March 3, 2010

Alan Solomon
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

RE: **Blythe Solar Power Project, Docket No. 09-AFC-6**
Riverside County Airport Land Use Commission (ALUC) Application for Major Land Use Action Review
Technical Area:
Traffic & Transportation

Dear Mr. Solomon:

Due to proximity of the proposed Blythe Solar Power Project to the Blythe Municipal Airport, applicant has completed and submitted the above referenced application to the ALUC. Attached please find the completed application, as submitted.

If you have any questions on this application, please feel free to contact me directly.

Sincerely,

Alice Harron
Senior Director, Development

Solar Millennium LLC
1625 Shattuck Avenue, Suite 270
Berkeley, CA 94709-4611
tel (1) 510-524-4517
fax (1) 510-524-5516
Info@SolarMillennium.com
http://www.SolarMillennium.com

STATE OF CALIFORNIA
ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of:
APPLICATION FOR CERTIFICATION
for the *BLYTHE SOLAR POWER PROJECT*

Docket No. 09-AFC-6
PROOF OF SERVICE
(Revised 1/26/2010)

APPLICANT

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Public Adviser's Office
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DECLARATION OF SERVICE

I, Carl Lindner, declare that on, March 3, 2010, I served and filed copies of the attached Blythe Solar Power Project Materials:

Riverside County Airport Land Use Commission Application for Major Land Use Action Review
Technical Areas: Traffic and Transportation

The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:

[http://www.energy.ca.gov/sitingcases/solar_millennium_blythe].

The document has been sent to the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

For service to all other parties:

__X___ sent electronically to all email addresses on the Proof of Service list;

_____ by personal delivery or by overnight delivery service or depositing in the United States mail at Camarillo, California with postage or fees thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

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

OR

_____ depositing in the mail an original and 12 paper copies, along with 13 CDs, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 09-AFC-6
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Carl E. Lindner

Application for Major Land Use Action Review

February 2010

Blythe Solar Power Project

Docket No. 09-AFC-6

Alice Harron
Senior Director of Project Development
1625 Shattuck Avenue, Suite 270
Berkeley, CA 94709-1161

APPLICATION FOR MAJOR LAND USE ACTION REVIEW
RIVERSIDE COUNTY AIRPORT LAND USE COMMISSION

ALUC Identification No.

PROJECT PROPONENT (TO BE COMPLETED BY APPLICANT)

Date of Application: 2-19-2010

Property Owner: Bureau of Land Management — Phone Number: 760-833-7100

Mailing Address: Palm Springs South Coast Field Office
1201 Bird Center Drive Palm Springs, CA 92262

Agent (if any): Palo Verde Solar I, LLC — Phone Number: 510-524-4517

Mailing Address: 1625 Shattuck Avenue, Suite 270
Berkeley, CA 94709

PROJECT LOCATION (TO BE COMPLETED BY APPLICANT)

Attach an accurately scaled map showing the relationship of the project site to the airport boundary and runways

Street Address: Site is ~8 miles west of Blythe and 2 mi north of Interstate I-10 (I-10) at exit #232, Airport/Mesa Dr - Attached Figure 5.7-5

Assessor's Parcel No.: Please see attached Figure 2-12 - Parcel Map — Parcel Size:

Subdivision Name: — Zoning Classification:

Lot Number:

PROJECT DESCRIPTION (TO BE COMPLETED BY APPLICANT)

If applicable, attach a detailed site plan showing ground elevations, the location of structures, open spaces and water bodies, and the heights of structures and trees; include additional project description data as needed

Existing Land Use (describe): Please see attached Figure 5.7-6 - Riverside County Zoning

Proposed Land Use (describe): Nominal 1,000 MW Solar power plant, including 3 phase 230 kV line to deliver solar-generated electrical power to a SCE substation. The transmission line will consist of monopoles with a height of 145 ft and a nominal spacing of 1000 ft. For portions of the transmission line extending under the 14CFR 77 Horizontal Surface, pole heights will be constrained by underlying terrain and pole hights will be 90 ft with a nominal spacing of 800 ft.

For Residential Uses — Number of Parcels or Units on Site (exclude secondary units): Not applicable - non-residential use

For Other Land Uses (See Appendix C) — Hours of Use: Solar power plant operation will be 24 hours per day.

Number of People on Site — Maximum Number: No existing residential use

Method of Calculation: Not applicable

Height Data — Height above Ground or Tallest Object (including antennas and trees): See Attachment 1. 14 CFR 77 Height Analysis and FAA No Navigable Hazard Letters

Highest Elevation (above sea level) of Any Object or Terrain on Site:

Flight Hazards — Does the project involve any characteristics which could create electrical interference, confusing lights, glare, smoke, or other electrical or visual hazards to aircraft flight? ☐ Yes ☒ No

If yes, describe: See Attachment 2 presenting the results of an analysis of potential aviation hazards posed by the BSPP including Electromagnetic Interference, Glare, Visible Vapor Plumes, Thermal Turbulence, and Bird Attraction.

REFERRING AGENCY (TO BE COMPLETED BY AGENCY STAFF)

Date Received _____

Agency Name California Energy Commission

_____

Staff Contact Alan Solomon

Phone Number 916-653-8236

Agency's Project No. 09-AFC-06

_____

Type of Project

- ☐ General Plan Amendment
- ☐ Zoning Amendment or Variance
- ☐ Subdivision Approval
- ☐ Use Permit
- ☐ Public Facility
- ☐ Other _____

ALUC REVIEW (TO BE COMPLETED BY ALUC EXECUTIVE DIRECTOR)

Application Receipt

Date Received _____ By _____

Is Application Complete? ☐ Yes ☐ No

If No, cite reasons _____

Primary Criteria Review

Airport(s) Nearby _____

Compatibility Zone(s) ☐ A ☐ B1 ☐ B2 ☐ C ☐ D ☐ E ☐ Ht.

Allowable (not prohibited) Use? ☐ Yes ☐ No _____

Density/Intensity Acceptable? ☐ Yes ☐ No _____

Open Land Requirement Met? ☐ Yes ☐ No _____

Height Acceptable? ☐ Yes ☐ No _____

Easement/Deed Notice Provided? ☐ Yes ☐ No _____

Special Conditions

Describe: _____

Supplemental Criteria Review

Noise _____

Safety _____

Airspace Protection _____

Overflight _____

ACTIONS TAKEN (TO BE COMPLETED BY ALUC EXECUTIVE DIRECTOR)

ALUC Executive Director's Action

- ☐ Approve Date _____
- ☐ Refer to ALUC

ALUC Action

- ☐ Consistent Date _____
- ☐ Consistent with Conditions (list conditions/attach additional pages if needed)

_____

_____

_____

- ☐ Inconsistent (list reasons/attach additional pages if needed)

_____

_____

_____

_____

Application Roadmap/Summary

Palo Verde Solar I, LLC, is submitting this Application for Major Land Use Review to the Riverside County Airport Land Use Commission (ALUC) for the proposed Blythe Solar Power Project (BSPP or Project), a 1,000 MW solar thermal electric generating facility. The Project is proposed for development on public lands managed by the Bureau of Land Management (BLM) on a site approximately one mile northwest of the Blythe Municipal Airport.

The Property Owner is the Bureau of Land Management, located in the Palm Springs-South Coast Field Office, 1201 Bird Center Drive, Palm Springs, CA, 92262.

The Referring Agency is the California Energy Commission (CEC). The CEC project officer is Mr. Alan Solomon (916-653-8236). The CEC project number is 09-AFC-06. The complete Application for Certification submitted to the CEC, including data responses, is contained on the DVD accompanying this Application.

Primary Criteria Review

Compatibility Zones. The application is provided so that the ALUC can perform a land use review of the BSPP and evaluate its potential compatibility with the Master Plan for the Blythe Municipal Airport. Figure 1 presents the compatibility zones for the Blythe Airport obtained from the Riverside County Airport Land Use Compatibility Plan (downloaded from the ALUC website on February 16, 2010). Figure 1 also shows the Project's boundaries, the locations within the Project site of the four air-cooled condensers, and the route of the 230-kV transmission line that will extend from the Project site to Southern California Edison's (SCE) Colorado River Substation, approximately five miles southwest of the BSPP plant site. As shown in Figure 1, the Project encroaches on Airport Compatibility Zones B1, C, D, E, and Height. The southeastern portion of the Project encroaches on Zones D and E while the 230 kV transmission line passes through Compatibility Zones B1, C, D, and E.

