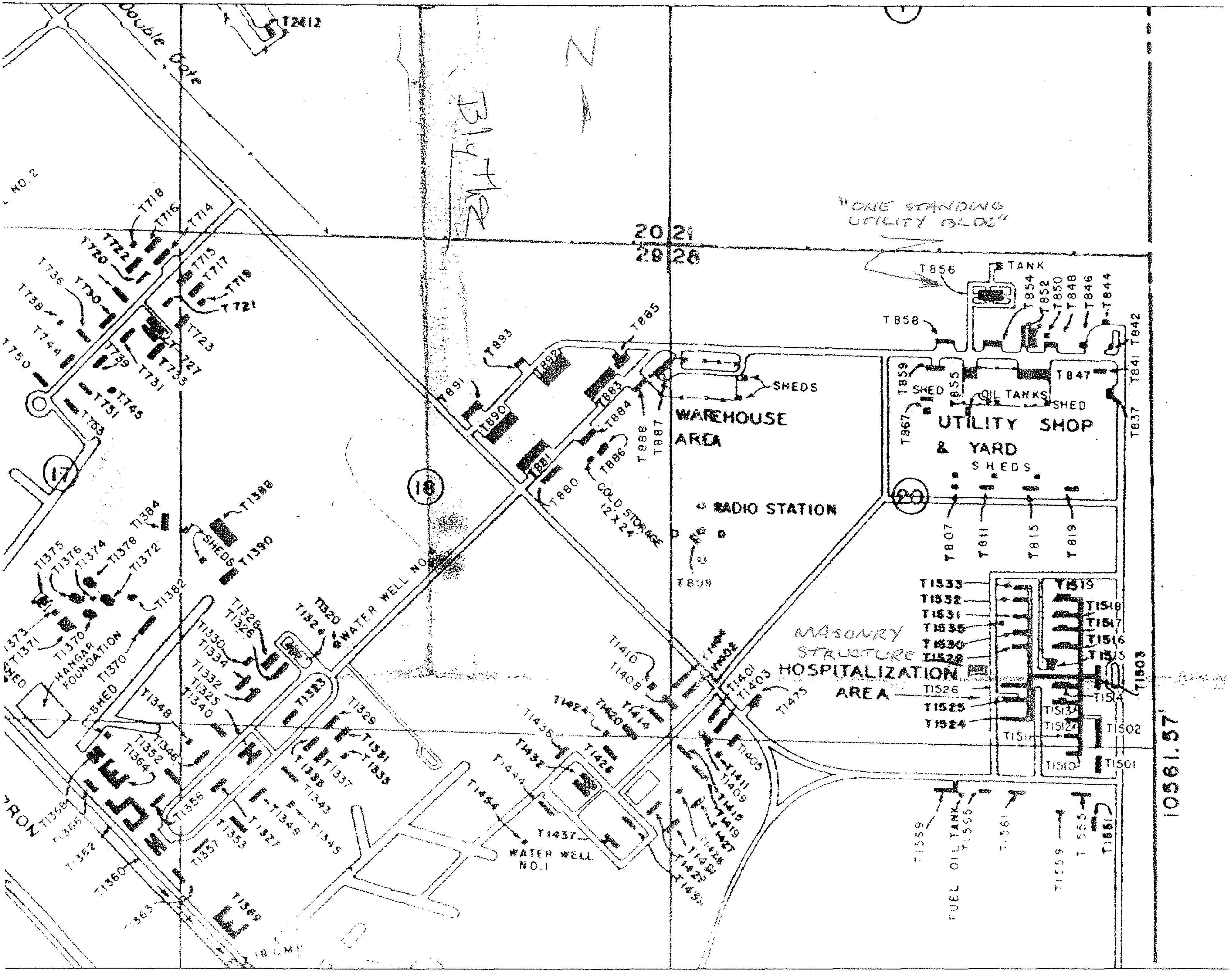
It is requested that this specific resource be evaluated for its significance and possible preservation.

