To: Craig Hoffman, Energy Commission Project Manager

From: Heather Blair, Energy Commission Staff Biologist (Aspen Environmental Group)

Date: March 12, 2010

Re: Abengoa Mojave Solar Project – Agency comments on draft Raven Plan

Following and attached are comments from Energy Commission staff, California Department of Fish and Game, and U.S. Fish and Wildlife Service on the Common Raven Monitoring, Management and Control Plan submitted by the applicant in response to Data Request #71.

Staff comment:

Section 1.2, Page 5: "Because MSLLC has agreed to support the USFWS program in lieu of a site-specific raven monitoring and control program (AFC DT-17), the Plan presented here will be a subset of a more comprehensive program."

> This statement mischaracterizes the relationship between the USFWS raven control program and the AMS-specific raven control plan. Although they work in concert to reduce impacts from ravens, they are not in-lieu of one another. Development and implementation of a project-specific raven control plan is required to prevent raven usage of the project area. In addition, contribution towards the USFWS regional raven control program is required to address the cumulative impact of ravens.

Section 6.2, page 15: "It should be noted that Project-related raven increases are not likely to be determined without a more rigorous quantitative monitoring program, including the collection of baseline and control data."

> Collection of baseline data is not necessary and establishment of a control site is probably not possible. The objective of the AMS site-specific plan is to prevent raven usage of the project area regardless of existing levels.

Enclosures:

1. CDFG comments
2. USFWS comments

Common Raven Monitoring, Management and Control Plan
CDFG Comments

Page 2, Paragraph 6:
Although the proposed project in relation to the Current SEGS VIII and IX facilities may not provide any additional raven subsidies, they would be cumulatively adding to the existing subsidies generated from the SEGS VIII and IX facilities.

Page 8, Paragraph 2:
Perhaps not as relevant to the raven plan, however, if the Designated Biologist (DB) is going to be the same individual identified in the AFC, then the DB should be "authorized" both by USFWS and under MOU with the Department of Fish and Game to handle desert tortoise.

Page 10, Paragraph 2:
Who determines the effectiveness of the PDF's?

Page 15, Paragraph 2:
"It should be noted that Project-related raven increases are not likely to be determined without a more rigorous quantitative monitoring program, including the collection of baseline and control data. What has been proposed for to establish baseline numbers, and when (prior to construction) would this occur?

Common Raven Monitoring, Management and Control Plan

Mojave Solar Project

Attachment DR-71 – Raven Control Plan

Prepared on behalf of:

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December 2009

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1.0 Introduction

In response to California Energy Commission (CEC) Data Requests 71 and 72 for the Mojave Solar Project (MSP or Project), this Common Raven Monitoring, Management, and Control Plan (Raven Control Plan or Plan) has been prepared for review by CEC, the U.S. Fish and Wildlife Service (USFWS), and California Department of Fish and Game (DFG). This Plan has been developed to expand on the components already addressed in the Application for Certification (AFC) in Avoidance and Minimization Measure DT-18 (Abengoa 2009: 5.3-45). The purpose of this Plan is to address concerns related to raven predation on hatchling and juvenile desert tortoises (*Gopherus agassizii*; DT) resulting from the proposed MSP. The Plan will also address similar concerns related to Mohave ground squirrel (*Spermophilus mohavensis*; MGS) depredation from ravens. The following section will provide a discussion of the Project background, the Plan's purpose and objectives, and the conditions of concern associated with the proposed MSP.

1.1 Project Description

The proposed MSP is a solar electric generating facility, to be located on 1,765 acres approximately 15 miles northwest of Barstow, California, and approximately 9 miles northwest of Hinkley, California (Figure 1) in the Mojave Desert in unincorporated San Bernardino County. The Project is situated near the southwest corner of Harper Dry Lake, an ephemeral alkali lake bed, in the southern section of the Lockhart U.S. Geological Survey (USGS) quadrangle and the northern section of the Twelve Gauge Lake USGS quadrangle. The Project is generally northeast of the intersection of Santa Fe Avenue with Harper Lake Road. The site is largely fallow agricultural land and the MSP was designed to minimize environmental impacts. The land was originally proposed as the site for Solar Electric Generating Stations (SEGS) XI and XII (which were never built), and is located next to the existing SEGS VIII and IX facilities.

Mojave Solar LLC (MSLLC or Mojave Solar) is proposing to construct, own, and operate the MSP. MSLLC is a Delaware limited liability company. Abengoa Solar Inc. (ASI), a Delaware corporation, specializes in solar technologies and is the sole member of MSLLC.

The Project will implement well-established parabolic trough technology to solar heat a heat transfer fluid (HTF). This hot HTF will generate steam in solar steam generators (SSGs), which will expand through a steam turbine generator (STG) to produce electrical power.

The Project will have a combined nominal electrical output of 250 megawatts (MW) from twin, independently operable solar fields, each feeding a 125-MW power island. The plant sites, identified as Alpha (the northwest portion of the Project area) and Beta (the southeast portion of the Project area), will be 884 acres and 800 acres, respectively, and joined at the transmission line interconnection substation to form one full-output transmission interconnection. An additional 81 acres shared between the plant sites will be used for receiving and discharging offsite drainage improvements. Start of commercial operation is planned for winter 2012, subject to timing of regulatory approvals and Mojave Solar achievement of Project equipment procurement and construction milestones.

The sun will provide 100 percent of the power supplied to the Project through solar thermal collectors; no supplementary fossil-based energy source (e.g., natural gas) is proposed for electrical power production. However, each power island will have a natural-gas-fired auxiliary boiler to provide equipment freeze protection and HTF freeze protection.

