4.0 Project Alternatives

4.1 Introduction

Alternatives to the Ridgecrest Solar Power Project (RSPP or Project) as proposed are presented in this section. Alternatives include the "No Action" (also called "No Project") alternative, alternative Project sites, alternative site layouts, a smaller plant alternative, transmission route alternatives, freeze protection and auxiliary boiler heating alternatives, alternative water sources, and alternative power generation technologies. This section summarizes the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) requirements with respect to alternatives evaluations and discusses: the methodologies and criteria used to identify and screen the various kinds of alternatives (alternative sites, layouts, sizes, etc.).

As this section makes clear, many of the alternatives to the Project would not meet the Project's basic objectives or the necessary screening criteria, and/or would not lessen the Project's potential environmental effects. In each instance in which an alternative would achieve the Project objectives and lessen potential effects, the Project has been modified to adopt that alternative.

Summary

Alternatives evaluated include the "No Action" (also called "No Project") alternative, alternative Project sites, an alternative site layout, a smaller plant alternative, transmission line alternatives, freeze protection and auxiliary boiler heating alternatives, alternative water sources, and alternative power generation technologies. The "No Action" alternative would not meet Project objectives. The selected site was the most suitable among the various sites considered based on economic, technical, environmental, transmission access, and other criteria. A smaller facility would not meet Project objectives and would not offer economies of scale. With the construction of a natural gas pipeline considered to be both environmentally intrusive and expensive, none of the other boiler fuel alternatives were economically preferable to the selected propane option. Even with dry cooling, the Project requires water, and using water supplied by the Indian Wells Valley Water District (IWVWD) represents the best option in terms of both environmental impact and economic feasibility. Other renewable technology alternatives were rejected because the Applicant (Solar Millennium) is an industry leader in parabolic trough technology.

4.1.1 CEQA Requirements

CEQA requires the lead agency to consider "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives" (Title 14 California Code of Regulations [CCR] Section 15126.6(a)). The CEQA Guidelines (Title 14 CCR Section 15126.6(c)) further provide that "among the factors that may be used to eliminate alternatives from detailed consideration in an Environmental Impact Report" are:

- Failure to meet most of the basic project objectives,
- Infeasibility, or
- Inability to avoid significant environmental impacts.

4.1.2 NEPA Requirements

Like CEQA, NEPA requires the identification and analysis of a reasonable range of alternatives. NEPA's requirements for an alternatives analysis are found in NEPA Section 4332, 42 USC 4332(2)(C)(iii), and in Section 1502.14 of the White House Council on Environmental Quality (CEQ) NEPA Regulations (Title 40 Code of Federal Regulations [CFR] 1500-1508). Section 1502.14(a) requires Federal agencies to explore a reasonable range of alternatives, "and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." CEQA Guidance concerning the NEPA regulations adds that reasonable alternatives include those that are "[p]ractical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" (CEQ NEPA's 40 Most Asked Questions, Answer to Question #2). In short, NEPA requires that an Environmental Impact Statement (EIS) thoroughly explore and evaluate all reasonable alternatives that meet the purpose and need of the proposed action, including those that are not within the jurisdiction of the action agency. NEPA also requires an explanation of the reasons that an alternative has been eliminated from detailed study.

The Federal Land Policy and Management Act (FLPMA) Section 1765 informs the BLM's NEPA review of the alternatives it must consider in an EIS. Per FLPMA Section 1765, the BLM must, when it grants a right-of-way, "minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment," "require compliance with State standards for public health and safety, environmental protection, and siting, construction, operation and maintenance of [ROWs]," and "require location of the [ROW] along a route that will cause least damage to the environment, taking into consideration feasibility and other factors."

The CEC will be the lead State agency for CEQA compliance for the Project. The BLM will be the Project's Federal agency for NEPA compliance. The CEC and BLM are conducting a joint review of the Project and will issue a combined CEQA/NEPA document (Draft Staff Assessment/Draft Environmental Impact Statement). The following alternatives discussion is intended to support the combined CEQA/NEPA document.

4.2 Alternatives Screening Methodology

A range of potential alternatives to the proposed Project that could reasonably attain most of the basic objectives are identified and evaluated in this section. Alternatives include the "No Action" (also called "No Project") alternative, alternative Project sites, an alternative site layout, a smaller plant alternative, transmission line alternatives, freeze protection and auxiliary boiler heating alternatives, alternative water sources, and alternative power generation technologies.

Alternative solar technologies were not considered because the use of an alternative solar technology would not avoid or substantially reduce environmental impacts compared to the implementation of the Project as proposed. In addition, Solar Millennium, the Project Applicant, is a leader in solar parabolic trough technology and has demonstrated expertise in this technology; hence, an alternative solar technology would not meet one of the Project's basic objectives -- to use solar parabolic trough technology.

While the following screening methodology is presented in terms of alternative Project locations (sites), essentially the same process applies to alternative site layouts, technologies, water sources, etc. In accordance with Title 14 CCR Section 15126.6 (c), and consistent with Title 40 CFR Section 1502.14, alternatives were not carried forward for further analysis if:

1) The alternative would not meet most of the basic Project objectives,
2) The alternative would not avoid or substantially lessen significant environmental impacts of the proposed Project, or

3) The alternative was not "feasible." Per Title 14 CCR Section 15126.6(f)(1), the factors that should be taken into account in determining whether an alternative is feasible are:
   a) Site suitability,
   b) Economic viability,
   c) Availability of infrastructure,
   d) Land use/land use plan consistency or regulatory/jurisdictional limitations, and
   e) Site control.

In order to implement this screening process for selecting the Project site, the Applicant needed to:

- Define the Project objectives, purpose, and need,
- Identify the potentially significant environmental impacts associated with the proposed project, and
- Further define the feasibility criteria.

Project objectives, purpose, and need; potentially significant environmental impacts; and feasibility criteria are presented below.

4.2.1 Project Objectives, Purpose and Need

The Project's objectives, purpose, and need are restated below from Section 2.2.1, Project Description. They are included because they guided the Project's alternatives evaluation process as one of the important parts of the overall Project development process.

4.2.1.1 Project Objectives and Purpose

The specific objectives and purpose of the Project are:

- To develop a utility-scale solar energy project utilizing parabolic trough technology.
- To construct and operate an environmentally-friendly, economically-sound, and operationally-reliable solar power generation facility that would contribute over 500,000 megawatt hours (MWh) of clean, renewable solar energy per year to the State of California's renewable energy goals.
- To locate the Project in an area with high solar insolation (i.e., high intensity of solar energy).
- To interconnect directly to the California Independent System Operator (CAISO) grid through the Southern California Edison (SCE) electrical transmission system while minimizing additions to electrical infrastructure (e.g., avoiding lengthy new transmission lines).
- To commence construction in 2010 to qualify for the American Recovery and Reinvestment Act (ARRA) of 2009's Renewable Energy Grant Program.