Allowable (not prohibited) Use. The Airport Land Use Compatibility Plan identifies allowable and prohibited uses for the different compatibility zones surrounding the airport. Table 1 below, extracted from Appendix D of the Airport Land Use Compatibility Plan, summarizes the compatible land uses by Zone for Transportation, Communications, and Utilities - Electrical Substations, Power Plants, and Power Lines. The Project's proposed uses are "Generally Compatible" or "Potentially Compatible with Restrictions". Prohibited uses consist of activities that would produce hazards to flight and require further analyses that are documented elsewhere in this Application.

Table 1. Compatible Land Use for the BSPP						
Project Component	**Zone A**	**Zone B1**	**Zone B2**	**Zone C**	**Zone D**	**Zone E**
Electrical Substations	–	0	0	0	0	+
Power Plants	–	–	–	0	0	+
Power Lines	–	0	0	0	0	+
– Generally Incompatible 0 Potentially compatible with restrictions (see Table 2A) + Generally Compatible						
Source: Riverside County Airport Land Use Compatibility Plan, Appendix D, December 2004.						

There are no Project electrical substations within the airport Compatibility Zone. The power plant disturbance area extends into Zones E (a compatible land use), and Zone D (potentially compatible but requiring the review of structures greater than 70 feet in elevation). Project transmission lines extend into Zone B1, requiring airspace review for structures greater than 35 feet in elevation, Zones C and D, requiring an airspace review for structures greater than 70 feet in elevation, and Zone E, requiring an airspace review for structures greater than 100 feet in elevation.

Based on Table 2A in Volume 1 of the Airport Land Use Compatibility Plan, land uses that create "Hazards to Flight" are prohibited in Compatibility Zones B1, C, D, and E. Hazards to Flight are defined in footnote 9 to Table 2A to include physical (e.g., tall objects), visual, and electronic forms of interference with the safety of aircraft operations. Land use development that may cause an increase in the level of attraction to birds is also prohibited. Potential physical, visual, and electronic forms of interference associated with the BSPP were reviewed and it was concluded that the Project would not pose a hazard to flight safety. While there are elevated structures at a solar thermal power plant on which birds could perch, the nature of the facility and the structures are such that they are not attractants to birds.

Density/Intensity. There are no density/intensity criteria or open land requirements that apply to the intended land use.

Height Acceptable. The height of project structures requires §14 CFR 77 FAA review. Such a review is underway. The Project's tallest structures will be four Air Cooled Condensers (ACC also referred to as dry cooling towers), each 120 feet in height. None of the ACCs will be located within the Blythe Airport's Compatibility Zone. The Project's transmission line will consist of monopoles 145 feet in height. For that portion of the transmission route where FAA §14 CFR 77 Horizontal Surface restrictions limit structure height to approximately 90 feet, the height of the monopoles will be 90 feet. Form 7460 has been submitted to the FAA for review for each of 58 Project structures that is subject to §14 CFR 77 height restrictions. To date, the FAA has issued Determination of No Hazard to Air Navigation letters for the two ACCs subject to review (ACC-1 and ACC-4) and for 39 transmission poles. The FAA has requested additional information for 15 poles while FAA review of the two remaining poles is in

progress. The height assessment for the Project is discussed in Attachment 1 to this Application. The FAA Letters of Determination and Requests for Additional Information are contained in the DVD accompanying this Application.

Easement/Deed Notice Provided. Easement/Deed Notice have been obtained from the Owner, the Bureau of Land Management and documented in the Application for Certification submitted to the California Energy Commissions.

Supplemental Criteria Review

Potential hazards to flight were addressed in the August 2009 Application for Certification submitted to the CEC and in the responses to subsequent Data Requests issued by CEC and BLM staff. Potential hazards addressed included potential electromagnetic interference from the power plant and transmission lines, potential glare from the parabolic mirrors used to collect solar energy, potential vapor plumes emitted from Project cooling towers, potential thermal turbulence created by thermal releases from Project cooling towers, and bird attraction. The analyses are documented in Attachment 2 of this Application. In summary, the detailed review of each of the potential hazards to flight has concluded that the proposed Blythe Solar Power Project will not pose a significant hazard to flight at or near the Blythe Municipal airport.