The auxiliary boiler will supply steam to HTF heat exchangers as needed during offline hours to keep the HTF in a liquid state when ambient temperatures fall below its freezing point of 54 degrees Fahrenheit (°F). Each power island will also have a diesel-engine-driven firewater pump for fire protection and a diesel-engine-driven backup generator for power plant essentials.

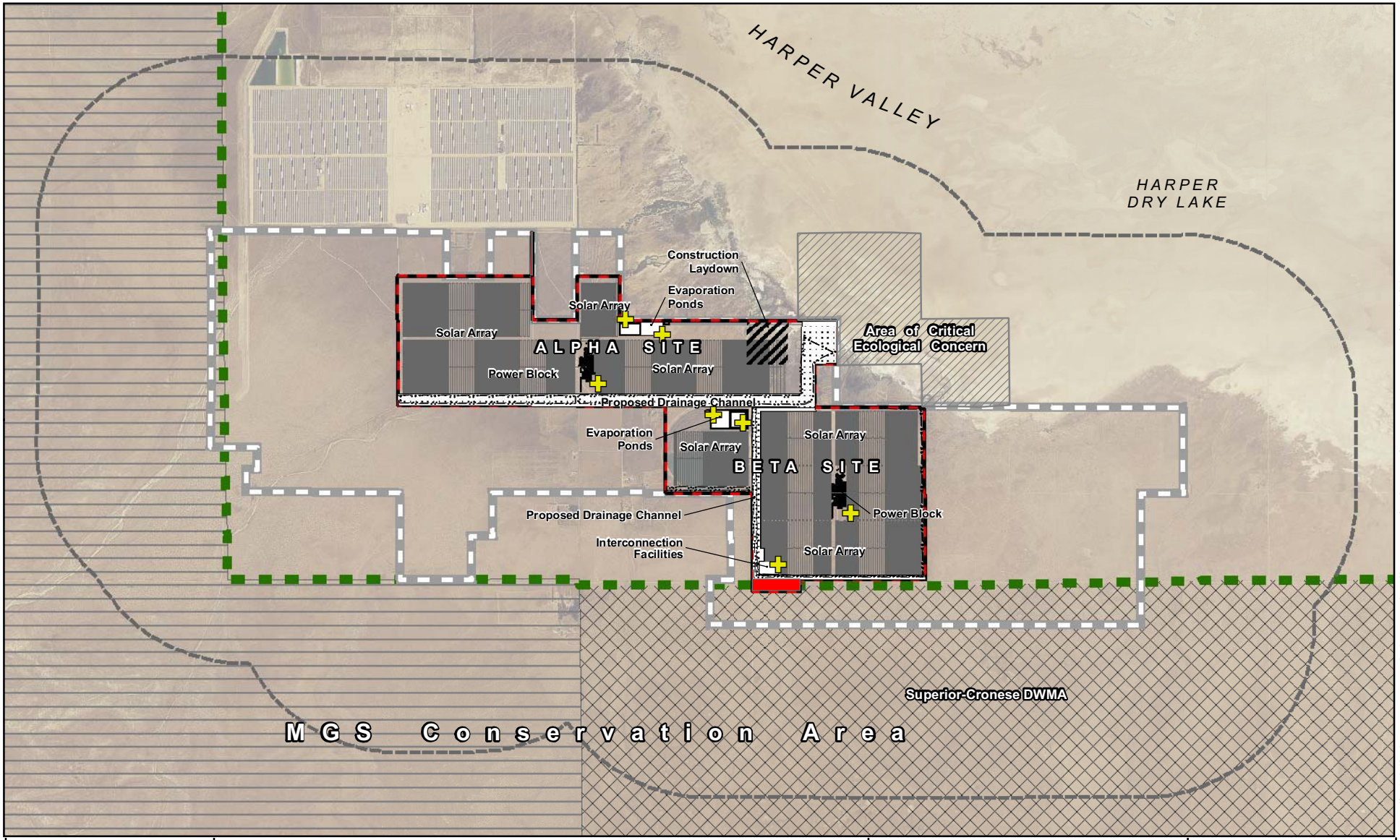
The Project is proposing interconnection to the Kramer-Cool Water 230-kilovolt (kV) transmission line, which is owned by Southern California Edison (SCE) and located adjacent to the southern border of the Project. The Interconnection System Impact Study (ISIS) has been completed in coordination with the California Independent System Operator (CAISO) and is located in Appendix N of the AFC. The Interconnection Facilities Study (IFS) is in progress to detail the on-the-ground system-wide improvements. As a separate process, SCE will lead the permitting effort for the transmission improvements beyond the Project-specific interconnection to the Statewide system. All Project-related transmission facilities are within the Project boundaries except the connection within the existing transmission right-of-way adjacent to the site.

The Project proposes to use wet cooling towers for power plant cooling and owns adjudicated water rights for this purpose. This onsite water is brackish. The Mojave Water Agency (MWA) administers the adjudication and manages water rights for all users through the Watermaster. Water for cooling tower makeup, process water makeup, and other industrial uses such as solar collector array (SCA) washing will be supplied from onsite groundwater wells drawing from these water rights and will also be used to supply potable water for employee use (e.g., drinking, showers, sinks, and toilets). A packaged water treatment system will be used to treat the water to meet potable standards since the source is brackish. No offsite backup cooling water supply is planned; the use of multiple onsite water supply wells, redundancy in the well equipment, and reserve water storage will provide an inherent backup in the event of outages affecting one of the onsite supply wells. The aquifer has been characterized as prolific and studies indicated that the health of the basin will not degrade during the life of the plant due to the Project.

A sanitary septic system and onsite leach field will be used to dispose of sanitary wastewater on each power island. Project cooling water blowdown will be piped to lined, onsite evaporation ponds for each plant area. The ponds will be sized to retain all solids generated during the life of the plant. However, if required for maintenance, dewatered residues from the ponds could be sent to an appropriate offsite landfill as non-hazardous waste.