Very truly yours,

Art Wilson

ART WILSON

Attachments (3)



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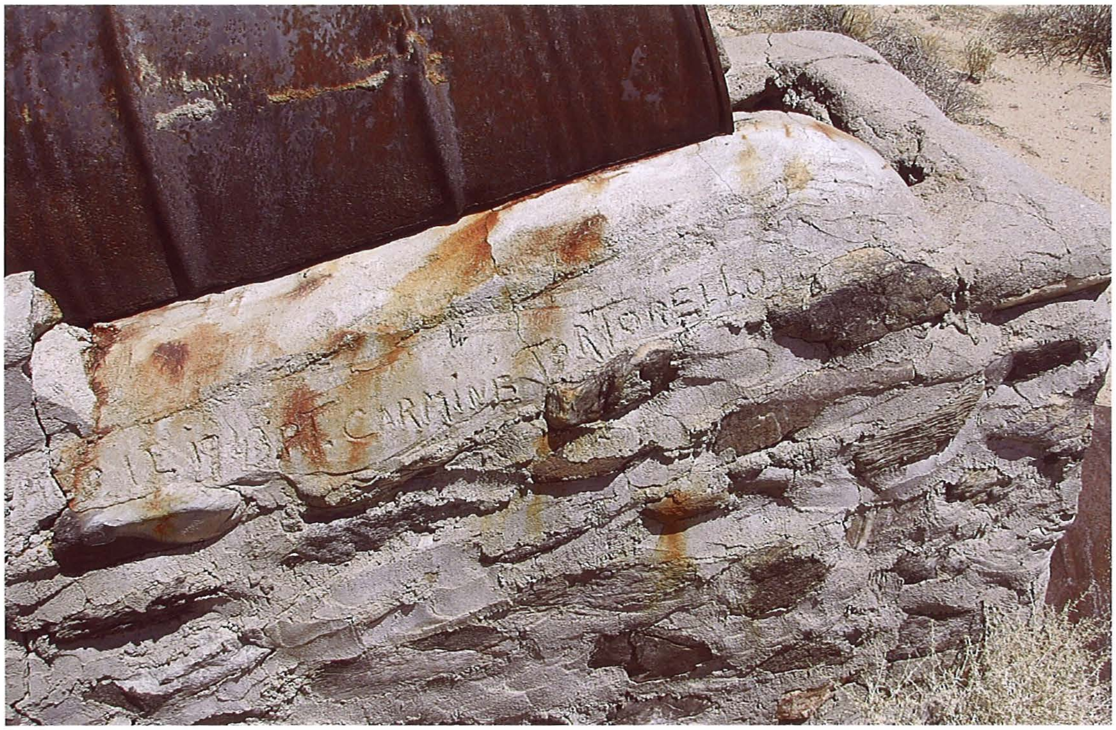
UTILITY SHOP & YARD
SHEDS
OIL TANKS
SHED
TANK
"ONE STANDING UTILITY BLDG"
MASONRY STRUCTURE
HOSPITALIZATION AREA
FUEL OIL TANK
WAREHOUSE AREA
RADIO STATION
COLD STORAGE 12 X 24
WATER WELL NO. 1
WATER WELL NO.
20 21
29 28
Blythe
Double Gate
HANGAR FOUNDATION


CARMINE

Response to Letter 16

Response 16-1

The commenter states that one feature found on the BAAB is a rock and masonry structure that should be specifically evaluated for its significance and possible preservation.

The rock and masonry structure is within an area that has been evaluated, and is not considered an historic structure. Section 4.2.5, *Cultural Resources*, of the Final EIR/EA discusses the BAAB. This section notes the County has concurred that the portion of BAAB (P-33-018837) within the Project APE is not eligible for listing on the CRHR. The BLM has determined that the remnant portions of BAAB within the Project APE, which encompass the site of the structure referenced by the commenter, are not eligible to the NRHP. Therefore, the resource in question is not considered a historical resource or a historic property. Though the resource is not significant and mitigation is therefore not required, the parties could nonetheless, in the context of developing and implementing the CRMP, decide to salvage elements of the feature in question or move the feature to a point located outside the area of construction.

Summary of Verbal Comments Received at the Public Meetings and Responses

The table below summarizes the verbal comments received during the Draft EIR/EA public meeting held on July 10, 2014. A complete transcript of the public meeting can be found in Appendix S of the Final EIR/EA document. The comments and questions are categorized by EIR topic and the responses are located in the column to the right.