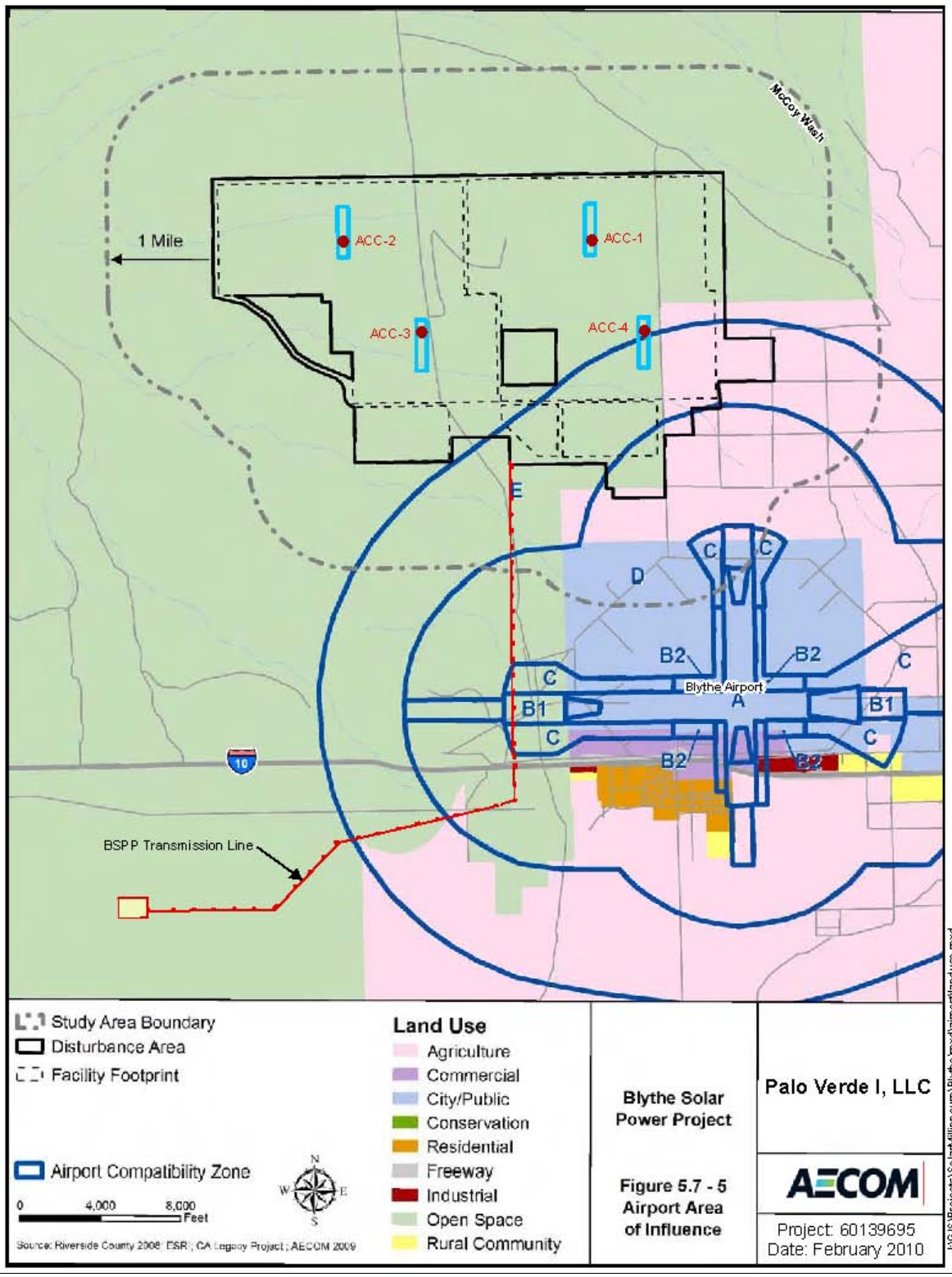
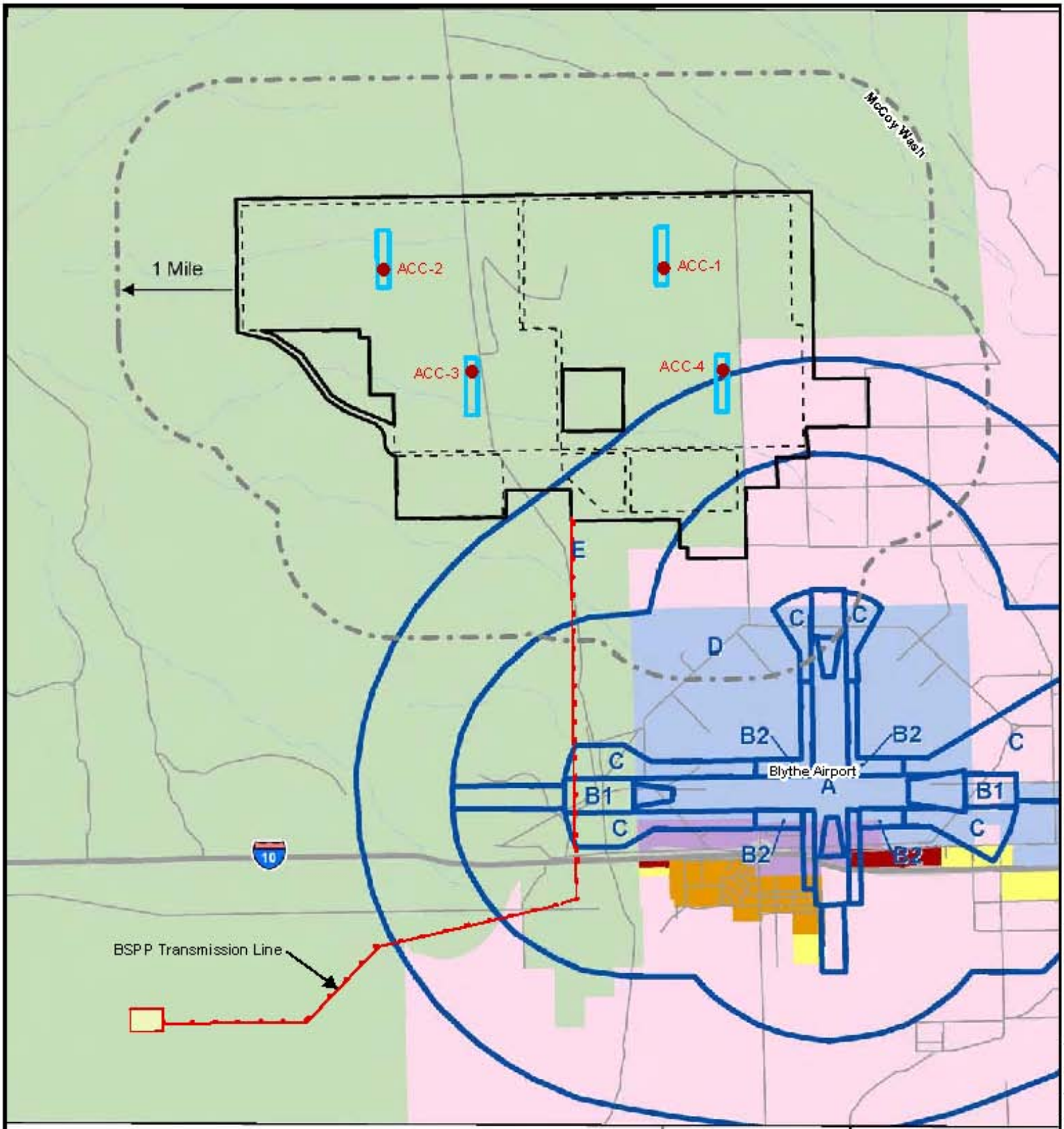


Figure 1. Land Use Compatibility for the Blythe Municipal Airport, Blythe Solar Power Project, and Location of the Air Cooled Condensers and Transmission Line



Study Area Boundary
Disturbance Area
Facility Footprint

Airport Compatibility Zone

0 4,000 8,000 Feet

N W E S

Source: Riverside County 2008; ESRI; CA Legacy Project; AECOM 2009

Land Use

- Agriculture
- Commercial
- City/Public
- Conservation
- Residential
- Freeway
- Industrial
- Open Space
- Rural Community

Blythe Solar Power Project

Figure 5.7 - 5 Airport Area of Influence

Palo Verde I, LLC

AECOM

Project: 60139695
Date: February 2010

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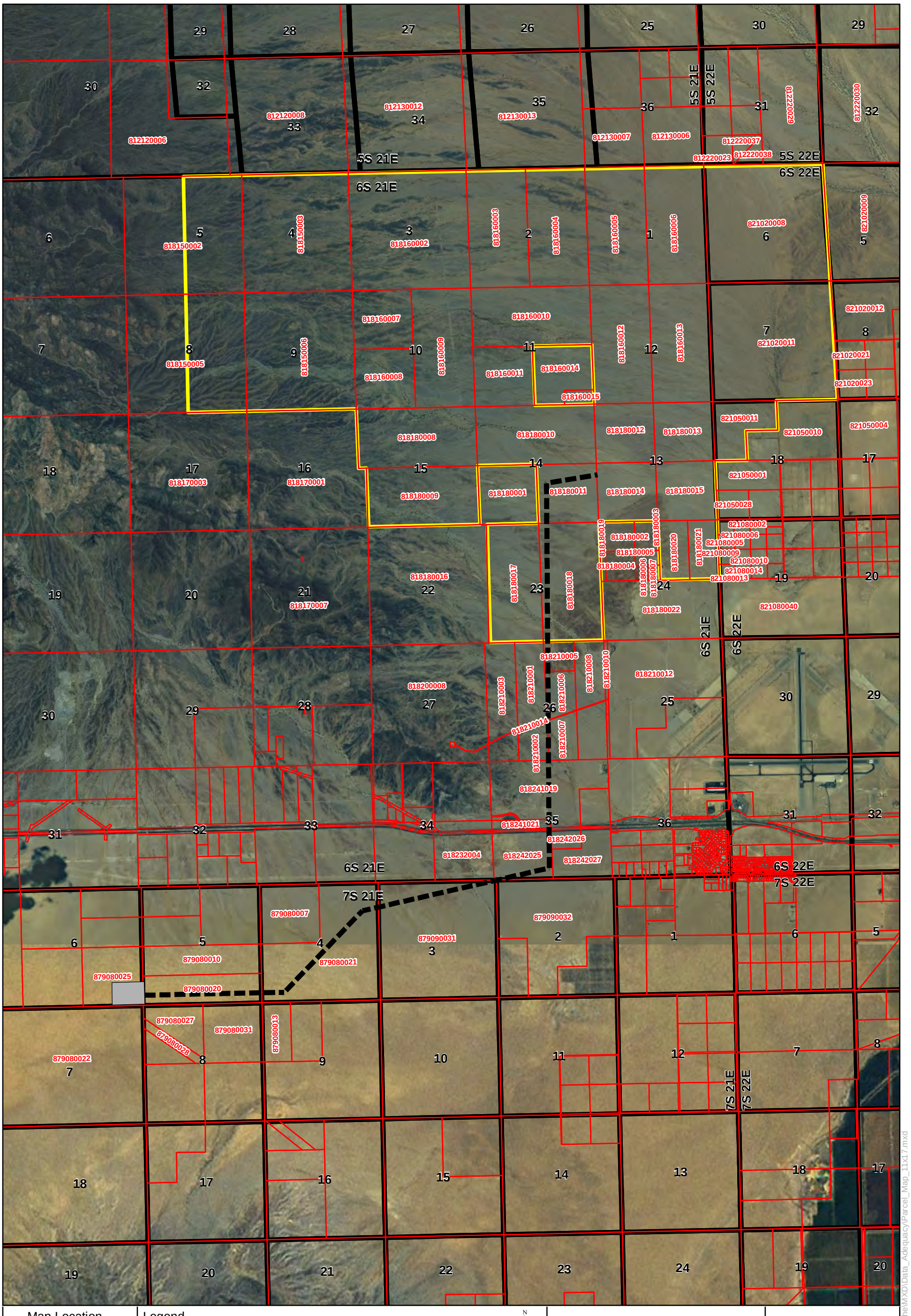