Natural gas for the Project's ancillary purposes, such as the auxiliary boilers, space heating, and the like, will be supplied by a Southwest Gas Corporation (SGC)-owned pipeline that runs to the Project boundary near the Alpha power island. No offsite pipeline facilities are proposed as a part of this Project. SGC was contacted and studied the demand requested and indicates that sufficient capacity exists to supply the Project. Confirmation from SGC is included in Appendix O of the AFC.

Common ravens are known to prey on hatchling and juvenile DT, which is listed as threatened under the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA). Although certain features of the proposed Project (i.e., evaporation ponds, support structures, substations) have the potential to provide human-provided subsidies of food, water, and nest sites that may increase the attraction and presence of common ravens (*Corvus corax*; raven) within the Project area, these features currently exist on the adjacent SEGS VIII and facilities. The Project, therefore, may not be providing any new raven subsidies to the area. As described in the AFC (Abengoa 2009) prepared for the Project, DT have been observed within and near the Project area; therefore, the proposed Project has the potential to indirectly impact DT populations within the Project area. This Raven Control Plan describes effective management mechanisms to control the presence of ravens within the Project area.



Map Location

Legend

- Project Area (2009)
- Survey Area (CEC 1-mile Biology Buffer)
- Previous Biological Resources Survey Area
- Area of Critical Ecological Concern
- Mohave Ground Squirrel (MGS) Conservation Area
- Superior-Cronese Desert Wildlife Management Area (DWMA)
- Desert Tortoise Critical Habitat
- Proposed Raven Monitoring Locations

1:51,000

0 4,250 8,500 12,750 Feet

N W E S

Mojave Solar Project
Figure 1
Plant Site Location and Raven Monitoring Areas

Source: NAIP 2005; USFWS 2006; BLM 2009; Mojave Solar, LLC 2009

Mojave Solar

EDAW | AECOM

Date: December 2009

Path: P:\2008\08080191 Harper Lake Abengoa AFC\6.0 GIS\6.2 Project Directory\6.2.5 Layout\AFC\interim_analysis\raven_plant_site_survey_area.mxd, 12/01/09, LeeJ

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1.2 Purpose and Objectives

The common raven is a known predator of DT and is considered a subsidized predator (food, water, or other limiting resources provided by or associated with human activities [Soule 1988]). Ravens are predators of other small mammals as well, so control of ravens at the MSP will assist in maintaining raven pressure on MGS and other small mammals to a level at or below the current predation levels.

The establishment of an effective management plan and set of control measures is intended to ensure that the proposed MSP does not create new subsidies that would increase the presence, survival, or reproductive success of ravens that might be attracted to the Project area. The purpose of the Raven Control Plan is to establish management strategies and project-specific control measures to avoid, minimize, and mitigate potential Project-related raven depredation of DT within the Project area. The specific objectives of the Raven Control Plan are as follows:

1. Identify project activities or features that have the potential to attract ravens to the Project area (conditions of concern) and identify ways to eliminate or reduce raven attractants.
2. Discuss how the Project will implement project design features (PDFs) and other control measures to manage the specific conditions of concern identified for the MSP.
3. Document the successes and failures of PDFs as well as other measures set forth in this Plan.
4. Establish criteria that will trigger modifications to PDFs and other control measures through adaptive management principles.
5. Define additional control measures and how they would be implemented if the monitoring results indicate that additional controls are necessary.

To ensure the purpose and objectives of this Raven Control Plan are being achieved, management controls and monitoring practices will be implemented to regulate and track raven activity within the Project area. The qualitative data derived from this effort will be used to evaluate the successes and failures of the PDFs, as well as the other raven management control measures implemented for the MSP.

The Raven Control Plan will work in concert with the USFWS rangewide raven monitoring and control program. Because MSLLC has agreed to support the USFWS program in lieu of a site-specific raven monitoring and control program (AFC DT-17), the Plan presented here will be a subset of a more comprehensive program.

1.3 Conditions of Concern – Raven Subsidies or Attractants

Project-specific activities and/or features that attract or subsidize ravens are called “conditions of concern.” These conditions have the potential to increase raven presence and/or use of resources within the Project area. Construction and operation of the MSP would not introduce any new types of raven subsidies or attractants, since the Project is similar to the existing SEGS facility immediately to the northwest of the MSP. Approximately 75 percent of the existing vegetation within the current Project area is either fallow or active agricultural habitat. These habitat types are of higher quality for ravens than the solar array field that will be built on that land as part of the proposed Project. Furthermore, subsidies that currently exist due to agriculture (e.g., fresh water, rodents, rodents and rabbits killed during harvesting) will be removed by the Project. With appropriate measures to reduce the attractiveness of any of the conditions of concern below, the Project area will actually become less attractive to ravens after Project

~~implementation than the current condition of the Project area.~~ The following five conditions of concern are associated with the MSP:

1. Availability of water from evaporation ponds,
2. Potential creation of new perching/roosting/nesting sites for ravens,
3. Temporary water ponding potential from dust suppression,
4. Raven food sources from soil disturbance (rodents, insects, etc.) and roadkill associated with construction activity, and
5. Human food and waste management.

Each of these conditions of concern is defined in more detail below to ensure that appropriate PDFs and control measures are established and implemented for the MSP.