4.2.1.2 Project Need

The Federal government and the State of California have clearly established the need for the nation and State to increase the development and use of renewable energy in order to enhance the nation's energy independence, meet environmental goals, and create new economic and employment growth opportunities. The Project will help meet these societal needs.

More specifically, the Project will further the development of renewable energy and thereby:

- Assist California in meeting its Renewable Portfolio Standard (RPS) goal of 33 percent of electrical power retail sales by 2020 under pending legislation.

- Support U.S. Secretary of the Interior Salazar's Order 3283 and 3285 making the production, development, and delivery of renewable energy top priorities for the United States.
- Support Governor Schwarzenegger's Executive Order S-14-08 to streamline California's renewable energy project approval process and to increase the State's RPS to 33 percent renewable power by 2020.
- Sustain and stimulate the economy of Kern County and southern California by helping to ensure an adequate supply of renewable electrical energy, while creating additional construction and operations employment and increased expenditures in many local businesses.
- Generate electricity without significant emissions of greenhouse gases, thereby meeting the statewide reduction goals of Assembly Bill (AB) 32.

Two integral goals of the ARRA of 2009's Renewable Energy Grant Program, for which the Project hopes to qualify, are to enhance America's energy independence and create near-term employment opportunities for Americans. The Project will help meet these vital societal needs.

4.2.2 Alternative Site Selection Criteria

In a report titled "California Solar Resources," the CEC provided estimates of the solar resources located in California and potentially available for use in meeting the RPS and the California Power Authority's approved Energy Action Plan goals. The CEC provided estimates based on the "gross" potential (i.e., the potential unconstrained by technical, economic, or environmental requirements) and the "technical" potential (i.e., unconstrained by economic or environmental requirements). Using National Renewable Energy Laboratory (NREL) direct beam insolation values on a grid size of 10 kilometers (6.2 miles) by 10 kilometers with NREL's Climatological Radiation Model, the CEC identified areas suitable for concentrating solar power (CSP) systems in California. The CEC analysis shows that the best locations for CSP facilities generally tend to be in the southeastern portion of the State. For example, using the criteria selected by the CEC, the total "technical' potential area in Kern County (where the proposed Project site is located), is approximately 418,639 acres.

The Applicant conducted a similar analysis using NREL data, first analyzing base maps of solar energy values and then applying exclusion criteria to identify study areas for further analysis. The following exclusion criteria were applied:

1. Solar resource: The site must receive insolation of no less than 7.0 kilowatt-hours per square meter per day ($kWh/m^2/day$).
2. Site size, shape, grade, hydrology, land use: The site must be large enough (at least 2,000 contiguous acres) and of adequate proportions to include a 250-megawatt (MW) parabolic trough solar thermal plant. The site also must be large enough to site the solar field(s) outside of large washes, to the greatest extent possible. The site needs to have no more than a 2 percent grade. The site should not be located in a flood zone. Competing land uses and land use designations may make the site more difficult to develop.
3. Environmental sensitivity: The site should not be highly pristine or biologically sensitive (e.g., not a wilderness area, Area of Critical Environmental Concern [ACEC] or a Desert Wildlife Management Area [DWMA]). The site should also not be located within a military base or park.
4. Proximity to transmission: The site should be located within 10 miles of a CAISO-interconnected transmission line with a rating of 230 kilovolts (kV) or higher.
5. Road access: The site should be in reasonable proximity to existing large, paved roads or freeways.

6. Site control: The land has to be available for sale or lease/ROW, at a reasonable cost (e.g., high-value irrigated agricultural lands were excluded). If private land, the site should not be subdivided between more than three landowners, to avoid lengthy and/or unsuccessful negotiations. If private land, a lease or purchase option should be obtained so that a large capital investment would not be necessary until the license is obtained.
7. Labor availability: The site should be close enough to areas with large construction labor pools so as to maximize the number of construction workers within daily commuting range.

Much of the western Mojave Desert is managed by the BLM in accordance with the West Mojave Plan (WEMO) under the multiple use objectives of the FLPMA and the California Desert Conservation Area (CDCA) Resource Management Plan (RMP). Much of this area is designated for land uses that could conflict with solar energy production, including off road vehicle use, national parks, and military use. Additional areas have been set aside for desert tortoise (DT) and Mohave ground squirrel (MGS) conservation. Within these designated species conservation areas (CAs), only 1 percent of the land can be developed for infrastructure purposes. Many BLM sites were considered and rejected, because they were wholly or significantly located within a MGS or DT CA, wilderness study areas, ACECs, or DWMAs.

Several factors that have been used to screen alternatives for other proposed large scale projects were not considered here. Water availability was not considered, since, as a dry cooled facility, the plant's water needs are minimal and can generally be supplied by a well or pipeline. Military low flight areas were not considered, since the Project's tallest structures meet low flight area standards. Proximity to natural gas supply was also not considered to be a requirement since the Project's startup boilers can be powered using propane. All of the alternative sites analyzed are close to major freeways, so freeway/highway proximity was not considered as a factor.

As discussed in Section 4.3.2, application of the above criteria eliminated all other potential Project locations from being carried forward for more detailed analysis. The site screening process that led to the selection of the proposed site and the elimination of alternative sites is discussed in the following section.

Solar Millennium LLC (the Applicant) evaluated a significant number of sites in other portions of the California desert, as the firm plans to develop multiple utility-scale solar projects in California. Solar Millennium and Chevron Energy Solutions are joint proponents for other solar projects, both within the I-10 corridor, one near Blythe (the Blythe Solar Power Project or BSPP) and another near Desert Center (the Palen Solar Power Project or PSPP). All three of these projects are on BLM land and thus are under the jurisdiction of both the CEC and BLM. However, the three projects are subject to separate environmental review processes, and separate Applications for Certification (AFCs) are being prepared for all three Projects.

The alternatives discussion presented below focuses only on the alternatives considered for a Project site in or near the Ridgecrest area. It does not include the evaluation process that led to the selection of the BSPP and PSPP AFCs and subsequent CEQA/NEPA documents prepared by the CEC and BLM. The separate AFCs for the BSPP and PSPP were submitted to the CEC in August 2009.

4.3 Alternatives Considered

The following paragraphs discuss the No Project alternative and the process that led to the selection of the proposed site over alternative sites. Alternatives to other aspects of the Project are also addressed.

4.3.1 No Project Alternative

Under the No Project alternative, the Project would not be constructed, and the electrical power that would have been generated will be generated by other facilities, presumably natural gas-fired generation. Solar power is generated close to peak consumption periods of the day. The peaking power needs met

by Project-generated power would otherwise likely be met by fossil fuel-fired peaking units such as simple-cycle gas turbines and other rapid starting equipment (e.g., reciprocating engines) that would produce higher levels of air emissions than a solar thermal power plant.

Because the Project facilities would not exist, its potential adverse environmental impacts would not occur. However, the Project's beneficial impacts also would not occur, which would result in greater fossil fuel consumption to meet increasing electricity demand and, as a result, no Project-related reductions in air pollutants, including the gases that contribute to global climate change.