VERBAL COMMENTS FROM THE DRAFT EIR/EA PUBLIC MEETING

COMMENT	RESPONSE
PM 1 Art Wilson	
The commenter states that the Blythe Army Airbase contains cultural resources of World War II buildings that are mentioned in the environmental impact report; however the environmental impact report does not mention another small structure related to the hospital.	The rock and masonry structure is within an area that has been evaluated, and is not considered an historic structure. Section 4.2.5, Cultural Resources, of the Final EIR/EA discusses the BAAB. This section notes the County has concurred that the portion of BAAB (P-33-018837) within the Project APE is not eligible for listing on the CRHR. The BLM has determined that the remnant portions of BAAB within the Project APE, which encompass the site of the structure referenced by the commenter, are not eligible to the NRHP. Therefore, the resource in question is not considered a historical resource or a historic property. Though the resource is not significant and mitigation is therefore not required, the parties could nonetheless, in the context of developing and implementing the CRMP, decide to salvage elements of the feature in question or move the feature to a point located outside the area of construction.
PM 2 Patricia Pinon	
The commenter expresses concern regarding the high incidence of asthma in kids and a high incidence of cancer in east Riverside County, The commenter further expresses concern the project is a fire hazard. The commenter further states that the project in an environmental injustice issue.	The fact that inhalation of dust could adversely affect human health is discussed in Section 4.2.8 of the Final EIR/EA. However, in light of the Applicant-proposed dust control measures (dust abatement plan, BMP-2) and Mitigation Measures Hazards-1 through Hazards-3, the risk of potential dust-related health impacts would be less than significant. The fact that inhalation of dust could adversely affect human health is discussed in Section 4.2.8 of the Final EIR/EA. However, in light of the Applicant-proposed dust control measures (dust abatement plan, BMP-2) and Mitigation Measures Hazards-1 through Hazards-3, the risk of potential dust-related health impacts would be less than significant. The Final EIR/EA provides a discussion relative to toxic air contaminant (TAC) emissions. The Final EIR/EA (pages 4-73 and 4-74) identifies that construction

COMMENT	RESPONSE
	activities would result in emissions of diesel particulate matter from heavy construction equipment used on-site and truck traffic to and from the site, as well as minor amounts of TAC emissions from motor vehicles, such as benzene, 1,3-butadiene, toluene, and xylenes. Health effects attributable to exposure to diesel particulate matter are long-term effects based on chronic, long-term exposure to emissions. Health effects are generally evaluated based on a lifetime (70 years) of exposure. As discussed in the Air Quality and Global Climate Change Report (Appendix B of the Final EIR/EA), the risk-driving TAC associated with construction activities at the Project area is diesel particulate emitted from equipment and vehicles operating on-site. Sources of diesel particulate matter at the site would include haul truck activities, heavy construction equipment, and contractor vehicles. Construction emissions were modeled using the SCREEN3 model to evaluate whether diesel particulate matter would result in a significant health risk to sensitive receptors in the Project area. A screening health risk analysis was conducted to evaluate the potential for the Project to expose sensitive receptors to substantial TAC concentrations. Based on the results of the screening health risk assessment, the maximum predicted cancer risk would be 0.549 in one million, which is below the significance threshold of 10 in one million. The chronic non-cancer hazard index would be 0.00769, which is below the significance threshold of 1.0. This estimate assumes implementation of BMP-16 (Diesel Engines) incorporating the use of ultra-low sulfur fuel in conjunction with Tier 2 and Tier 3 diesel equipment to reduce TACs emitted during construction of the proposed gen-tie line and solar array facility. Based on the screening analysis, construction activities would not result in a significant impact to sensitive receptors. Section 4.2.8, page 4-226 of the Final EIR/EA discusses fire hazards. Standard fire prevention and suppression measures would be implemented for the proposed Project. O&M buildings would be designed with fire protection systems based on applicable Riverside County and City of Blythe requirements. The PV modules are typically Class C fire -rated and nonflammable material (aluminum, steel, and glass). The solar facility would be maintained with a minimum of vegetation and other combustible materials. Up to nine 10,000 -g Access roads would provide emergency access throughout the solar facility. Further, implementation of BMP-4 (Fire Management and Protection Plan) would minimize