Evaporation Ponds

As described in Section 1.1, the proposed Project includes four evaporation ponds that will collect blowdown water from the cooling towers. However, within the 1-mile buffer of the Project area, approximately 23.1 acres of evaporation ponds already exist (at the SEGS VIII and SEGS IX facilities to the northwest of the MSP site). In addition to these evaporation ponds, water is also periodically available within marsh habitat within Harper Dry Lake. While the groundwater that historically supported the marsh habitat within the lake has largely been depleted by agricultural activities, there is a small amount of marshland in the southwest corner of the lake that is largely supported by runoff from farms. A reduction in agricultural activities within the area has reduced the amount of water to the lake. The Bureau of Land Management (BLM) set up an agreement for the existing SEGS VIII and IX facilities that provides pumped water to the lake. Water is also currently available to ravens from existing irrigation in the active agricultural fields in the Project area. While ~~ravens are known to travel up to 40 miles from their roosts for subsidies, including water (Boarman 2003), the presence of water in several forms within the Project vicinity reduces the importance of additional evaporation ponds as an attractant to ravens.~~

Raven Perching, Roosting, and Nesting Sites

Ravens often nest and perch on power towers, telephone poles, buildings, billboards, fences, abandoned vehicles, freeway or railroad overpasses, and light posts, and large communal roosts are known to form on transmission towers (Boarman 1993). Therefore, Project components such as tower structures, transmission poles and lines, and support structures ~~could~~ introduce new elevated perching sites. However, it should be noted that the current condition of the Project area probably contains more perching, roosting, and nesting sites in the form of abandoned buildings, vegetation (e.g., tamarisk scrub), and transmission line structures than would be provided by the Project.

Ponding Water

As discussed above, water is a critical resource for ravens in the desert. However, water is currently available in the immediate Project area (see above). Dust-suppression activities occurring during the construction phase of the MSP have the potential to create sources of free or standing water within the Project area. Ponding water may occur as a result of water being applied to newly graded areas, construction rights-of-way, dirt roads, trenches, spoil piles, and other areas of ground disturbances to reduce dust emissions and erosion of topsoil. During operation of the MSP, deionized water will be used to wash mirrors; however, the amount of

water used will be minimal and is not anticipated to result in ponding water on site. Furthermore, the current availability of water in the Project vicinity, as discussed above, ~~reduces~~ the additional attraction to ravens of any ponding water that may occur.

Landscaping, if any, will incorporate xeriscaping techniques to minimize the use of irrigation that might provide temporarily ponded water.

Raven Food Sources from Soil Disturbance

The operation of heavy equipment during the construction, decommissioning, and restoration phases of the MSP will cause soil disturbance within the Project area. This soil disturbance could potentially "unearth" and expose natural food sources such as rodents and insects. Since ravens scavenge roadkill, they may be drawn to the soil disturbance areas to prey on unearthed, injured, and dead animals. ~~However, the conversion of portions of the Project area from the current agricultural use to a solar field will substantially reduce the prey base for ravens within the Project area.~~

Human Food and Waste Management

Ravens scavenge refuse at landfills for food and obtain food subsidies at sewage ponds, open dumpsters, agricultural fields, feedlots, parks, and picnic areas (Boarman 2003). In addition, dumpsters with food waste can attract ravens and small mammals (e.g., rodents) that may become an additional food source for ravens. Implementation of the MSP will result in increased food and waste generation in the Project area, so proper waste management will be conducted to prevent the creation of subsidies that could attract ravens to the site.

Landscaping

Any landscaping could provide food (insects and rodents) and water (irrigation for landscaping). Landscaping plans, therefore, would incorporate xeriscaping techniques to avoid the use of irrigation.

2.0 Management Strategies

2.1 Roles and Responsibilities

Prior to the initiation of construction activities, to ensure that all conditions of this Raven Control Plan are being met, Mojave Solar will assign an Environmental Compliance Manager (ECM) and a Designated Biologist (DB) to the MSP. This section describes the roles and responsibilities of the ECM and the DB, as well as the typical duties and the required qualifications for each position.

2.1.1 Environmental Compliance Manager

Mojave Solar will be required to designate an ECM to the MSP. Typical duties required of the ECM involve managing, supervising, and/or providing advice on work affecting air quality, water/streambed permits, and biological resources environmental compliance programs. The ECM must have experience in the implementation of general environmental compliance measures and must have specific training by the DB to conduct the biological monitoring activities specified in the Raven Control Plan. The contact information for any ECM named to oversee the

Project will be incorporated into the Final Biological Resources Mitigation, Implementation, and Monitoring Plan (BRMIMP) for the MSP.

2.1.2 Designated Biologist

Prior to the initiation of construction activities, Mojave Solar will be required to designate a DB to the Project. (The DB will be the same as the Project Authorized Biologist [AB] discussed in the AFC.) Mojave Solar will submit the resume of the proposed DB, with at least three references and contact information, to the CEC Compliance Project Manager (CPM) for approval in consultation with DFG and USFWS.

The DB will have the following background and training:

- Bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field, and 3 years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society.
- At least 1 year of field experience with biological resources found in or near the Project area.
- Be aware of the latest information on the USFWS protocols and guidelines for DT.
- Have a thorough and current knowledge of DT behavior, natural history, ecology, and physiology, and demonstrate substantial field experience.

Mojave Solar will ensure that the DB performs the activities specified in the Plan. In addition, Mojave Solar will also designate an alternate biologist with the same qualifications as the DB, outlined above. The CPM, in consultation with the DFG and USFWS, could also appoint a DB without the above mentioned qualifications if the candidate is determined to be otherwise qualified with the appropriate training and background to effectively implement the Raven Control Plan.

3.0 Project Design Features, Project-Specific Control Measures, and Implementation of Project Design Features

To reduce the potential Project impacts to DT from common ravens, it is imperative that the PDFs (i.e., those features that are built into the Project's physical design and functioning) eliminate or mitigate any subsidizing of ravens with water, nest sites, food, or other resources. This section describes the PDFs, management practices, and Project-specific control measures that have been established to ensure that activities associated with the MSP during both the construction and operation phases do not create new subsidies that will increase the presence or attraction of ravens to the Project area. These management practices specifically address the five basic conditions of concern identified in Section 1.3. These are divided into the construction phase of the MSP (Section 3.1) and the operation phase of the MSP (Section 3.2).