Moreover, the No Project alternative would not assist the State and the nation in meeting renewable energy mandates and goals. In 2002, California established the RPS program, with a goal of increasing the percentage of renewable energy in the State's electricity mix to 20 percent by 2017. The CEC's 2003 Integrated Energy Policy Report (IEPR) recommended accelerating the 20 percent goal for renewables to 2010, while the 2004 IEPR Update and the State's 2005 Energy Action Plan recommended increasing the target percentage to 33 percent by 2020. The 2006 IEPR Update states that "California must accelerate its pace of development if it is to meet its long-term [RPS] Goal of generating 33 percent of the State's electricity from renewable sources by 2020, as recommended by Governor Schwarzenegger, the Energy Commission, and the California Public Utilities Commission." The 2007 IEPR states that "renewable resources are an essential tool for reaching AB 32 goals", but that "program adjustments" are needed to meet the 2010 RPS goals. The 2007 IEPR cites the statements "critical imperative to reduce greenhouse gas emissions" and "management of the risk borne by ratepayers for electricity generation" as the two main considerations driving the need to achieve the RPS goals. The IEPR states that the goal of 33 percent renewables by 2020 is achievable "with a concerted effort by and coordinated support from government, industry, and the public." The 2008 IEPR reiterates this goal.

Beyond the State RPS program, there is significant State and Federal focus on promoting and expediting the development of renewable resources:

- On August 8, 2007, the U.S. Department of the Interior, BLM, California Desert District, and the CEC staff signed a memorandum of understanding (MOU) concerning joint environmental review for solar thermal power plant projects. The MOU sets out a 12-month schedule for joint AFC/EIS review of applications submitted for solar projects located on BLM lands.
- On November 17, 2008, Governor Schwarzenegger signed Executive Order S-14-08, which raises California's renewable energy goals to 33 percent by 2020.
- On January 16, 2009, Department of Interior Secretary Kempthorne's Order 3283 established BLM renewable coordination offices to expedite permitting of solar projects and electrical transmission facilities.
- On March 11, 2009, Department of Interior Secretary Salazar's Order 3285 established the Departmental Task Force on Energy and Climate Change to increase renewable energy development on public lands.

The No Project alternative would mean that the proposed solar project would not be developed. Consequently, the No Project alternative would not support the program goals of the State's RPS, the Governor's Executive Order, or the orders issued by successive Secretaries of the Interior. The purpose of the Project is to generate renewable solar power and provide electric power to California's electrical users. In short, the No Project alternative would not provide the additional power needed in California in a manner that assists the State in meeting its renewable power and greenhouse gas reduction goals.

4.3.2 Project Site Alternatives

From the site screening process described above, four candidate site locations (including the proposed Project site) were identified for a 250 MW project. The approximate locations of the candidate sites and transmission lines other than the proposed site are shown on Figure 4-1 and described in Table 4-1.

Table 4-1 Alternative Sites Considered and Rejected

Site	General Description/Location
Alabama Hills	BLM property in general area south of Lone Pine, California
Boron	Private property in general area approximately 20 miles south of California City near Route 58
South of California City	Private property in general area approximately 20 miles south of California City near Route 58

A summary of the site selection criteria and reasons for elimination from further consideration are presented below and summarized in Table 4-2 below. As shown in Figure 4-2, all of the sites have adequate DNI direct normal insulation (DNI). However, none of the alternative sites has a DNI rating equal to that found at the Ridgecrest site (8 kWh/m^2/day).

4.3.2.1 Site Grade and Use

All sites except for Alabama Hills had a two percent grade. The Alabama Hills site is located in the Alabama Hills National Recreation area and has a five percent grade.

4.3.2.2 Environmental Sensitivity

Unlike the proposed Project site, all of the alternative sites would require construction of new transmission lines and designation of new transmission corridors. Although the Ridgecrest site is located partially inside a Mohave ground squirrel (MGS) Conservation Area,, this portion of the site constitutes only 6.6 percent of the total (one percent) of the MGS Conservation Area that is allowed for development under WEMO.

4.3.2.3 Proximity to Transmission

Unlike the proposed Project site, all of the alternative sites would require construction of new transmission lines and designation of new transmission corridors. The South of California City site is located 12.3 miles from a Los Angeles Department of Water and Power (LADWP) 230 kV transmission line, 20.1 miles from an SCE 230 kV transmission line, and 15.9 miles from an LADWP 230 kV transmission line. The Alabama Hills site is located 5 miles from a 230 kV transmission line. The Boron site is 16.2 miles from a 230 kV transmission line. The proposed Project site is less than 0.25 mile from SCE's existing 230 kV Inyokern/Kramer Junction transmission line.

4.3.2.4 Site Control

Ownership of the South of California City site is too fragmented to permit feasible development, and the solar resource is the poorest at this site of all sites examined. The Boron site also would require the purchase or lease of a number of private parcels.

Only the Ridgecrest site and the Alabama Hills site are located on BLM land (available via ROW). The remaining sites showed poor probability of obtaining site control because they are each located on multiple parcels of private land. It is not clear for either site that all of the parcels of private land could be leased or purchased.

A summary of the site selection criteria and reasons for elimination of alternative sites from further consideration are presented below and summarized in Table 4-2.

Table 4-2 Comparison of Proposed Site and Alternative Sites

Site	Site Suitability (Grade, Land Use)	Site Control	Transmission	Environmental Sensitivity	Solar Resource
Proposed Site Ridgecrest	Good – Slope is 2% - appropriate for construction of CSP. Solar fields can be positioned outside of a large wash.	Good – BLM property.	Excellent – SCE 230 kV line runs alongside site. No linear corridor required.	Medium – Not within a DT CA or critical habitat. Southern part of site is within MGS CA. Close to developed urban area.	Excellent – 8 kWh/m^2/day
Alt #1 Alabama Hills	Poor – Slope is close to 5% - not optimal for construction of CSP. Potential conflicting resource use - Alabama Hills National Recreation Area.	Good – BLM property.	Poor – Near LADWP 230 kV transmission lines, no SCE lines in area. 5-mile linear corridor required.	Medium –Far from developed urban area.	Medium – 7.2 kWh/m^2/day
Alt #2 Boron	Good – Correct slope (2%) for CSP construction.	Poor – Private property, subdivided, availability of purchase or lease unknown.	Good – 15.9 miles to LADWP 230 kV line; 16.2 miles to SCE 230 kV line.	Good – No resource conflicts identified. Some distance from urban developed area - may see urban development in several decades.	Good – 7.7 kWh/m^2/day
Alt #3 South of California City	Good – Site large enough to support a 250 MW plant. 2% slope. Solar fields can be positioned outside of wash.	Poor – Private property, availability of purchase or lease unknown.	Poor – 12.3 miles to LADWP 230 kV line; 20.1 miles to SCE 230 kV line.	Good – Identified to Ridgecrest, outside of MGS CA. Close to developed urban area.	Good – 7.7 kWh/m^2/day

4.3.2.5 Alternative Sites Would Fail to Meet Project Objectives

A primary set of screening criteria categories-solar resource and site suitability-address two of the Project objectives: to construct a 250 MW parabolic trough solar thermal power plant and to locate it on a contiguous, sufficiently large area of land with high DNI and slopes of 2 percent or less. The Alabama Hills site failed to meet these objectives. Figure 4-4 shows the alternative sites and the slope in the surrounding area.