Map Location

Legend

- Project Right-of-Way
- Project Transmission Line
- Parcel Boundary
- Section/Township/Range
- Substation

1 inch = 4,000 feet

0 2,000 4,000 8,000 Feet

Blythe Solar Power Project
Figure 2-12
Parcel Map with Section Township and Range

Solar Millennium

AECOM

Date: October 2009

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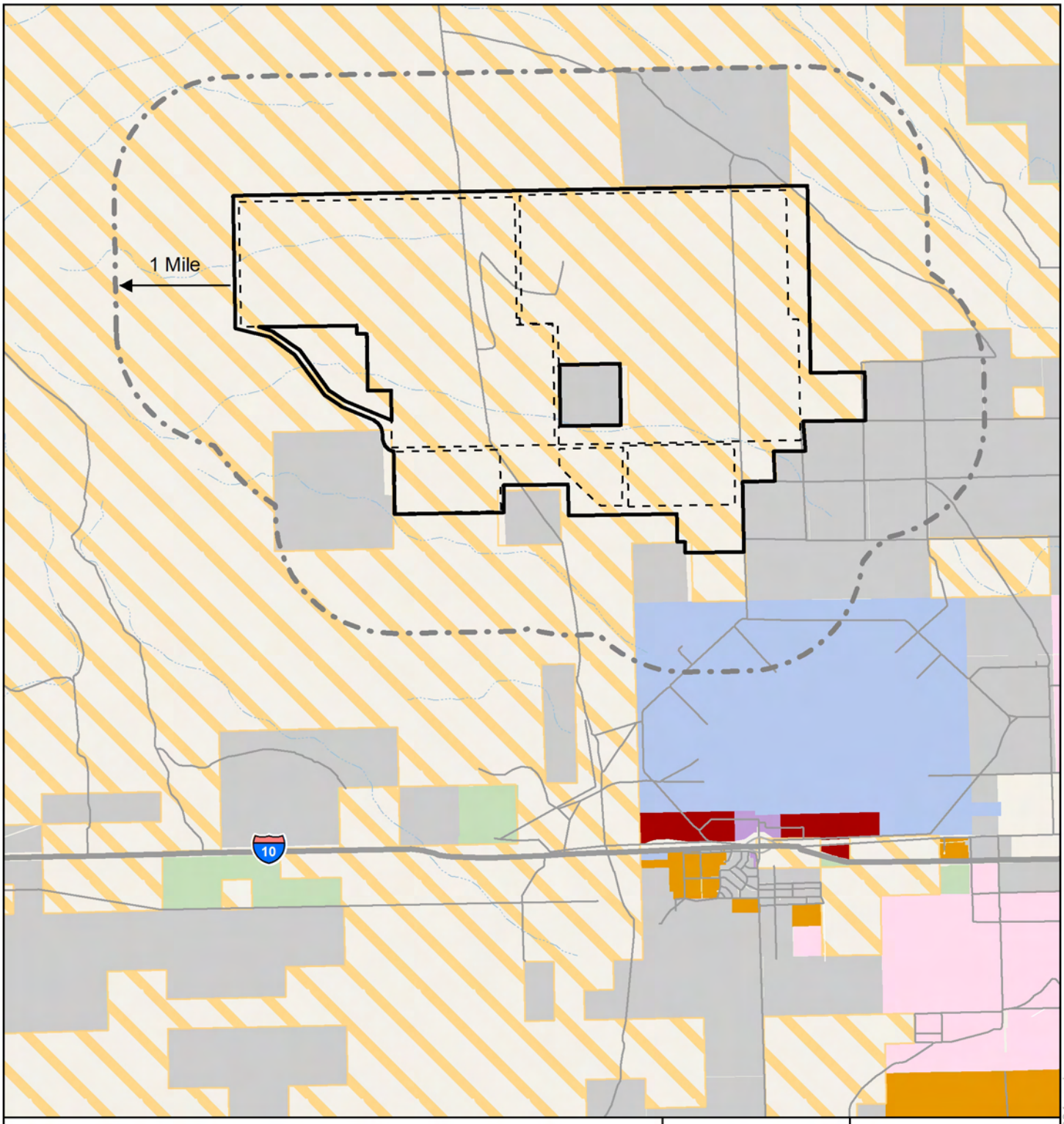

Disturbance Area
Study Area Boundary
Facility Footprint

Ownership
BLM

Zoning
Agriculture
Commercial
Industrial
Manufacturing
Natural Assets
Residential
Controlled Development

0 4,000 8,000 Feet

N W E S

Source: Riverside County 2008; ESRI; CA Legacy Project ; AECOM 2009

Blythe Solar Power Project

Figure 5.7 - 6
Riverside County Zoning

Solar Millennium

AECOM

Date: August 2009

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Attachment 1.

§14 CFR 77 Analysis of Allowable Heights for BSPP
19 Feb 2010

Allowable Heights of Structures

The structures proposed for the Blythe Solar Power Project (BSPP or Project) would be an incompatible land use with the Blythe Municipal Airport if the heights of the structures were to pose a hazard to air navigation near the airport. To ensure that no such hazard would be created by construction of the Project, the Applicant performed a §14 CFR 77 (Objects Affecting Navigable Airspace) analysis for the BSPP. This assessment included review of the potential compliance with §14 CFR 77 of all Project structures. All Project structures are less than 150 feet in elevation above ground level. The specific Project structures for which detailed review was performed are two Air Cooled Condensers (ACCs) (120 feet in height) and 56 high voltage transmission lines monopoles (145 feet and 90 feet in height). The transmission line will connect the Project to the Southern California Edison (SCE) system at the new Colorado River substation.

Figure 1 presents a graphical representation of the results of the Applicant's analysis of the allowable height of structures within the Part 77 Horizontal Surface boundary and the Conical Surface boundary. There is a portion of the transmission line route at which terrain will restrict the allowable height of the transmission line poles to a nominal 90 feet above ground level. Outside of this limited area, BSPP will limit the height of transmission poles to a nominal 145 feet above ground level. For that section of the transmission line route with pole height of 90 feet, the pole spacing will be a nominal 800 feet. For the rest of the transmission line route, the pole spacing will be a nominal 1,000 feet.

The Applicant submitted Federal Aviation Administration (FAA) Form 7460 (Notice of Proposed Construction and Alteration) to the FAA for those elements of the Project that are to be located within the compatibility zone requiring analysis under §14 CFR 77. These structures consist of the two eastern-most of the Project's four air cooled condensers (ACC-1 and ACC-4) and 56 transmission line poles. Both ACC-1 and ACC-4 are located to the north-northwest of the approach end of Runway 17. The remaining two air cooled condensers are outside the area subject to FAA review under §14 CFR 77.

To date, the FAA has issued Determination of No Hazard to Air Navigation letters for the two air cooled condensers subject to review (ACC-1 and ACC-4) and for 39 transmission line poles. The FAA has requested additional information for 15 poles while the FAA reviews of the two remaining poles are in progress. The FAA Determination of No Hazard to Air Navigation letters received to date are included on CD-ROM and are included with the Application package.