3.1 Construction

Impacts associated with the construction phase of the MSP are considered to be more temporary than operational impacts. As such, temporary management practices can be implemented to effectively preclude and/or minimize the potential to attract additional ravens to the Project area.

Temporary measures include best management practices (BMPs) during construction such as trash containment and removal from the construction site.

3.1.1 Evaporation Ponds

Rainwater may be collected in the four onsite evaporation ponds during the construction phase of the MSP. Given the scarcity of water resources in the desert, ravens could be drawn to this new water source. However, it should be noted that Harper Dry Lake is located adjacent to the Project area and includes marsh habitat within the southwest corner of the lake that sometimes provides water. ~~In addition, the Project area currently includes raven subsidies that will be removed with implementation of the Project. Water, in the form of irrigation for active agricultural fields, and prey, in the form of insects and rodents associated with the active agricultural fields, are currently present in the Project area and will be removed with the implementation of the proposed Project.~~ During construction monitoring, the ECM will monitor for the presence of ravens and, if ravens are identified to be present at evaporation ponds, hazing techniques will be used to discourage use.

3.1.2 Raven Perching, Roosting, and Nesting Sites

Equipment and/or materials associated with construction of the MSP may provide temporary perch, roost, or nest sites for ravens within the Project area. During construction monitoring, the ECM will monitor raven presence and, if ravens are found perching, roosting, or nesting on building materials, equipment, waste piles, or other construction debris, hazing techniques will be used to discourage use. ~~However, the proposed Project will likely contain fewer perching, roosting, and nesting sites than the current condition of the Project area, which includes existing abandoned buildings that already provide nesting and roosting sites.~~

3.1.3 Ponding Water

The application rates of water for dust-suppression activities will be predetermined to minimize excessive application and curtail ponding water within the Project area. Soil infiltration and evaporation rates will be used to determine the appropriate application amount and frequency. In the vicinity of the water truck refill area, water will run off into a collection tank or other system that will preclude surface pooling. The ECM will monitor areas to make certain water does not puddle for long periods (more than 1 hour) and make recommendations for reduced water application rates as necessary.

3.1.4 Raven Food Sources from Soil Disturbance and Roadkill

Ravens are scavengers and are well known for eating animals that have been killed along roads and highways (Boarman and Heinrich 1999). In fact, roadkill is considered to make up a substantial portion of a raven's diet. This food source facilitates increased raven nesting near roads and highways in areas that might otherwise offer little food (Kristan et al. 2004).

The operation of heavy equipment during the construction, decommissioning, and restoration phases of the MSP will cause soil disturbance within the Project area. This soil disturbance will "unearth" and expose natural food sources such as rodents and insects. Weekly construction monitoring conducted by the ECM will include observations of the MSP site, as well as access roads, to ensure that food sources are properly disposed of within containers that are not accessible to ravens.

3.1.5 Human Food and Waste Management

During the construction phase of the MSP, a trash abatement program will be prepared to ensure that trash and food items will be contained in closed, secured containers on the MSP site and removed daily to reduce potential food sources to ravens and other scavengers. Weekly observations of the construction site and access roads will ensure proper disposal of all trash and roadkill.

3.2 Operations

Impacts associated with the operations phase of the MSP are more long term in nature, and require the implementation of ongoing PDFs and management practices for the life of the Project. If, through monitoring, it is determined that these PDFs or management practices are not effective in accomplishing the goal of this Raven Control Plan, modifications to these practices and/or additional measures will be implemented through adaptive management and monitored to ensure the Plan's purpose and objectives are being met.

3.2.1 Evaporation Ponds

Because the ponds need to remain uncovered to maximize evaporation rates, a series of avian deterrence measures such as the BirdAvert system are being considered for incorporation into the design and operation of the evaporation ponds. The operational design of the ponds is described in detail in the MSP Evaporation Pond Monitoring and Remediation Action Plan (AECOM 2009).

Other options include the use of antiperching devices placed strategically along the perimeter of the ponds to exclude ravens and other birds from accessing the edge of the ponds to drink water. These design features will make it difficult for perching birds (e.g., ravens) and/or shorebirds and wading birds to access the water. Netting of the pond may also be considered if other design measures do not prove to be effective.

The DB will be responsible for making qualitative observations on the relative success of the deterrent(s) at each pond and providing recommendations for future improvements in monthly reports, including adapting the current configuration of the antiperching devices to maximize deterrence.

3.2.2 Raven Perching, Roosting, and Nesting Sites

PDFs that will be considered to reduce raven perching, roosting, and nesting are physical bird deterrents such as bird spikes, plus auditory and visual deterrents. In addition, nest removal will occur in conjunction with monitoring, as discussed below in Section 5.3. Under specific circumstances, the Animal and Plant Health Inspection Service – Wildlife Services (APHIS–WS) is authorized to remove "offending" ravens. "Offending" ravens are ravens that are known to be depredating DTs. The purpose of this activity is to reduce or eliminate predation of DT by common ravens within the Mojave Desert in San Bernardino, Riverside, and Kern counties in California. The ECM or DB will notify USFWS of ravens that show evidence of depredating tortoises (USDA 2009).

3.2.3 Ponding Water

The application rates of water for dust-suppression activities will be predetermined to minimize excessive application and curtail areas of ponding water within the Project area. Soil infiltration and evaporation rates will be used to determine the appropriate application amount and

frequency. The ECM will monitor areas to make certain water does not puddle for long periods (more than 1 hour) and make recommendations for reduced water application rates as necessary. During operations, deionized water will be used to wash mirrors; however, the amount of water used will be minimal and is not anticipated to result in ponded water on site. If water becomes a concern, changes will be made through adaptive management (as discussed in Section 6.0).