The fifth screening criterion, proximity to a CAISO-interconnected transmission line rated at 230 kV or greater, is also a Project objective. The California City and Boron sites, over 10 miles from the closest transmission lines, do not meet this screening criteria and would not fulfill the Project objective.

Additional objectives include siting the Project in an area that is not highly pristine or biologically sensitive (e.g., not a designated wilderness area, ACEC, or DWMA), or subject to a conflicting use (e.g., a National Recreation Area) and where the Project would be consistent with existing land use plans. The Alabama Hills site does not meet this objective because it is located within the Alabama Hills National Recreation Area and because it is relatively isolated, a small part of the Ridgecrest site is within the MGS Conservation Area, although a small amount of development is allowable in the Conservation Area.

4.3.2.6 Alternative Sites Would Not Avoid or Substantially Reduce Environmental Impacts

All four sites, except for the Alabama Hills site, are located within the WEMO planning area of the western Mojave Desert and would require about five square miles of contiguous, rectangular-shaped land area and linear corridors of varying lengths. One of the four sites, California City, might be expected to have lower levels of environmental sensitivity, because, like the Ridgecrest site, it is in an area that is gradually being enveloped by urban expansion; however, the remaining two sites would be expected to have environmental sensitivities greater than the Ridgecrest site because of their relative isolation.

4.4 Selection of Proposed Site

Table 4-2 above compares the ability of the alternative sites to meet screening criteria. As shown in the table, no alternative site would feasibly attain most of the basic objectives of the Project while also avoiding or substantially reducing any potentially significant impacts of the Project.

The Project site and the alternative sites are all able to meet the basic objective of hosting a 250 MW solar power plant, but the Ridgecrest site has several advantages over the others. The Ridgecrest site is superior to the alternative sites in terms of its solar resource; it also avoids the need for a transmission line to interconnect to the CAISO system. It is easily accessible from major roads. Like the California City site, the Ridgecrest site is close to an expanding urban center. At present the Ridgecrest site is used heavily by off-road vehicles and is used for sheep grazing. It is outside desert tortoise conservation areas designated under WEMO and outside of DT critical habitat, as shown in Figure 4.4. While the southern portion of the site is located inside a WEMO MGS CA, the plant footprint occupies only one-sixteenth of the total one percent of the Conservation Area A that is allowed for development. The site is not located in a wilderness study area, ACEC, or DWMA.

Given the clear preferability of the proposed site for the Project, both in terms of meeting necessary site screening criteria and reducing environmental impacts, none of the alternative sites were carried forward for more detailed analysis.

4.5 Alternative Site Layout

The proposed 250 MW Ridgecrest Project configuration is the result of considering a number of topographic, socioeconomic, stormwater, biological, design, and operating limitations.

- Topography: The Project configuration has been limited by the site area's physical constraints such as Brown Road, U.S. Highway 395, the transmission lines and the old rail spur that run through the site, and the El Paso Mountains to the south of the site.

- Stormwater control: The Project has been configured to avoid as much as possible the El Paso Wash, the major wash that runs through the center and to the north of the site. As part of this effort, the Project solar field was divided into two smaller solar fields, placed on either side of Brown Road. Where the facility footprint would impact the wash (and other smaller washes), wash rerouting is proposed to minimize downstream flow effects. Channels and berms will be designed to be as harmonious as possible with the natural surroundings.

- Socioeconomics: The need to avoid siting the Project excessively close to neighboring residences also affected the final layout. The ROW area originally extended north of U.S. Highway 395 and contained a third solar field (roughly equivalent to Alternative 1 in Figure 4-1 below) that was rejected partly due to concerns about proximity to residences and interruption of wash flows. The proposed size of the site was decreased by an additional 1,000 acres to respond to concerns of off-highway vehicle (OHV) users of the southern areas of the site near the El Paso Mountains.

- Biology: The Project was designed to minimize impacts to the El Paso Wash, considered the most valuable habitat on site. Also, where possible, redirected wash sections will be designed in order to release water at the north end of the site, improving habitat values and decreasing flow rates through the site area.

- Design and operating limitations: The original plan to utilize wet cooling was discontinued in favor of a dry cooling facility process, thus reducing the proposed water usage by 90 percent and eliminating both a possible winter steam plume and the use of large evaporation ponds.

The Applicant also considered several alternative configurations that would remove the Project's southern solar field from the MGS CA. These alternatives were all selected to be within one mile of the northern solar field to limit costs of long header pipes connecting the two fields. The alternatives are shown in Figure 4-5.

Alternative 1: This alternative, which is located largely on private land, was rejected because the western half of the solar field would be located on the wash.

Alternative 2: This alternative, also located largely on private land, was rejected because of the large number of parcels required to consolidate the field area, and because the existing SCE 161 kV transmission line cuts across the alternative field area.

Alternative 3: This alternative, which is located entirely on BLM land, was formerly part of the site layout described in the original Plan of Development developed for BLM, but was rejected because it overlays a number of large washes and would bring the solar field into close proximity to neighboring residences.

4.6 Plant Size

The Applicant considered the development of a smaller plant such as a 125-MW "peaker" plant that would only function at peak hours. Generally, a smaller plant would have fewer environmental impacts. However, optimization studies show the size of a project utilizing parabolic trough technology to be most viable in blocks of approximately 250-MW, with significantly larger plants resulting in increasingly unacceptable parasitic losses due to pumping heat transfer fluid (HTF) fluid over long solar field distances and smaller plants being less economically feasible.

Since a solar thermal facility's power output is directly related to the size of the solar collector area, a smaller facility would require a smaller site with a smaller footprint with a theoretically lower potential for adverse environmental impacts. However, given the selected site's relative homogeneity, there is no substantial environmental advantage to a smaller size project, and given that a facility developed in blocks of approximately 250-MW blocks is preferable from an economic perspective, the development of a smaller project was rejected. Building the proposed 250-MW plant allows for economies of scale while limiting the potential impacts associated with the development of additional transmission, water, and gas infrastructure In addition, a smaller plant would not be as effective in meeting the Project objective of assisting the State in meeting renewable energy goals and the BLM in meeting energy siting goals of the Energy Policy Act of 2005. For these reasons, the development of a smaller project was rejected.

4.7 Transmission Route Alternatives

As discussed in Section 2.0, Project Description, for a number of reasons, the Applicant is proposing to deliver the power generated from the Project by interconnecting to the existing SCE 230 kV transmission line that runs along the site's western boundary and connects to the Inyokern substation. This line will be relocated to outside of the plant boundary but within the proposed Project ROW. The Project will interconnect at the most suitable location on the SCE 230-kV line at the site boundary.

