SES Solar One

Raven Monitoring and Control Plan

In Response to CEC and BLM Data Request 55 Application for Certification (08-AFC-13)

July 2009

DOCKET
08-AFC-13
DATE JUL 20 2009
RECD JUL 20 2009

Submitted to:
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Tessera Solar™
power from stirling energy systems

July 17, 2009

Mr. Christopher Meyer
Project Manager
Attn: Docket No. 08-AFC-13
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

RE: SES Solar One
Applicant's Response to CEC and BLM Data Request 55
Raven Monitoring and Control Plan

Dear Mr. Meyer,

Tessera Solar hereby submits the Raven Monitoring and Control Plan in response to CEC and BLM Data Request 55 (Data Requests Set 1, Part 1).

I certify under penalty of perjury that the foregoing it true, correct, and complete to the best of my knowledge.

Sincerely,

Camille Champion
Project Manager

REPORT

RAVEN MONITORING AND CONTROL PLAN FOR THE SES SOLAR ONE SITE IN SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for

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July 14, 2009

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Figure 1 Solar One Project Vicinity Map
Figure 2 Solar One Vegetation Map

ACEC	Area of Critical Environmental Concern
AFC	Application for Certification
APLIC	Avian Power Line Interaction Committee
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe railway
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CEC	California Energy Commission
CSSC	California Species of Special Concern
DWMA	Desert Wildlife Management Areas
I-40	Interstate 40
kV	kilovolt
kWe	kilowatt-electrical
LORS	laws, ordinances, regulations, and standards
MBTA	Migratory Bird Treaty Act
NEMO	Northern and Eastern Mojave Desert Management Plan
ORV	Off-road Vehicle
PCU	Power Conversion Unit
POD	Plan of Development
Project	Solar One Project
PVC	Polyvinyl Chloride
RO	Reverse Osmosis
SCE	Southern California Edison
SES	Stirling Energy Systems
TDS	total dissolved solids
USFWS	U.S. Fish and Wildlife Service

SECTION 1 INTRODUCTION

The proposed Solar One Project (Project) would develop a solar-powered electricity generating facility situated approximately 37 miles east of Barstow in San Bernardino County in southern California (Figures 1 and 2). The Project is located on lands managed by the Bureau of Land Management (BLM). A total of 8,230 acres would be included within the Project area.

This plan provides for active management of the ravens (*Corvus corax*) that may be associated or attracted to the Solar One site. Ravens are a key predator of desert tortoise and a potential predator of Mojave fringe-toed lizard (*Uma scoparia*), and their active management is intended to benefit populations occurring in the Project vicinity.

SECTION 2 SOLAR ONE PROJECT FEATURES, CONSTRUCTION, AND OPERATION

A detailed description of the Project is provided in the BLM Plan of Development (POD) and the Project's Application for Certification (AFC). This information is summarized below.

2.1 PROJECT FEATURES

2.1.1 Solar Receivers

The SunCatcher is a 25-kilowatt-electrical (kWe) solar dish Stirling system designed to automatically track the sun and collect and focus solar energy onto a Power Conversion Unit (PCU), which generates electricity. The system consists of an approximately 38-foot-high by 40-foot-wide solar concentrator in a dish structure that supports an array of curved glass mirror facets. These mirrors collect and concentrate solar energy onto the solar receiver of the PCU. The SunCatcher pedestal on which the SunCatcher Dish Assembly is secured is approximately 18 feet 6 inches in height. The dimensions of the PCU are approximately 7 feet long by 5 feet wide by 3 feet high. The PCU consists of six subsystems: solar receiver, Solar Stirling Engine, generator; cooling system, gas management system, and the PCU control system. The Suncatchers provide perching opportunities for ravens.

2.1.2 Electrical System

The Project includes construction of a substation, which will include transformers, circuit breakers, metering, and other protection required to connect the Project to the Southern California Edison (SCE) Pisgah Substation. The Project interconnect transmission system will require construction of approximately 2 miles of single-circuit 220 kilovolt (kV) transmission line. Power will be collected at the 34.5kV level by a combination of underground cables and overhead collection lines and will be delivered to the Project substation, where the voltage will be stepped up to 220kV for transmission to the SCE Pisgah Substation and connection to the grid.

The proposed double-circuit transmission line will originate at the Solar One Substation, follow a route due south to the southern boundary of the site, then due east to the Pisgah-Lugo Transmission Line, and finally south to the SCE Pisgah Substation. It will traverse the southern boundary of the Project and connect with the Solar One transmission line at the eastern boundary of the Project. The double-circuit transmission line from the Solar One Substation to the SCE Pisgah Substation will utilize lattice steel towers approximately 70 to 110 feet tall and designed to provide at least 30 feet of conductor-to-ground clearance at any point along the span. Utility poles and wires provide perching and nesting additional opportunities for ravens.

2.2 CONSTRUCTION

2.2.1 Schedule, Workforce, Access, and Laydown

The Project will be developed in two phases (SES 2008). Heavy construction for the Project will be scheduled to occur between 0700 and 1900 Monday through Friday. Additional hours may be necessary

to make up schedule deficiencies or to complete critical construction activities. Some activities will continue 24 hours per day, 7 days per week. These activities include, but are not limited to, SunCatcher assembly, refueling of equipment, staging of materials for the next day's construction activities, quality assurance/control, and commissioning.

Four construction staging and laydown areas will be used for the Project. Two 26-acre construction laydown areas will be provided one at the south entrance off Hector Road and one at the east entrance just north of the SCE Pisgah Substation. An approximate 14-acre construction laydown area will be provided adjacent to the Main Services Complex and an approximately 6-acre construction laydown area will be provided adjacent to the Satellite Services Complex. The 26-acre laydown areas, located near the south and east entrances to the Project Site, are nearly level and will require little grading. The laydown areas adjacent to the Main and Satellite Services Complex are on a gently sloping, rocky area that will require minimum grading and fill operations to create a level area. Pads will be prepared for setting the trailers housing the temporary construction facilities.