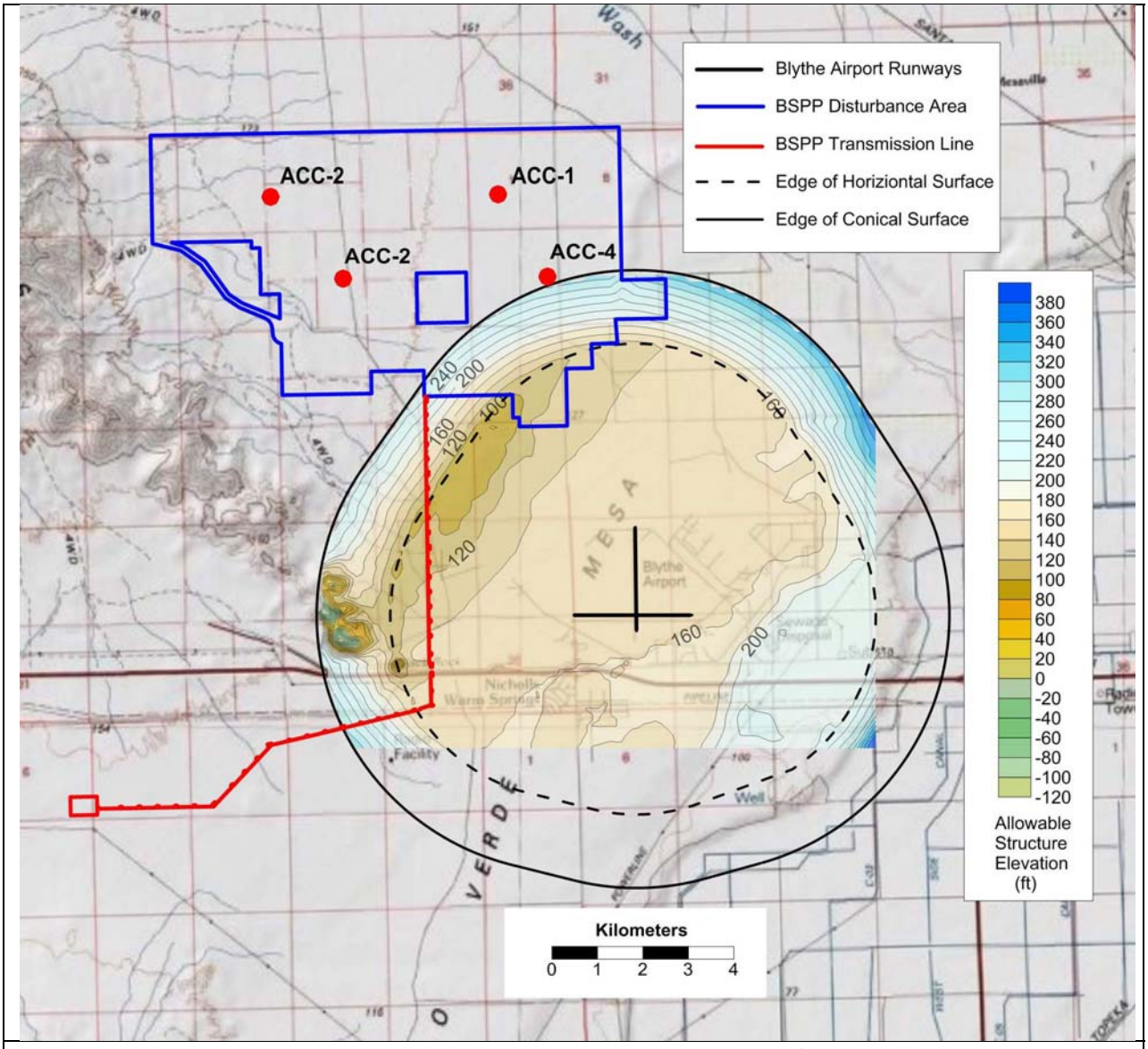


Figure 1. Blythe Solar Power Plant 14 CFR 77 Allowable Height Analysis for Transmission Line and Air Cooled Condensers (ACCs)

Attachment 2.

Aircraft Safety Assessment for BSPP for submittal to Riverside County ALUC
23 Feb 2010

The Blythe Solar Power Project (BSPP or Project) is located approximately one mile northwest of the Blythe Municipal Airport and portions of the Project site fall within the Land Use Compatibility Zone established by the Riverside County Airport Land Use Commission. In a telephone conversation with Mr. John Guerin, ALCU Senior Planner, on 2/9/2010, Mr. Guerin indicated that the land use compatibility issues of concern to the ALCU for the BSPP were hazards to aviation consisting of electromagnetic interference, glare, visible plumes, turbulence from thermal plumes, bird attraction, and structure height. Structure height is addressed in Attachment 1. The remainder of this document addresses each of the remaining potential hazards to aviation posed by the BSPP.

Electromagnetic Interference

The electromagnetic signal/noise emanating from the BSPP due to operation of electrical equipment will be at base frequency of 60 hertz with less intense higher frequencies from harmonics. The sources and potential magnitude of electromagnetic radiation from the BSPP are expected to be comparable to that generated by the Palmdale Hybrid Power Project (PHPP). The proposed PHPP is a hybrid power generating facility that includes a solar thermal generation component comparable to that at the BSPP. The PHPP is proposed for construction on a site adjacent to the Air Force Plant 42/Palmdale Regional Airport in Palmdale, California. Both solar thermal projects will employ parabolic mirror troughs and will use generally similar electrical control systems and equipment. Navigation and aviation communication signals commonly employed at the AF Plant 42 airfield for control and guidance are in the range of 108 megahertz to 135 megahertz (VHF) and 225 megahertz to 400 megahertz (UHF). The California Energy Commissions did not express concern that electromagnetic signals generated by the PHPP would interfere with navigation signals at the Palmdale Airport (CEC Preliminary Staff Assessment Palmdale Hybrid Power Plant Project, Docket 08-AFC-9, Volume 1, Transmission Line Safety and Nuisance, December 29, 2009). Consequently, since the solar components of the PHPP and the BSPP are similar, there is no reason to suspect that the BSPP would produce significant electromagnetic interference at the Blythe Airport.

The BSPP proposes to construct a 230 kV circuit transmission line to connect the BSPP to the Southern California Edison (SCE) Colorado River substation to allow interconnection with the SCE system. Potential transmission line-related radio frequency interference is a potential indirect effect of transmission line operation and is produced by the physical interactions of line electric fields. Such interference is due to the radio noise produced by the action of the electric fields on the surface of the energized conductor. The process involved is known as corona discharge and can occur within gaps between the conductor and insulators or metal fittings. Since the level of interference depends on factors such as line voltage, distance from the line to the receiving device, orientation of the antenna, signal level, line configuration and weather conditions, maximum interference levels are not specified as design criteria for modern transmission lines. The level of any such interference usually depends on the

magnitude of the electric fields involved and the distance from the line. However, the potential for such impacts is minimized by reducing the line electric fields and locating the line away from inhabited areas.

The potential for such corona-related interference is usually of concern for lines of 345 kV and above. The BSPP transmission line will operate at 230 kV and will be designed in accordance with standard utility practices to reduce the electric field at energized surfaces to acceptable levels. Each transmission line circuit consists of three phases. Each phase conductor utilized will be bundled - two or more sub-conductors separated by 18 to 22 inches to make up one phase conductor - specifically to reduce electric fields at the conductor surface. In addition, electric field mitigation devices called corona rings will be mounted at conductor-hardware interface points at the end of the insulators to reduce the field levels at those locations. Radio frequency interference is therefore not expected to be a concern during operation of the transmission line.

Glare from Parabolic Trough Mirrors

Potential glare from parabolic trough mirrors was investigated during the California Energy Commission (CEC) licensing proceeding for the Victorville 2 (VV2) Hybrid Power Project (CEC Docket Number 07-AFC-1). The VV2 is a hybrid power generating facility that will use parabolic trough mirrors comparable to those proposed for the BSPP to generate a portion of its output. The VV2 project is proposed for construction adjacent to the Southern California Logistics Airport (SCLA). In the VV2 siting case, CEC Staff reviewed the information submitted by the applicant in support of the licensing proceeding, including light reflection and scattering optics in a parabolic mirror and the heat conduction element (HCE) at the focal point, and indicated that the VV2 project would not cause an impact to nearby flight operations at the SCLA (CEC, Final Staff Assessment, Victorville 2 Hybrid Solar Power Project, Docket 07-AFC-01, Traffic and Transportation, March 2008). Likewise, BSPP is not expected to have an impact on Blythe Municipal Airport flight operations

The mirrors proposed for the BSPP are in the form of a trough whose cross section has the shape of a section of a parabola. The primary feature of a parabola is that all incident light entering the parabola is focused on a single focal point. For a linear parabolic trough mirror, the focal point becomes a line of focus with the heat conducting element located along this line of focus. The HCE is 70 millimeter diameter glass tube running the length of the mirror containing a heat transfer fluid. Because all incident light striking the mirror is focused on the HCE tube, and almost all the focused light is absorbed upon striking the HCE, there is no direct reflection of sunlight by the mirror to an outside observer. Figure 1 presents a discussion of the optics associated with a parabolic mirror and a graphic presenting a visualization of the reflections within a parabolic mirror.