An alternative that was explored was to interconnect at Inyokern substation, which is located five miles from the Project site. This is not the preferred option, because it would require the construction of five additional miles of new transmission line. Such a new line would have to be constructed either in the existing ROW for the SCE 230-kV line or a new ROW would have to be obtained. The existing ROW is occupied by a 115-kV transmission line in addition to the SCE 230-kV line. It is uncertain if this ROW could support an additional new 230-kV transmission line. Constructing a new 230-kV transmission outside of the existing ROW would be extraordinarily difficult if not infeasible since it would require obtaining the permission of dozens of private landowners.

4.8 Freeze Protection and Auxiliary Boiler Heating Alternatives

The Applicant considered several alternatives for energy sources to be used for HTF freeze protection and quick start for the auxiliary boiler during the early morning hours. The four options considered included:

- Electricity purchased from SCE,
- Propane acquired from a third-party distributor,
- Solar energy from the Project, or
- Natural gas, requiring installation of a natural gas pipeline.

Emissions related to the natural gas pipeline and propane options are considered to be insignificant. Therefore the alternatives analysis focused on land use impacts and economic efficiency.

Electricity delivered via the Project's transmission interconnect could be used for HTF freeze protection and quick start for the auxiliary boiler. This would entail the installation of several small electric boilers. This alternative would be high in capital cost.

A new, 7.1-mile natural gas pipeline to serve the Project could be built by Pacific Gas and Electric (PG&E) along China Lake Boulevard. However, construction of a new gas pipeline would require significantly greater expense than would the propane option, and it would result in increased environmental disturbance.

The Applicant has researched the possibility of designing a heating system that would use propane as the fuel. Propane would be delivered to the Project by a third party distributor in bulk via delivery trucks. The propane would be stored on site near the propane heating system. This option is attractive in that it is cost effective and avoids the need for a pipeline, but it would involve minor impacts from increased truck traffic.

The Applicant analyzed the option of using solar energy to heat the HTF using the plant's own thermal energy. This option would eliminate the need for an alternative fuel source but would delay the daily heating of the HTF to operating temperatures. This delay in morning production would significantly impact the efficiency and power generation of the overall plant. The loss in production would make the Project economically infeasible.

Based on the environmental impacts, feasibility and economic considerations, the Applicant has chosen to use propane as the fuel for HTF freeze protection and for quick start up of the entire plant.

4.9 Water Supply Alternatives

The Project was initially proposed with wet cooling due to the considerable operational efficiencies and economic advantages associated with this technology. However, after careful research and analysis of the proposed Project site conditions and development plan, and in the context of the current water supply

situation in California, the Applicant has chosen to abandon wet cooling and to propose dry cooling instead. No water will be used for power plant cooling. This means that the Project will be in compliance with State Water Resources Control Board Policy 75-58.

Even a dry cooled facility requires some water use, although it is a small fraction of what would be required for a wet cooled plant. Water will be needed for plant requirements such as feedwater makeup, solar mirror washing, firewater supply, onsite domestic use, makeup water for ancillary equipment (heat rejection for auxiliary boiler) and dust control. This water would be supplied by the Indian Wells Valley WATER District (IWVWD) via a new five-mile pipeline to be constructed by the Applicant. The total anticipated water usage for operational requirements of the proposed facilities is approximately 150 afy. The Project will also need approximately 1,500 acre-feet of water during construction for soil compaction and dust control. Currently available data indicate that the water available from groundwater wells is brackish (i.e., has high total dissolved solids [TDS]).

As part of the initial site analysis, the Applicant investigated potential alternatives to meet the water requirements for the proposed Project. Table 4-3 describes three potential water sources that were investigated.

Table 4-3 Water Source Alternatives

Potential Water Source	Description
Groundwater via wells on site or near the site	The IWVWD's March 2008 groundwater study indicates that the Project lies in a high-TDS, shallow aquifer that is not currently used to extract water. The BLM also has significant concerns regarding the installation of new wells on site. While water from an offsite well on private land could be available, the depth to water (approximately 600 feet) and need to treat the water to make it usable for plant operation would make this alternative prohibitively expensive. Even if water were used solely for construction and not treated, the cost of digging the well would exceed the cost of purchasing water from the Water District.
Reclaimed water from City of Ridgecrest wastewater plant	The City of Ridgecrest wastewater treatment plant is located approximately 16 miles from the site. Presently, the City produces about 2,800 afy of reclaimed water from the treatment plant, although the City is in the process of raising plant capacity. Of this 2,800 afy output, 750 afy is committed to the U.S. Navy. The City also provides 400 afy for irrigation of an alfalfa field, leaving 1,650 afy available. The City expects this to gradually increase with time, and possibly increase further with the development of a new wastewater treatment plant. Although the City's wastewater could potentially supply Project water needs, it would not be economically feasible to build a pipeline from the treatment center to the Project site, and to treat the reclaimed water on site, especially given the Project's low water consumption. Also, the additional pipeline construction would be more environmentally intrusive.
Supply of water from the Indian Wells Valley Water District	This is the selected alternative. Although the Project is not located in the IWVWD's territory, the District is interested in providing water to the Project. The Applicant proposes to build a five-mile pipeline from a District tank along China Lake Boulevard to the Project site. This pipeline would provide treated water for Project operations.

4.10 Power Generation Technology Alternatives

An objective of the Project is to support Federal and State policies/goals with respect to increasing the siting of renewable projects on Federal land and the use of renewable energy sources. Fossil fuel technologies (simple cycle, combined cycle, advanced combustion turbine technologies, integrated gas combined cycle, fluidized bed boilers, etc.) by definition do not support this objective and thus were not considered as alternatives for the Project. Nuclear power also is not renewable energy and is prohibited by California law at present because of concerns about nuclear waste disposal.

As for alternative renewable energy sources, the proposed Project would generate power by using concentrated solar thermal trough technology to produce high-pressure steam to drive a steam turbine generator. Other renewable energy technologies, including, for example, photovoltaic solar energy, have not been analyzed as alternatives because Solar Millennium is a technology leader in parabolic trough technology and has expertise with this technology. In addition, there is little evidence that the use of other solar technologies at the Project site would meaningfully decrease the Project's potential environmental impacts.