3.2.4 Raven Food Sources from Soil Disturbance and Roadkill

Operational activities associated with the MSP will not result in new ground or soil disturbance. As such, potential food sources for ravens will not be unearthed and no additional PDFs related to this issue are necessary.

The ECM will document any roadkill observed during the biweekly monitoring during Project operations (see below). Areas observed will include the MSP site, the associated paved and dirt access roads, staging areas, and/or any other Project area facilities that may support vehicular traffic, potentially extending to Harper Lake Road, if necessary. In addition, MSP operations staff will notify the ECM daily if roadkill is observed within these areas.

3.2.5 Human Food and Waste Management

The trash abatement program developed for the construction phase will also include operational measures to be implemented for the life of the Project. Trash and food items will be contained in closed, secured containers and removed daily to reduce the potential attraction of ravens to the site. The ECM will continue to ensure that these practices are enforced and make recommendations for improvements where applicable as discussed in Section 6.0.

4.0 Raven Monitoring Strategies

This section describes the monitoring practices that will be performed as part of this Raven Control Plan. Both qualitative and quantitative monitoring activities will be used to evaluate the effectiveness of the PDFs and the other raven management and control measures implemented for the MSP. This monitoring program will be based on observations and performed during both the construction and operation phases of the MSP in an effort to record and evaluate any changes in raven activity and populations.

4.1 Construction Phase

During the construction phase of the MSP, the designated ECM will perform reconnaissance-level surveys in the Project area at least once a week (or more frequently as needed). Initially and periodically, the DB will assist the ECM to ensure that monitoring objectives are being achieved. The ECM will specifically focus survey efforts on the following Project features:

- Evaporation ponds,
- Waste disposal areas,
- Built structures,
- Equipment staging and storage areas,
- Locations where water will be applied to control dust and erosion,
- Potential nest sites, and
- Areas where there have been surface and soil disturbances.

Once the Project design for the MSP is final, data sheets will be created and submitted for agency approval prior to implementation of this Raven Control Plan. Once approved, the data sheets will be used to record each raven observed within the Project area. The ECM will take note of the activity of the raven (i.e., flying, perching, nesting, and scavenging) as well as the general location of the observed raven(s). If the raven(s) is found perching, detail will be recorded pertaining to the type of perch (structures, fences, etc.). Furthermore, any nesting locations will be documented and uninhabited nests will be removed pursuant to methods set forth in Section 4.2.2 of this Plan.

4.2 Operation Phase

During the operation and maintenance phase of the MSP, the designated ECM, in coordination with the DB, as appropriate, will perform biweekly (every 2 weeks) reconnaissance-level surveys at the MSP site for the life of the Project. In addition, annual breeding season monitoring will be conducted at the MSP in perpetuity. Details pertaining to these monitoring requirements are discussed in detail below.

4.2.1 Ongoing Biweekly Raven Monitoring

The ECM will conduct biweekly surveys (every 2 weeks) monitoring raven activity for the first 5 years of Project operation, beginning when the Project becomes operational. The ECM will be accompanied by the DB during the first four surveys to facilitate appropriate data collection. The DB will also periodically look at data sheets and discuss the monitoring with the ECM to ensure that monitoring objectives are being achieved. After the first 5 years of Project operation, surveys will be conducted biweekly for at least 1 year out of every 5 years into perpetuity, unless results indicate more frequent or less frequent monitoring is appropriate.

Survey locations will be identified by the DB based on Project features that may influence raven presence, activity, and behavior by potentially allowing perching, roosting, and nesting opportunities or by providing other subsidies such as food and water. These Project features include tower structures, transmission poles and lines, and support structures, as well as waste disposal facilities and evaporation ponds, and may occur both inside and outside of the Project footprint, depending on access. At each evaporation pond, the DB will identify up to five permanent sampling points, in addition to one stationary sampling point. If it is determined that, with a reduction from five points to three points that all important areas can still be viewed, the number of permanent sampling points can be reduced to three permanent sampling points and one stationary sampling point. Points would be located within areas that have the greatest likelihood of attracting ravens. Figure 1 shows an example of how these permanent sampling locations may be set up.

The evaporation ponds will be monitored as described in this Plan and as outlined in the Evaporation Pond Monitoring/Remediation Action Plan (AECOM 2009). Overlapping surveys for both plans will be performed concurrently.

At each determined survey point, the EMC will conduct a 5-minute sampling session to observe and listen for ravens. Raven sightings will be recorded along with the type behavior (e.g., perched, flying, nesting, scavenging), and distance and direction from the survey point. If the raven(s) is found perching or nesting, detail will be recorded pertaining to the type of perch (structures, fences, etc.). Other data to be collected will include the survey start/stop time and weather (including temperature, average wind speed, and percent cloud cover). In addition, the location of any nests discovered during a survey will be documented and their location recorded using Universal Transverse Mercator (UTM) coordinates. Just prior to the initiation of the

breeding season for ravens, extra effort will be taken to remove any inactive nests to prevent these nests from becoming active. The area below any nest sites will be searched each spring for any evidence that ravens are depredating DT. If evidence of predation of DTs is found, the ECM or DB will notify USFWS so that the APHIS–WS can be notified and the offending ravens removed.

As with the construction monitoring, a data sheet will be prepared in advance of operational monitoring activities that will include the aforementioned data to be collected. Surveys will be performed as scheduled unless wind or rain interferes with audible or visual detection of ravens. Surveys will be rescheduled to occur as soon as the wind or rain has subsided.

4.2.2 Breeding Season Raven Surveys

The typical raven breeding season begins in mid-February and continues through the end of June (Boarman 2002, 2003). During this time, the ECM will perform biweekly (every 2 weeks) surveys on MSP-owned lands to systematically search and identify nests, as well as evidence of DT predation at nest locations. The ECM will conduct these breading season surveys for the life of the MSP.