While there is no direct (or specular) reflection from a parabolic mirror other than that impinging on the line of focus, there are minor sources of specular reflection and diffuse scattering from light striking the HCE tube. Because the HCE is in front of the mirror, a small fraction of incoming sunlight directly

impinges on the HCE and this small amount of light is scattered or reflected away from the mirror. In addition, there is scattering, reflection, and refraction occurring along the entire line of focus on the side of the HCE facing the mirror. Due to these scattering and refraction effects, the HCE can be seen to glow when in service. In addition, metal surfaces within the solar trough array have the potential to produce specular reflections given the proper sun-mirror-observer geometry. Figure 2 presents a ground level view of the reflected light from the HCE. Note there is a primary reflection point and smaller reflections from joints in the HCE. Figure 3 presents a ground level view of the direct reflection from several points on the HCE tube plus the glow along the HCE from a working section of the mirror trough. In this instance, the glow is visible because of the uniform backdrop of the mirror, and constitutes most of what is what is generally seen from an aircraft looking down on a mirror array, given the proper geometry. The point reflections from the HCE tube are comparable to that from, for instance, a mirror or windshield from a passing truck, or broken glass along the highway. The BSPP will construct a 25-foot tall wind screen around the solar array fields and this wind screen will prevent such reflections from seriously impacting ground level observers outside the fence line of the facility.

The diffuse scattered and reflected light from the HCE, when viewed from aloft, has the appearance of the diffuse reflection from a body of water. Figure 4 presents three pictures of the diffuse light from an active solar trough array observed from an aircraft flying over the Kramer Junction SEGS solar power plant (Flight referenced in CEC Final Staff Assessment, Victorville 2 Hybrid Solar Power Project, Docket 07-AFC-01, Traffic and Transportation, March 2008). The glow from the diffuse scattering/refraction and direct reflection from the HCE elements is visible as a bright area in the solar trough array field. Note that as the observer position changes between frames, the area of the solar field producing the corresponding “lake surface” effect changes as the observer-mirror-sun geometry changes. The observed glow is not brilliant and can be easily observed steadily, as opposed to an intense specular reflection from a mirror.

Two aircraft were involved in the over-flight during which the pictures in Figure 4 were taken. Figures 5 and 6 are copies of emails from two persons involved in the over-flight, James Adams of the CEC, and Peter Soderquist, the SCLA Manger and pilot of one of the aircraft. Both Mr. Adams and Mr. Soderquist comment in their emails that there was no glare (i.e., intense specular reflection) observed from the solar trough mirrors during the fly-over (Flight referenced in CEC, Final Staff Assessment, Victorville 2 Hybrid Solar Power Project, Docket 07-AFC-01, Traffic and Transportation, March 2008).

Visible Plumes associated with Cooling Towers

The BSPP will use an air-cooled condenser (ACC) to reject waste heat from the steam cycle in each power block. An air cooled condenser is essentially a large open air radiator that dissipates heat to the atmosphere through air convection without the use of cooling water. Consequently, there is no water evaporation from an air cooled condenser nor is there any potential for formation of visible moisture plumes that could be a potential hazard to aviation.

The Project will also have four small auxiliary two-cell wet cooling towers, one for each of the four power blocks. The purpose of these auxiliary cooling towers is to reject waste heat from auxiliary boiler during startup and other non-routine operations. They are not designed to reject heat from the power plant steam cycle, as is the case for the much larger cooling tower at the nearby Blythe Power Plant. The California Energy Commission is not concerned with these small auxiliary cooling towers being a potential hazard to aviation and did not require a visible or thermal plume analysis for these auxiliary cooling towers as part of the licensing process for the BSPP (CEC, Final Staff Assessment Victorville 2 Hybrid Solar Power Project, Docket 07-AFC-01, Traffic and Transportation, March 2008.)

Turbulence Associated with Vertical Plumes from the Air Cooled Condenser

An air cooled condenser operates by using a rectangular array of fans to blow large amounts of air through cooling fins to allow steam to condense as part of the steam cycle for the power plant. The heat released by the condensation of the steam is transferred by convection to the atmosphere and creates a buoyant plume of warm rising air above the ACC. This rising plume of warm air has the potential to create turbulence that could be a hazard to aviation.

Based on the design basis for the Project's ACCs, the heat transferred to the air blowing past the cooling fins in the ACC will raise the temperature of the air by less than 10°C (18°F). This is to be compared to a power plant exhaust plume where the plume temperature can be over 400°C (750°F) greater than the ambient temperature upon release from the stack. Thermal energy is the primary energy source in an exhaust stack plume that can produce turbulence above the release point. Consequently, the ACC plume, with only a 10°C increment over the surrounding air, has little potential energy available to create vertical turbulence that would be a hazard to general aviation. Based on the mass flow rate through the ACC produced by the fans and the dimensions of the structure, the average upward velocity through the ACC is 4.5 meter per second (m/s). This velocity, which will occur at the upper face of the ACC, can be compared to the vertical velocity of 4.3 m/s that is used by the CEC as a significance criterion for the potential for a thermal plume to produce turbulence that could interfere with aircraft operation (CEC, 2010. Preliminary Staff Assessment for Palmdale Hybrid Power Project, Docket 08-AFC-09, Traffic and Transportation, February 9, 2010). As there is a steady decrease in plume vertical velocity as the thermal plume rises, there is little potential for the ACC to produce significant turbulence that could affect aircraft flight safety, even if the aircraft were immediately above the ACC.

Figure 7 presents a diagram illustrating the Airport Influence Area Boundary for the Blythe Municipal Airport, the general aircraft traffic pattern envelope for the airport obtained from the airport Master Plan, and the location of the air cooled condensers within the BSPP project area. The concern for flight safety from thermal plumes is that aircraft on final approach could be subject to turbulence at low level with little room for recovery if hazardous turbulence were experienced. However, as shown in Figure 7, the typical patterns for final approach do not take aircraft over the air cooled condensers of the BSPP. ACC-4 is adjacent to the Influence Area Boundary, approximately 14,000 feet north-northwest from the

approach end of Runway 17, and slightly off the extended centerline of the extend runway. ACC-1 is further away, at approximately 19,000 feet north-northwest. None of the traffic pattern envelopes, which are considered to encompass 80 percent of all flights, approach the location of the BSPP air cooled condensers. While aircraft may pass over the air cooled condensers during some flight operations in the terminal area, these flights will be at higher altitude and not subject to the potential low-level of turbulence that may occur above the air cooled condensers.

In summary, there is not expected to be any significant impact on aircraft safety due to thermal plumes generated by the BSPP air cooled condensers due to

1. Flight patterns at the airport do not take aircraft over the air cooled condensers at low altitude, and
2. The magnitude of turbulence above the air cooled condensers is near the threshold level established by the CEC, and will diminish with altitude above the structures.

Bird Attraction

Birds are attracted to elevated structures for perching and water surfaces are attractants for migratory birds. There are no ponds associated with the BSPP that would be attractants to migratory birds. While there are elevated structures associated with the BSPP, the most significant ones can be easily excluded as bird attractants. Birds are unlikely to perch on the parabolic mirror arrays because of the local glare/scattered light near the mirrors and heat conduction element and the continuous motion of the mirrors. Likewise, birds are unlikely to perch on the air cooled condensers because of the fan noise and the relatively large vertical air flow (approximately 4.5 meter per second, or 10.0 miles per hour).

Figure 1. Parabolic Trough Mirror Design

Parabolic Trough Mirror Design

Prevents Escape of Reflected Incident Rays

The design of VV2's single axis solar collector essentially prevents the escape of incident rays that directly strike the surface of the mirror. This is accomplished by the fundamental physics of the parabolic reflector as shown at Figure A in EXHIBIT 1 (attached). All rays entering the parabolic reflector are concentrated at single point (the focal point), located ½ the distance of the arc's radius, shown as Fp in Figure A. A Parabolic Trough Mirror type solar array is engineered so as to place the Heat Collection Element (HCE) precisely at the Fp (see also Figure B, on the attached EXHIBIT 1).