4.11 References

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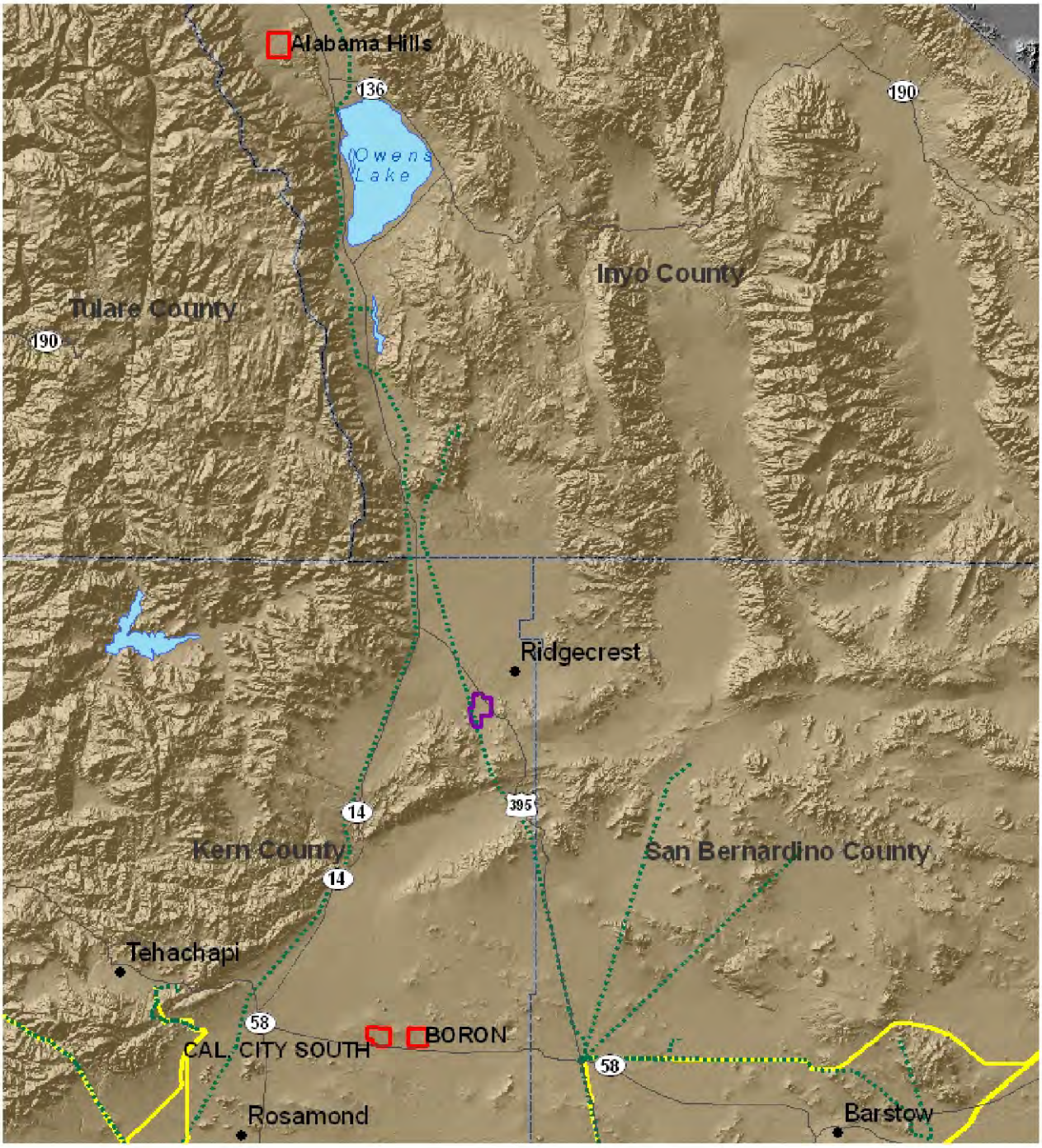
State Water Resources Control Board. 1975. Resolution No. 75-58 Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Power Plant Cooling.



Alternative Site

Planned Site

Transmission Voltage (kV)

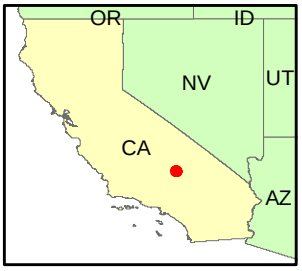
230

500

0 10 20 40 Miles

N

Project Location



Ridgecrest Solar Power Project

Figure 4-1
Alternative Western Mojave Sites and Transmission Lines

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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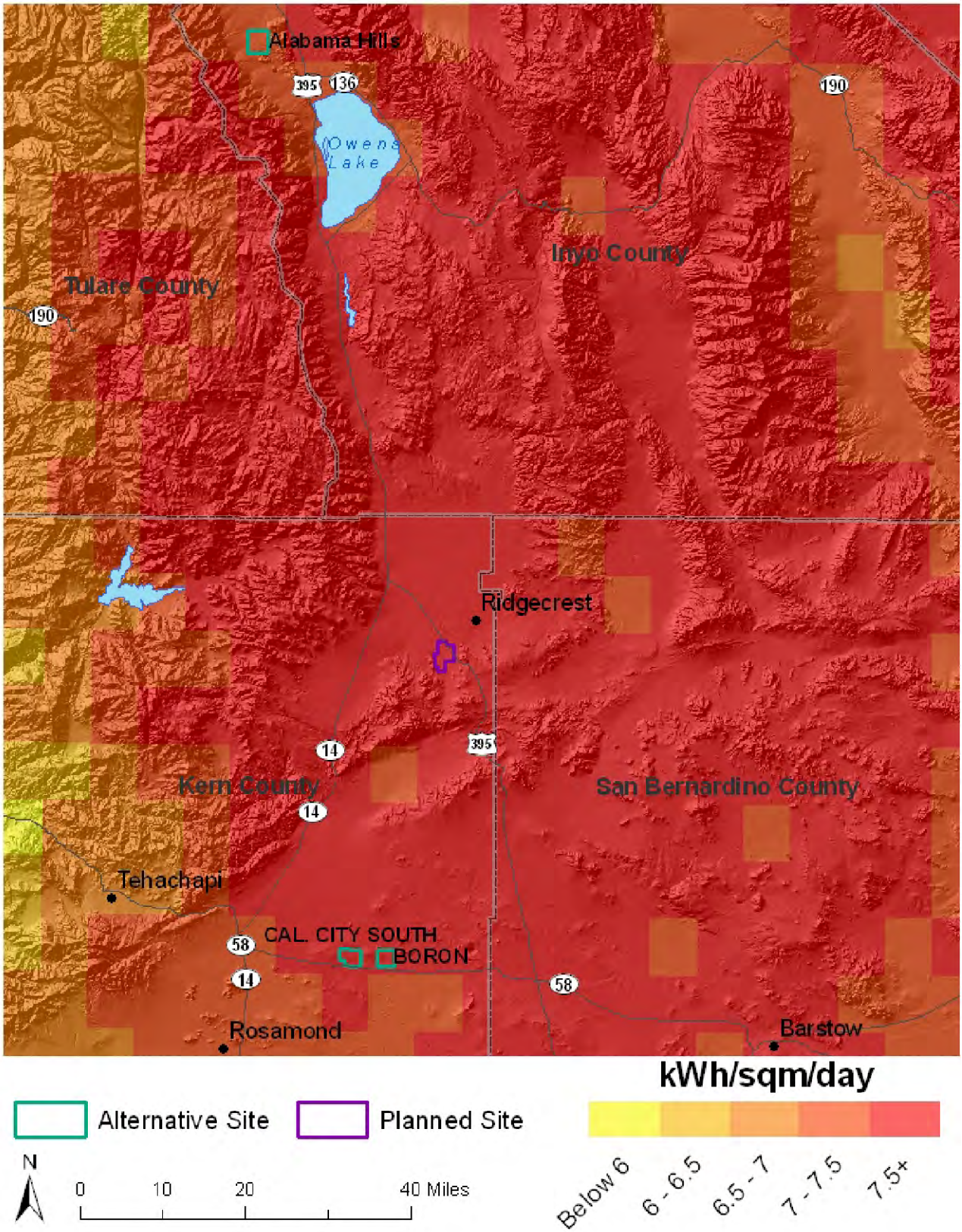
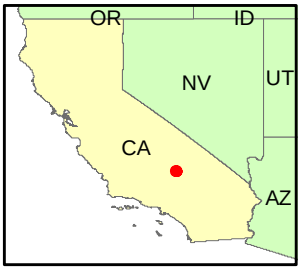