Surveys will be conducted by vehicle when possible and on foot as necessary. All trees, landscaping, utility poles, transmission towers, and other structures within the Project area will be searched for nests. If nests are encountered, the ECM will contact the DB to verify nest conditions. The ECM will record a UTM coordinate for any nest locations and identify the nesting substrate and the current breeding status, if it can be determined. Raven activity will be documented for all observations so that the data can be reviewed to determine how ravens are using the site. Once data have been collected, the DB will determine if the nest is unoccupied (i.e., no eggs in the nest or nestlings have fledged), in which case the nest will be removed by the DB or the ECM (see description of nest removal below). If occupied nests are detected during surveys, Mojave Solar will notify USFWS for assistance with control measures. In addition, the DB will also investigate the 30-meter radius surrounding any detected nest site and/or perch site for evidence of DT predation. If any depredated DTs are discovered, they will be photographed, a UTM coordinate collected, and the length measured (or estimated). The DB will then notify USFWS. To avoid duplication of data recording on subsequent surveys, each DT shell will be marked.

Semi-quantitative and qualitative data will be collected to document raven nesting behavior and DT predation. This survey data will provide valuable information for assessing raven behavior and documenting potential problem individuals for management actions. If the breeding survey results reveal that raven activities appear to have increased within the Project area, modifications to the PDFs and/or other control measures through adaptive management (as described in Section 5.0) may be necessary.

4.3 Nest Removal

The majority of raven predation on DT is most likely to occur in the spring, from April to May, when DT are most active and ravens are feeding young (Boarman and Heinrich 1999). To help reduce raven depredation on DT during this time, the removal of unoccupied raven nests ~~may~~ be conducted as part of the MSP-specific raven management efforts. ~~However,~~ nest removal ~~may~~ only occur within Mojave Solar-controlled lands and the SCE transmission line right-of-way, and inactive nest removal can only be conducted by the DB. ~~Prior authorization from DFG for the DB to remove inactive nests must be obtained.~~ Removal of active nests cannot be conducted by either the ECM or DB. In situations where raven predation of DT can be documented, USFWS

will be contacted and APHIS–WS has the authority to remove offending ravens and their nests. If an identified nest is located outside of Project area boundaries, USFWS will be notified by the DB.

If an unoccupied raven nest is detected outside of the breeding window during biweekly surveys, it will be removed by the DB. Removing raven nests outside of the breeding season may have a smaller effect on the raven population since they may readily rebuild the following season. However, evidence suggests that birds with no nests in their territory at the beginning of the breeding season are less likely to commence nesting than those who already have intact nests (Kristan and Boarman 2003). A recent study in the Mojave Desert showed a roughly 50 percent decrease in the number of nests rebuilt following wintertime removal (Boarman in prep.).

4.4 Decommissioning and Restoration Phase

If the MSP requires a decommissioning and restoration phase, the ECM will perform reconnaissance level surveys in the Project area at least once a week (or more frequently as needed) during ground-disturbance activities. Monitoring will follow the procedures set forth in the construction phase (Section 3.1 above).

5.0 Regionwide Raven Management and Monitoring Program

As part of Data Request 72, CEC suggested that Mojave Solar contribute to the USFWS regional raven management and monitoring program to offset the MSP's cumulative effects on DT due to raven predation. Mojave Solar will contribute ~~approximately $50,000~~ to the fund to avoid, minimize, and mitigate potential impacts to DT resulting from increased raven predation associated with implementation of the MSP. It is anticipated that the funds contributed by Mojave Solar would be held by the National Fish and Wildlife Foundation established under the USFWS regional raven management program until needed to implement the regionwide program.

6.0 Adaptive Management

This section discusses how adaptive management will be applied as a tool to help attain the overall purpose and objectives of this Raven Control Plan. This section provides a broad definition of adaptive management, identifies the conditions that will trigger the need for implementation of adaptive management measures, and summarizes how modifications to specific PDFs and/or other control measures can be made to likely improve the Plan's overall success.

6.1 Definition

Adaptive management is a problem-solving environmental management approach to facilitate more effective management of resources to achieve desired objectives. It involves synthesizing existing knowledge, exploring alternative actions, making explicit predictions of their outcomes, selecting one or more actions to implement, monitoring to determine whether outcomes match those predicted, and using these results to adjust future plans (Holling 1978). By nature of the definition, adaptive management can be defined as an iterative and structured optimal decision-making process based on feedback and adjustment that is intended to reduce uncertainty through system monitoring. The iterative process simultaneously maximizes one or more resource objectives and accrues information needed to improve future management, either actively or passively.

Adaptive management is usually categorized in one of two ways: active or passive. Passive adaptive management involves the use of conceptual modeling to guide management actions. The model is adjusted as new knowledge is obtained and management decisions are subsequently modified. Active adaptive management involves testing alternative hypotheses through system manipulation. Passive adaptive management is based on information gained from observational studies, whereas active adaptive management is based on information gained from experimental manipulation (Holling 1978). This Plan will focus on passive adaptive management but may ultimately apply both passive and active adaptive management.

6.2 Adaptive Management Triggers

Should the results from the monitoring practices reveal that it appears raven ~~activities have increased within~~ the Project area ~~as a result of the MSP,~~ modifications to the PDFs and/or other control measures through adaptive management ~~may~~ be necessary. The implementation of adaptive management measures will be triggered if both of the following conditions are met:

1. The biweekly and/or annual breeding season raven monitoring and survey results indicate that the existing PDFs are ineffective at controlling ~~increases in~~ raven presence and activity in the Project area (the raven population size has increased, active nests are present, etc.), thereby increasing the potential for DT predation; and
2. Mojave Solar has made every attempt to adjust PDFs to control raven occurrences, and has contacted and worked with the DB and the resource agencies to identify other sources of ravens and/or management measures, but increased raven occurrences and use of the Project area appears to continue.