The solar array will track the East to West movement of the sun with an accuracy of 0.1 degrees. The concentrated area of the sun's reflected incident rays will be magnitudes smaller than the 70MM diameter of the HCE. The HCE positioned in this direct line of sight with the sun will block or absorb all entering direct incident or reflected incident rays. As a result, aircraft flying over the array will generally not be exposed to reflected incident rays of sunlight -- in other words, the sun itself (or any portions thereof) will not appear to pilots as a reflection in a mirror.

It is important to note that the HCE is encased in glass and will be a minor source of reflection as described below (this is generally what accounts for the "glittering" effect of parabolic trough solar arrays, often described as similar to flying over a body of water):

1) The HCE is designed to absorb and collect incident rays reflecting off the parabolic mirror but, of course, some incident rays will strike the HCE directly as it is located in front of the mirror. As a result, there will be some reflections from the glass coating the HCE; however, these reflections will be minor as the HCEs are designed to absorb sunlight, not reflect it.

2) The reflected incident rays of the sun will generally be directed to the lower portion of the HCE glass encasement by design and will produce a glow from the reflected scattered beams as they enter the collector. If an aircraft were positioned at exactly the right angle above the array, this "glow" phenomenon could be visible along the entire length of the collector element for an individual row of mirrors. However, there are no reflected incident rays of sunlight associated with this glow and the brilliance/intensity of the light is much less by comparison to reflected sunlight.

In summary

Based on practical experience and the laws of physics, solar arrays using the parabolic trough mirror design do not produce significant glare or reflection that would pose a distraction to aviation. The fundamental reason for this conclusioncan be found in the design of the parabolic trough mirror. The focal point created by the parabolic mirror will not allow any concentrated rays to escape the solar field. As a result, descriptions by pilots over flying a solar thermal facility (SEGS) indicate that, with regard to reflective glare, the general appearance of the array from the air is similar to flying over a body of water (see for example, the attached e-mail from Peter Soderquist of SCLA describing a recent overflight of the existing SEGS plants).

Figure 1. Parabolic Trough Mirror Design (Continued)

EXHIBIT 1: Parabolic reflectivity

Fp = Focal Point = A point located ½ the distance of the arc's radius

C = Center of Arc

Incident Ray = Separate and continuous bombardment of sunlight

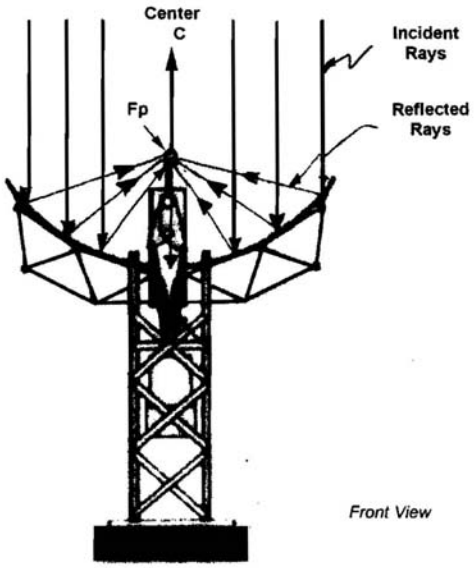


Figure A

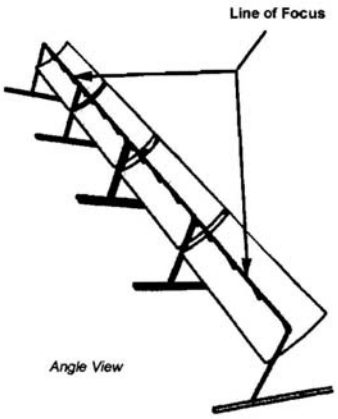
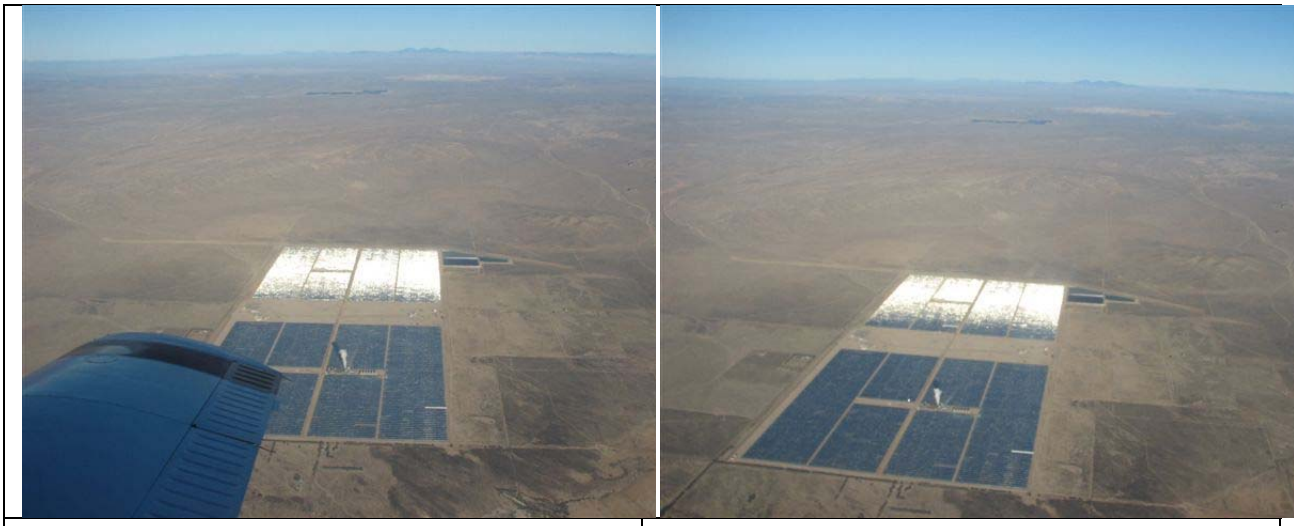


Figure B

A parabolic reflective surface (Figure A) will precisely direct an Incident Ray of light (Ir) to a focal point (Fp) ½ the distance from the center (C) of the arc. There is a "line of focus" (Figure B) created by the parabolic trough that will travel the full length of the mirror.

Figure 2. Ground Level View of Direct Reflection from the 70 mm Glass Heat Collection Element (HCE) at the Focus of the Parabolic Mirror at the SEGS Power Plant. There will be a wind fence surrounding the facility that will prevent most such reflections from being visible from a ground level observer.

Figure 3. Ground Level View of Reflection and Scattering from the HCE Tube at the SEGS Power Plant. Note the Diffuse Glow due to Scattering Along the Entire Length of the HCE Tube. There will be a wind fence surrounding the facility that will prevent most such reflections from being visible from a ground level observer.



Three views of the Solar Array at Kramer Junction showing the "glow" of scattered and diffuse reflected sunlight from the solar trough array. The source and intensity of such light is dependent upon the geometry between the viewer, the solar trough, and the sun. Glow from the foreground array and portions of the background array are not visible because the observer-mirror-sun geometry is not correct. The observed light is comparable to the diffuse reflected light off a surface of water. There is no difficultly in looking directly at the solar array as the observed light is mostly due to diffuse scattering processes rather than direct, specular reflection of sunlight from a mirror.

Figure 4. Aerial Photographs of Observed Scattered and Diffuse Reflected Sunlight from the Solar Trough Array at Kramer Junction, September 24, 2007.

*

From: Jim Adams [mailto:Jadams@energy.state.ca.us]
Sent: Friday, October 12, 2007 3:07 PM
To: Barnett, Tom
Cc: John Kessler
Subject: Re: Solar Design

Tom,

Peter flews us over the arrays at Kramer Junction and Harper Lake on September 24 between 10-10:30 AM. From a distance the facilities look like a lake or big pond. We started off at 4,000 feet AGL and got down to 1,500. We simulated doing an approach for landing and kept the facility in sight off to our left. I managed to take some pictures with my digital camera even though it was a bumpy ride. There was no glare at any time. Curt and a colleague from Caltrans Aeronautics flew similar overflights in another plane. They didn't see any glare either. I will be getting a letter from them soon. I also talked to Mark Mehos with NREL and he sent me an e-mail noting that all the sun rays are captured by the parabolic collector. Worst case scenario is when a collector is not "on sun" in which case the reflected light drops to ambient levels (same intensity as would be reflected off a flat mirrored surface). I will continue to research this and plan on contacting parabolic collector manufacturers for additional info on the potential for glare. We'll discuss this at the PSA workshop and I'll revisit in the FSA.