COMMENT	RESPONSE
	potential hazards and accidents. Compliance with applicable requirements and design features incorporated as part of the Project, no direct impacts relative to fire hazards are anticipated during operation of the proposed Project. The Final EIR/EA (pages 4-319 and 320) provides an environmental justice analysis and assessed the potential for any such major impacts to be disproportionately distributed to minority or low-income population within the local area. The Final EIR/EA did not identify impacts which are significant and unavoidable and none of the Project's impacts were determined to have a disproportionate impact on local low-income or minority populations.
PM 3 Alfredo A. Figueroa	
The commenter states that all the solar projects are connected and the areas where the solar projects are located are scared. The commenter further states that 250 jobs were destroyed when the orchards were destroyed.	The commenter submitted written comments on July 22, 2014; see responses to Letter 10-La Cuna de Aztlan Sacred Sites Protection Circle, which addresses the verbal comments offered at the public meeting.
PM 4 Jesus Rivera	
The commenter expresses concern about visual effects of the solar panels and the location of the gen-tie line poles.	See Section 4.2.1, Aesthetics, Visual Resources, and Reflection of the Final EIR/EA for a discussion of the aesthetic impacts of the proposed Project and action alternatives. Please see section 4.2.13 regarding socioeconomic impacts associated with the proposed Project and action alternatives. The comment does not raise any question the sufficiency of the environmental analysis in the Final EIR/EA; therefore, no further response is required.
PM 5 David Harper	
The commenter is with the Colorado River Indian Tribes Mojave Elders Committee and states that the County, BLM and the Applicant should work with the Tribe before construction on the project even begins.	On March 12, 2012, the BLM formally invited 15 (listed in first bullet below) federally recognized tribes to consult on a government-to-government basis for the proposed Project, as provided in the Executive Memorandum of April 29, 1994, Executive Order 13175, and Sections 101 and 106 of the National Historic Preservation Act (NHPA): • Aqua Caliente Band of Cahuilla Indians, Augustine Band of Cahuilla Indians, Cabazon Band of Mission Indians, Cahuilla Band of Mission Indians, Chemehuevi Indian Tribe, Cocopah Indian Tribe, Colorado River Indian Tribes, Fort Mojave Indian Tribe, Fort Yuma Quechan Tribe, Morongo Band of Mission Indians, Ramona Band of Mission Indians, San

COMMENT	RESPONSE
	Manuel Band of Mission Indians, Soboba Band of Luiseno Indians, Torres-Martinez Desert Cahuilla Indians, Twenty-Nine Palms Band of Mission Indians • All of these federally recognized tribes were invited to be consulting parties. • The BLM has received formal responses from four Indian tribes regarding their interest in the Project, comments on the EA, and/or requests to consult in a government-to-government manner. These four tribes are Aqua Caliente Band of Cahuilla Indians, the Augustine Band of Cahuilla Indians, the Colorado River Indian Tribes, and the Soboba Band of Luiseno Indians. Please refer to the Mitigation Measures Cultural-1, Cultural- 2 and Cultural-3, provided in Section 4.2.5 of the Final EIR/EA document which includes consultation with the Native American tribal representatives. Procedures for Treatment and Disposition of Remains: Cultural-1 The BLM and the County of Riverside shall ensure that any human remains encountered during the course of construction are treated in a respectful manner and consistent with applicable law. No construction activities will be allowed within 100 feet of the discovery site of human remains until a Notice to Proceed is provided by the BLM or the County as appropriate. In the case where human remains are inadvertently uncovered on federal land, the BLM will consult in accordance with 36 CFR 800.13. Reasonable and good faith efforts shall be made by the BLM to identify the appropriate Native American Indian tribes, group(s) and individuals, or other ethnic group(s) and individuals, related to the burial, and consult with them concerning the treatment of the remains. Native American human remains, associated grave goods, or objects of cultural patrimony discovered on federal lands will be treated in accordance with the requirements of NAGPRA. The BLM will direct its consultation regarding Native American human remains to specified federally recognized tribes with cultural affiliation to the project area. The BLM may invite consultation with non-federally recognized tribes, groups and individuals at its discretion. Regarding the disposition of human remains, Native