~~It should be noted that Project related raven increases are not likely to be determined without a more rigorous quantitative monitoring program, including the collection of baseline and control data~~. However, this Plan sets forth measures to preclude attracting ravens to the Project area and control measures to eliminate those that become problematic, regardless of their association with Project activities. The funds for more rigorous methods will be supplied to the USFWS' rangewide raven monitoring and control program.

6.3 Adaptive Management Measures

During implementation of the monitoring program, identified adaptive management measures will be discussed by Mojave Solar, CEC, USFWS, and DFG before any decisions are made to incorporate them into the MSP. Adaptive management measures may include modifications to PDFs or monitoring strategies, or implementation of additional control measures. Key examples are 1) modifications to the monitoring program survey frequency, including increase or reduction of the monitoring frequency and survey points, should results of surveys deem it to be warranted; 2) removal or enhancement of a PDF or management measure if it is not working; or 3) incorporating a defined control measure, if impacts are observed that would not otherwise be implemented (triggered).

6.3.1 Control Practices

If the results of the monitoring efforts suggest that there is a substantial and ongoing increase in raven activity that may result in DT predation, even with the implementation of PDFs, then Mojave Solar may need to implement agency-approved additional control practices to further manage ravens in the Project area. This section defines the types of control practices that may be implemented if additional measures are determined to be necessary based on the adaptive

management triggers described above in Section 6.2. If none of the control measures included below work to achieve the objectives of this Raven Control Plan, additional control measures will need to be considered and implemented.

Roadkill Removal

If the ECM and/or MSP operations staff regularly observes roadkill that may be attributable to the Project, it may be necessary for the ECM to develop a roadkill removal program specific to the MSP.

Hazing

Hazing techniques involve the diligent application of a number of visual and/or auditory devices designed to scare birds and create an integrated system of negative stimuli to reduce the attraction of birds to an area. Hazing must be dynamic, creative, and mobile. Hazing techniques include implementation of floating or stationary figures, helium filled balloons, air or propane cannons, human or aircraft herding, and/or bioaccoustic deterrents.

The key elements of hazing include timing, organization, variation (random), and persistence. Because ravens are adept at learning the type, timing, and location of hazing techniques, these variables must be changed frequently. This effort will help to delay raven habituation to the hazing techniques.

Often, a combination of the above tactics must be employed to be effective, as many birds become accustomed to methods quickly. If hazing techniques are determined to be necessary for the MSP, the DB, ECM, and CEC will develop a hazing program specific to the Project area. Because some of these techniques will create additional sources of noise in the areas, permission may be required from the local police or municipality, as there may be local ordinances that prohibit the creation of loud noises.

Methyl Anthranilate

Methyl anthranilate (MA) is a naturally occurring non-toxic, non-lethal listed compound used as a food flavoring and fragrance additive that acts as a chemosensory repellent, irritating pain receptors associated with taste and smell. It has been documented to be an effective bird repellant; however, MA is thought to have limitations for topical application as it is considered highly volatile and breaks down readily under exposure to ultraviolet (UV) light (Umeda and Sullivan 2001). With USFWS and DFG approval, the most appropriate application of MA would be to small areas of ponding water or areas where known nesting has occurred. In areas of ponding water, it would be necessary to repeat topical application due to the chemical breakdown that occurs with exposure to UV light. In areas where known nesting has occurred, the ECM could apply MA to deter nest rebuilding in that location. However, before MA is applied to any area at the MSP, research will be conducted by the DB to obtain the most current application of MA; the most effective methods to deter raven activity will then be developed in coordination with the ECM and CEC.

Lethal Removal (Depredation)

Lethal removal may be considered if ravens are still attracted to the MSP even after the implementation of PDFs, modification to PDFs, and implementation of control measures. Lethal removal is also appropriate if there is evidence that nesting ravens are depredating DT. Under this control method, targeted ravens will be shot by rifle or shotgun. If shooting is not possible

(e.g., on power lines) or has been proven unsuccessful, ravens will be trapped and humanely euthanized. Juvenile ravens found in nests of removed adults will also need to be euthanized humanely.

It should be noted that there is no evidence suggesting that lethal removal will have a long-lasting effect on raven population levels, raven foraging behavior, or survival of juvenile DT (Boarman 2002). Targeting and removing individuals in this fashion is also considered time consuming. However, this method can be effective if there are specific raven pairs determined to be responsible for taking relatively large numbers of DT (Boarman 2002). These individuals can often be identified by the presence of juvenile DT shells beneath their nests, which are often used for consecutive years by the same pair of breeding ravens (Boarman and Heinrich 1999). While it would be very difficult to identify the target bird(s) with absolute certainty and lethally remove both members of a pair, removing those birds known to prey on DT would likely increase the survival of juvenile DT in that vicinity (Boarman 2003).

7.0 Reporting

During construction and the first year of operation of the MSP, monthly monitoring reports will be prepared by the ECM and submitted to Mojave Solar and the DB for review. Mojave Solar will then forward the reports to CEC, USFWS, and DFG monthly. These reports will provide a summary of all monitoring activities occurring within the Project area and describe any noted raven activity and/or any observations reported by MSP operations staff. After the first year of operation, monitoring data will continue to be provided monthly. In addition to the monthly data submittals, an annual report will be prepared and submitted to summarize the overall monitoring results, evaluate the effectiveness (success or failure) of PDFs, and make recommendations for modification of PDFs or implementation of control measures if needed. The yearly report will be technically reviewed by an academic scientist. Results of the monitoring efforts will be used to assess the overall impacts of the MSP and specific Project components, such as evaporation ponds, on raven activities (e.g., presence or type of activity).

8.0 References

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