Project Location



Ridgecrest Solar Power Project

Figure 4-2
Alternative Western Mojave Sites and Solar Radiation

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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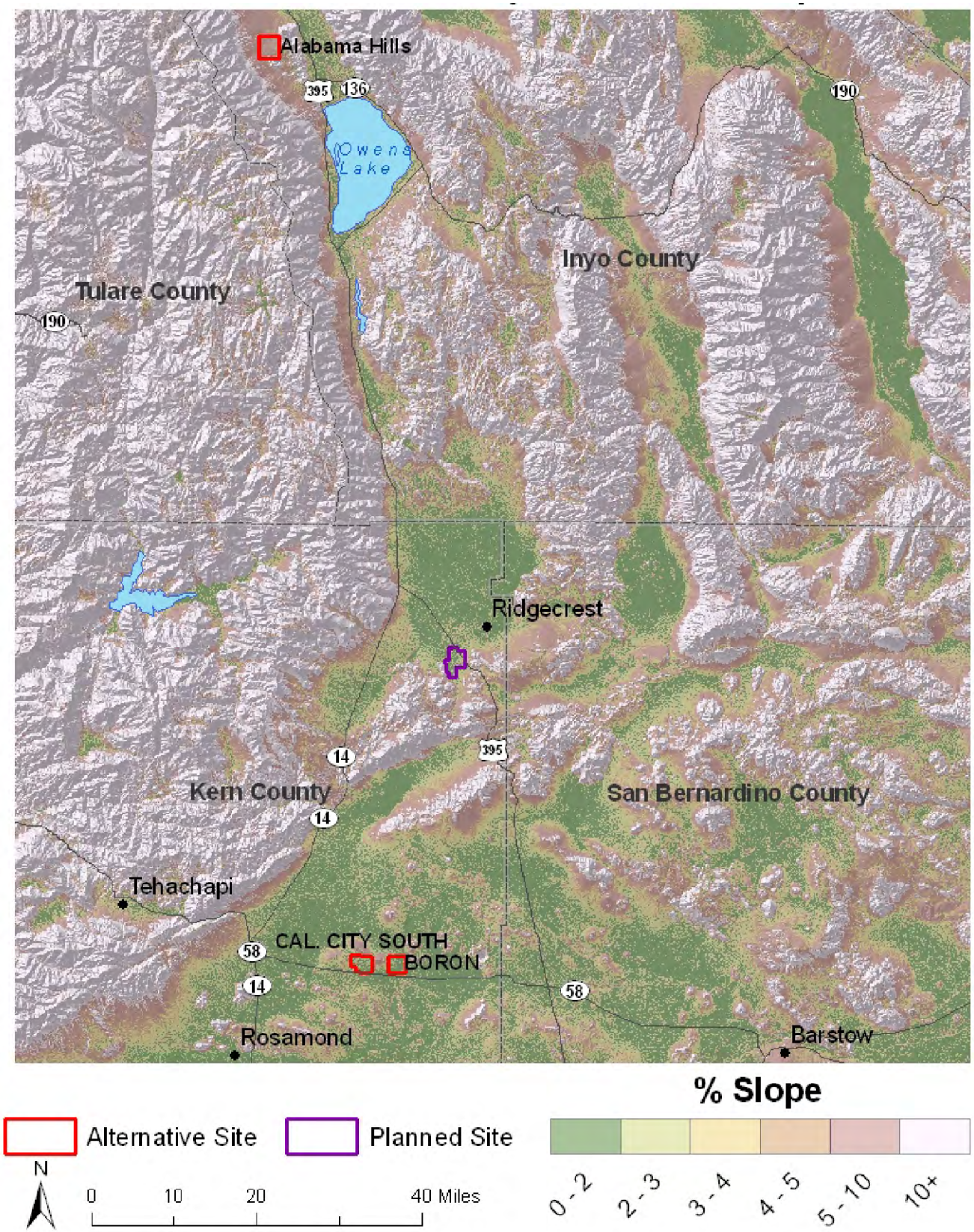

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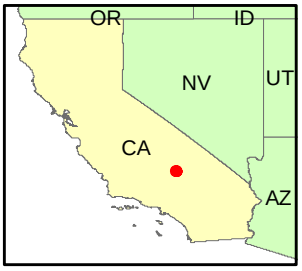