COMMENT	RESPONSE
	American Concurring Parties will be consulted regarding the removal (if necessary) and reburial of the remains. Tribal elders, Most Likely Descendants and other persons identified by tribes will be consulted to determine what options are acceptable to Native Americans. It is understood that such options will be generally consistent with applicable state and federal laws, depending on jurisdiction. If human remains are discovered on non-federal lands, the County of Riverside shall ensure that the human remains will be treated in accordance California Health and Safety Code Section 7050.5 and any other applicable state law. No construction activities will be allowed within 100 feet of the discovery until a Notice to Proceed is provided by County environmental department lead(s). The County will consult with the California Native American Heritage Commission to seek the advice of the Commission in such matters as determining which tribes, groups and individuals have standing as cultural participants or as Most Likely Descendants. Should any dispute arise the County will request that the NAHC act to mediate the dispute. Procedures for Cultural Items (Artifacts): Cultural-2 The County advocates avoidance as the preferred choice, and the BLM requires that the development of a discovery plan (see Cultural–3) must occur prior to project construction. If, during ground disturbance activities associated with construction, operation and maintenance, or decommissioning, archaeological sites are discovered that were not identified and evaluated in the archaeological survey reports or the Final EIR/EA conducted prior to Project approval, and the following procedures shall be followed. 1) All ground disturbance activities within 100 feet of the discovered resource shall be halted until a meeting is convened between the developer, the Project archaeologist, the Native American tribal representative, the BLM, and (on non-federal land) the County archaeologist to discuss the significance of the find. 2) At the meeting, the significance of the discoveries shall be discussed in consultation with the Native American tribal representative and the Project archaeologist. The BLM alone shall determine the appropriate treatment for cultural resources

COMMENT	RESPONSE
	on BLM-managed lands. The County Archaeologist and the BLM together shall determine the appropriate mitigation (documentation, evaluation, recovery, avoidance, etc.) for cultural resources on private lands. In determining the appropriate treatment on private land, the BLM shall follow requirements of 36 CFR 800.13 for post-review discoveries and the County Archaeologist shall implement CEQA Guidelines Section 15126.4(b) regarding mitigation related to impacts on historical resources and CEQA Guidelines Section 15064.5(c) and 21083.2(g) regarding archaeological resources. 3) Further ground disturbance shall not resume within the area of the discovery until a meeting is convened with the aforementioned parties and a decision is made with the concurrence of the BLM and (on private land) the County Archaeologist as to the appropriate preservation or mitigation measures. The Applicant shall comply with the determinations of the County Archaeologist and BLM. Cultural-3 Prior to obtaining the Project-related grading permit from the County of Riverside, the Applicant shall have the Secretary of the Interior Qualified/County-approved Project Archaeologist prepare and submit for approval to the BLM and the County of Riverside a CRMP. The CRMP shall map all cultural resources within the APE, as described in this Final EIR/EA. The CRMP must conform with BLM Measure #5, #6, #7 and #8 as found in the determination and findings document provided to SHPO dated August 7, 2013 (BLM 2013). The CRMP shall also detail how resources, if any, are determined eligible or resources that are unevaluated but avoided by Project design, would be marked and protected as Environmentally Sensitive Areas during construction. The CRMP shall also map additional areas that are considered to be of high sensitivity for discovery of buried significant cultural resources, including burials, cremations, or sacred features. The CRMP shall detail provisions for monitoring construction in these high-sensitivity areas. It shall also detail procedures for halting construction, making appropriate notifications to agencies, officials, and Native American tribes, and assessing NRHP and CRHR eligibility in the event that

COMMENT	RESPONSE
	unknown archaeological resources are discovered during construction. For all post-review discoveries, the CRMP shall detail the methods, consultation procedures, and timelines for implementing Mitigation Measures Cultural-1 and Cultural-2. The CRMP shall be presented to all construction personnel, with Native American Participants in attendance, in the form of a worker education program by the Project Archaeologist prior to commencement of groundbreaking. During subsequent Safety Meetings on the job site, the Project Archaeologist and/or his qualified representative shall inform all new construction personnel of the cultural resources issues associated with the Project.
PM 6 Mark Bennett	
The commenter states that the proposed project will be right next to their property and will affect their view. The commenter also expresses concern about the solar panels giving off heat and that the area will be hotter.	The commenter submitted written comments on July 21, 2014; see responses to Letter 16 which responds to the commenter's concerns relative to visual effects and health effects of heat or radiation from the solar array field.

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