Regards,

Jim

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Figure 5. Email documenting observation of lack of reflected glare from parabolic trough mirrors during a flyby at a solar thermal power plant, September 24, 2007.

From: Peter Soderquist [mailto:PSoderquist@CI.VICTORVILLE.CA.US]
Sent: Friday, October 05, 2007 11:23 AM
To: Barnett, Tom
Subject: RE: Solar Glare follow Up

Note to file regarding a "photo flight" over the solar arrays at Kramer Junction and Harper Lake.

On September 28, I received an email from Jim Adams regarding using my plane to fly him up to Kramer Junction and Harper Lake to take aerial photos of the solar arrays. The note began with: "We don't have a problem with using your plane. We should arrive about 10 AM on Thursday and will need to get airborne ASAP. I'm forwarding this e-mail from Kurt with the google earth points and hold harmless agreement. You need to tell the military guys that your flight is a substitute for the Caltrans approved flight."

I coordinated with Sport Radar (the military), advising them that I was making the flight instead of CALTRANS.

Jim, Kurt Houkel, and Gwyn Rees (also from CALTRANS arrived). After I explained that I had switched planes (as directed by Jim) Kurt noted his displeasure with this and expressed his strong desire to go. We ended up taking two aircraft. Jim was with me and Kurt and Gwyn went in the CALTRANS airplane.

We took off at around 10:15 and flew up to Kramer Junction. On the way up, Jim pointed out a lake in the distance and asked what that was. I said that was the Kramer Junction solar array. I asked him if he could see the lake at our 2:00 position. He did. I told him that was the Harper Lake array.

At Jim's request, we flew by the Kramer Junction array on the east side at 1,500' AGL. We turned west and simulated an approach to land (as though we were landing at SCLA with the solar array off our left wing). The only time "glare" appeared was when we were heading north on the east side of the array. The "glare" was thin, glinting lines that "moved" north over the array as the aircraft moved north. They were not offensive. While one could not stare at the sun, one could stare at these lines. I did not see the "glare" after turning west or while flying south to "land." My observations were from 1,500 AGL to 500' AGL.

After "landing" we headed direct to the Harper Lake solar array. On the way to Harper Lake, I asked Jim what he thought of Kramer Junction. His response was noncommittal.

As we approached Harper lake, again, it looked like water. There was no reflection at all – no glare. We remained south of the array and after passing it to the east, we headed back to SCLA.

On the way back, I asked Jim if he could see the glare off my left wing. He could not as it was close to the fuselage. I was attempting to show him that the glare from the sun off my wing was offensive. Unlike the "glare" we saw at Kramer Junction which one could look at, you could not look at the sun's glare on the wing.

While overflying Silver Lakes, I attempted to identify the glare that pilots commonly see reflecting from

lakes. There was no visible glare because the water was too choppy.

As we approached to land at SCLA, I pointed out to Jim that the "solar array" on our left was passing by under our wing and was only partially visible.
After landing, the four of us reconvened briefly in the theater (Kurt wanted to make a quick departure to avoid incoming weather/winds). During that time, Kurt mentioned several times that he did not see a problem with what he saw/experienced.

Jim was less noncommittal in the conference room. Though he did not specifically make the statement that the glare was not offensive, his comments suggested that it his mind, it was not. He stated that his report would probably recommend the power plant utilize the newer technology mirrors that are being used at Fresno as they are apparently designed to minimize glare.

To sum, I thought the flight demonstrated to Jim that the glare that that was reflected off the Kramer Junction solar array was visible but not offensive. I use the expression *"…the glare that <u>was</u> reflected…"* to remind us that while the flight around the Kramer Junction array took several minutes, the only time these wispy lines of glare appeared was while we were passing by it on the east side. The rest of the time, the array was non-reflective.

Peter Soderquist

Figure 6. Email by Pilot Peter Soderquist Documenting His Observation of Lack of Reflected Glare from the Parabolic Trough Mirrors during a Flyby at a Solar Thermal Power Plant, September 24, 2007.

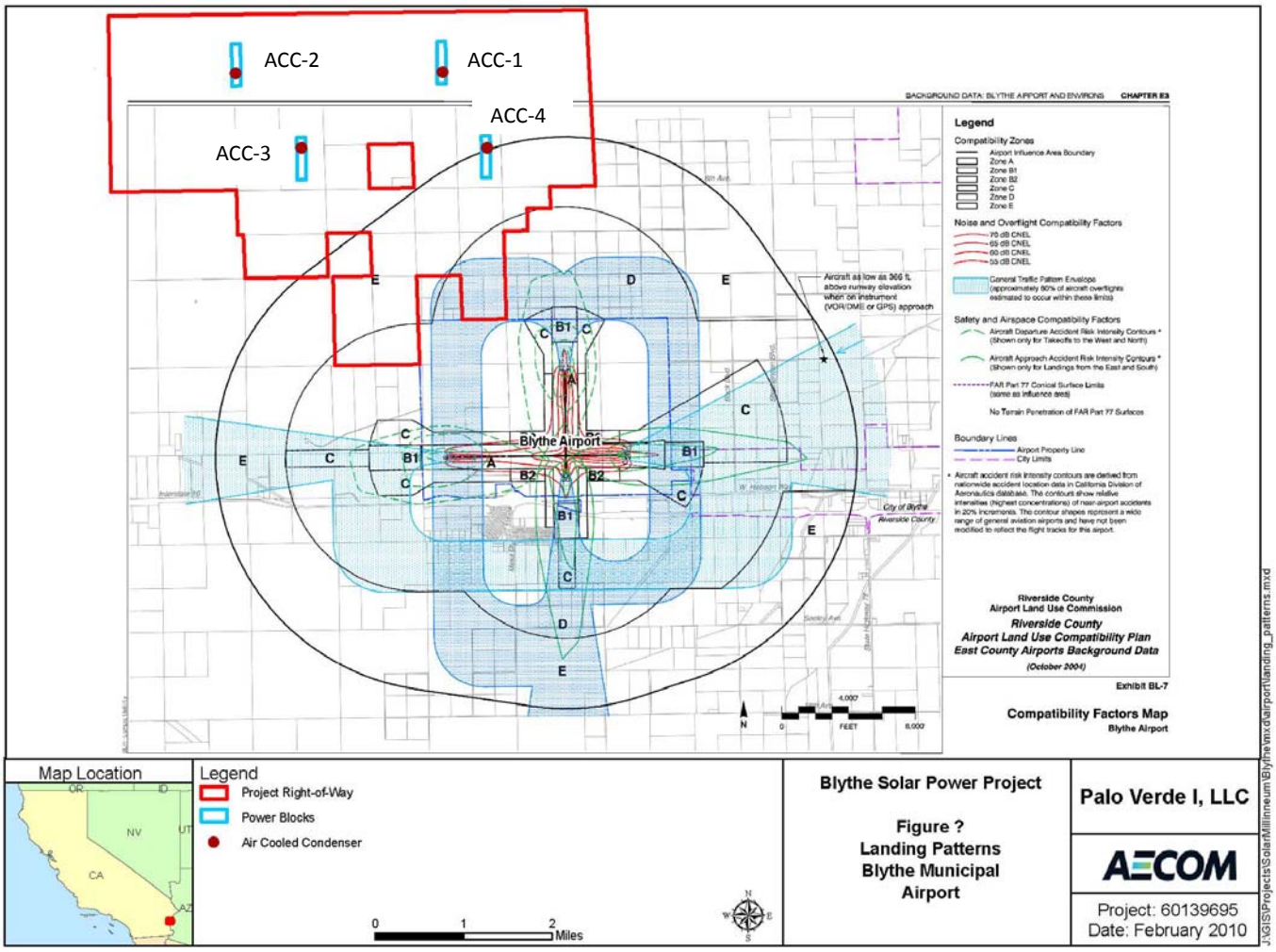

Figure 7. Blythe Municipal Airport Traffic Patterns, Blythe Solar Power Project Boundary, and Location of Air Cooled Condensers and Transmission Line