Ridgecrest Solar Power Project

Figure 4-3
Alternative Western Mojave Sites and Slope

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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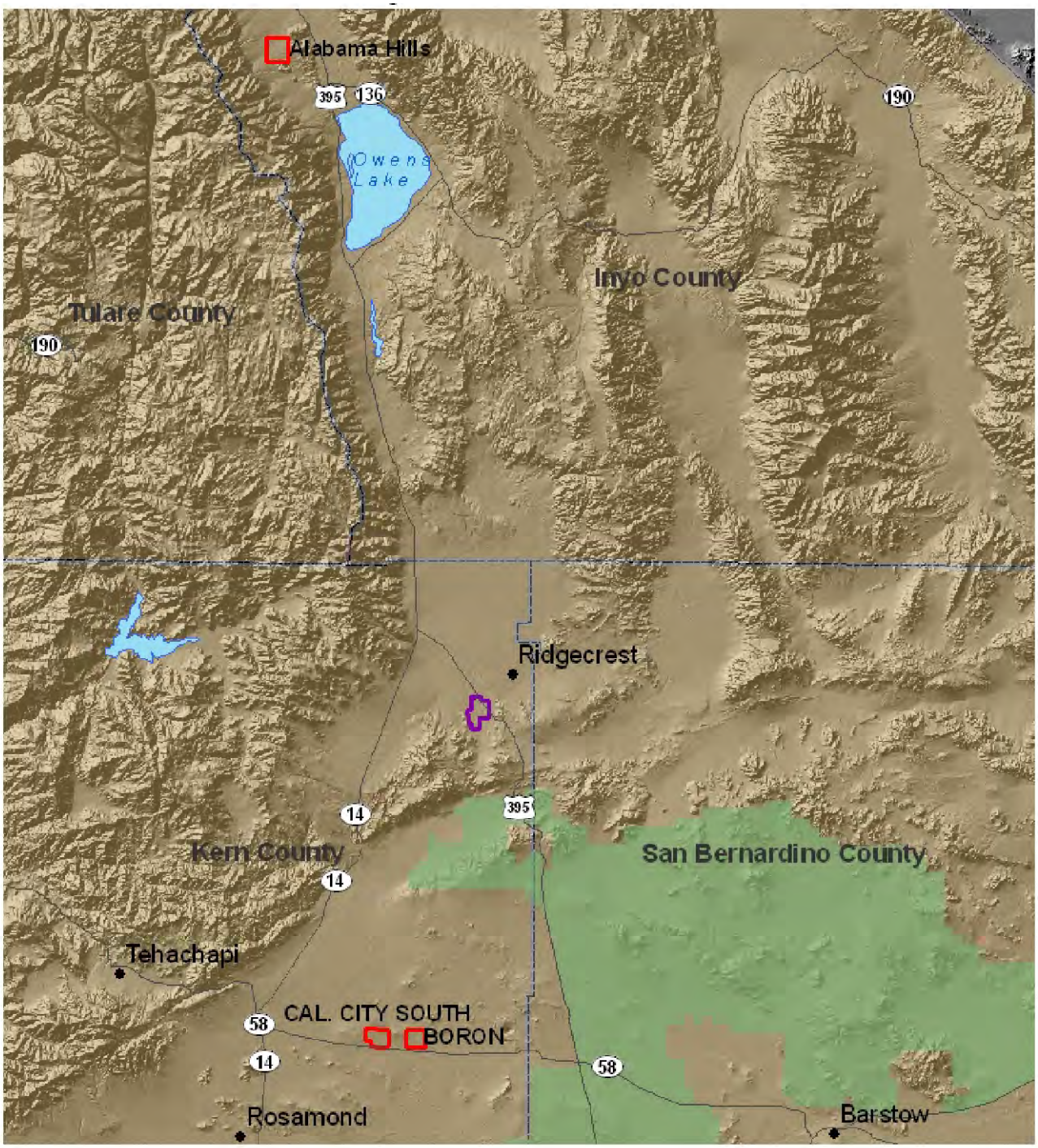
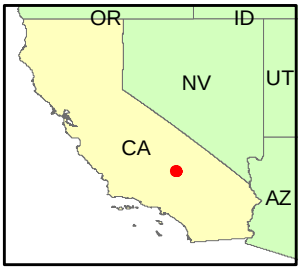


Alternative Site | Planned Site | Desert Tortoise Critical Habitat

0 10 20 40 Miles

N

Project Location



Ridgecrest Solar Power Project

Figure 4-4
Alternative Western Mojave Sites and Desert Tortoise Critical Habitat

Solar Millennium

AECOM

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Date: September 2009

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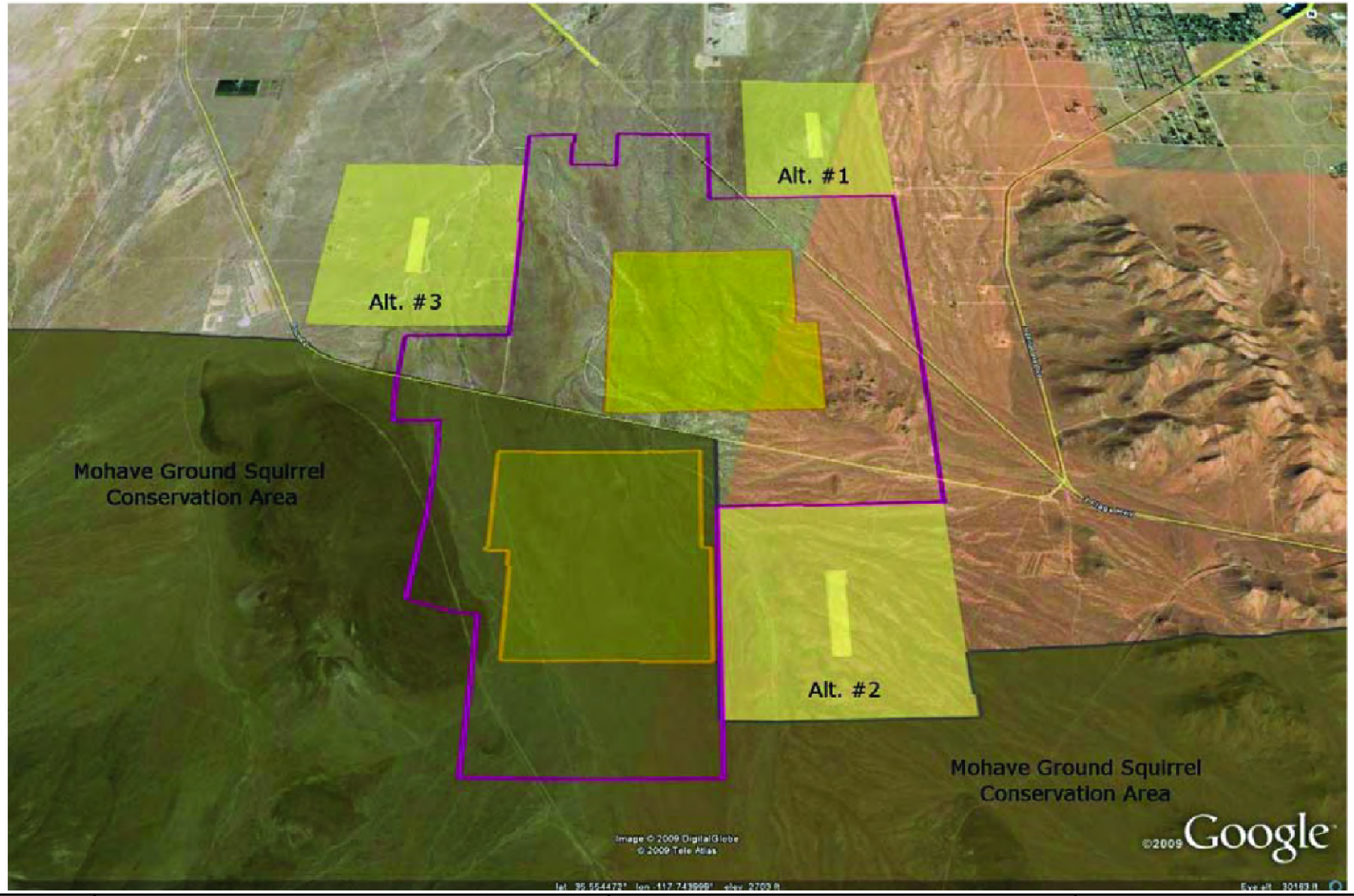

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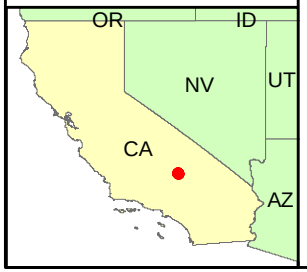

Ridgecrest Solar Power Project

Figure 4-5
Southern Solar Field Alternatives
Outside MGS Conservation Area

Solar Millennium

AECOM

Project: 12944-003
Date: September 2009

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