2.2.2 Clearing and Grading

The ground surface at the Project Site generally slopes southwest and west. Site preparation will be based on avoiding major drainages and minimizing surface-disturbing activities. Also, areas of sensitive habitat and cultural resource will be avoided wherever possible. The clearing, blading, and grading operations will be undertaken using standard contractor heavy equipment. This equipment will consist of, but not be limited to, motorgraders, bulldozers, elevating scrapers, hydraulic excavators, tired loaders, compacting rollers, and dump trucks. Limited localized channel grading will take place to improve channel hydraulics and to control flow direction where buildings and roadways are proposed.

2.3 OPERATION

2.3.1 Solar Fields

It is expected that the Project will be operated with a staff of approximately 180 full-time employees. The Project will operate seven days per week, generating electricity during normal daylight hours when the solar energy is available. Maintenance activities will occur seven days a week, 24 hours a day to ensure SunCatcher availability when solar energy is available.

2.3.2 Water System

The following types of water will be required for the Project:

- equipment washing water,
- potable water,
- dust control water, and
- fire protection water.

Water resources have potential to attract ravens to the Project Site.

2.3.3 Waste Management

The water treatment wastewater generated by a demineralizer equipment will contain relatively high concentrations of total dissolved solids (TDS). Wastewater or brine generated by a demineralizer unit will be discharged to a concrete-lined evaporation pond, or equivalent. Each pond will be sized to contain one year of discharge flow, approximately two million gallons. A minimum of one year is required for the water treatment waste to undergo the evaporation process. The second pond will be in operation while the first is undergoing evaporation. The two ponds will alternate their functions on an annual basis. The solids will be scheduled for removal during the summer months, when the concentration of solids is at its greatest because of an increase in evaporation rates, in order to achieve maximum solids removal.

Sanitary wastewater generated at the facility cannot be conveyed to an existing sewage facility or pipeline as there are no public or private entities that manage sanitary wastewater flows for locations in the vicinity of the Project Site. The wastewater generated at the Main Services Complex will be discharged into a sub-surface wastewater disposal system with septic tanks and leach fields, and will be designed in accordance with the applicable laws, ordinances, regulations, and standards (LORS), including San Bernardino County, California State Regional Water Quality Board, and the Department of Health Services. Open evaporation ponds and sewage ponds are known attractants for ravens and could potentially attract the species to the Project Site (Boarman *et al.,* 2006).

The Project will generate a variety of non-hazardous and hazardous wastes during construction and operation. These wastes include liquids and solids from the wastewater system, replaceable parts, rags, and other waste materials and chemicals produced from maintenance activities, including equipment and vehicle maintenance. Inert solid wastes resulting from construction activities may include recyclable items such as paper, cardboard, solid concrete and block, metals, wire, glass, Type 1 to 4 plastics, drywall, and wood. Non-recyclable items include insulation, other plastics, food waste, roofing materials, vinyl flooring and base, carpeting, paint containers, packing materials, and other construction wastes. Management of these wastes will be the responsibility of the construction contractor(s). Typical management practices required for contractor waste include recycling when possible, proper storage of waste and debris to prevent wind dispersion, and weekly pickup of wastes with disposal at a local approved landfill.

It is expected that a 40-cubic-yard container will need to be emptied on a weekly basis during the construction of the buildings and once a month thereafter. Inert solid wastes generated at the Project during operation will be predominantly office wastes and routine maintenance wastes, such as scrap metal, wood, and plastic from surplus and deactivated equipment and parts. Scrap materials such as paper, packing materials, glass, metals, and plastics will be segregated and managed for recycling. Non-recyclable inert wastes will be stored in covered trash bins in accordance with local ordinances and picked up by an authorized local trash hauler on a regular basis for transport and disposal in a suitable landfill area. Trash and landfill areas are known attractants for ravens and could potentially attract ravens to the Project Site.

2.3.4 Fire Protection

The Project fire protection and safety systems will be designed to limit personnel injury, property loss, and Project downtime as a result of fire or other event. The systems will be designed in accordance with federal, state, and local fire codes, occupational health and safety regulations, and other jurisdictional requirements, the California Building Code, and National Fire Protection Agency standard practices. The fire water supply and pumping system will provide an adequate quantity of firefighting water to yard hydrants, hose stations, and fire sprinkler systems. The system will be capable of supplying maximum water demand for any fire protection requirements, as per applicable LORS.

The Project fire water system will consist of a water storage tank, a diesel fire water pump, yard hydrants, fire risers, and fire sprinkler systems within the buildings. The fire water pump, located at the Main Services Complex, will be sized in conjunction with a potable water storage tank. The potable and fire flow water will be stored in an aboveground steel tank with supply and fire flow pumps sized to handle the specific demands. The water in the fire flow and potable fire flow tank will be chlorinated and circulated to keep it fresh. The fire distribution system will need to be flushed periodically to keep water fresh and free from algae growth. Any leaking water from the fire water system could potentially attract ravens to the Project Site.

SECTION 3 ENVIRONMENTAL SETTING

The 8,230-acre Project Area and the proposed temporary access road are located within the Mojave Desert in an area approximately 37 miles east of Barstow, California. The Mojave Desert is the transitional area between the hotter Sonoran Desert and the cooler and higher elevation Great Basin Desert. This desert is within the rain shadow of the Transverse and Sierra Nevada mountain ranges, and is defined by a specific combination of latitude, elevation, geology, and indicator plant species.

Vegetation is dominated by Mojave creosote bush scrub through the rolling terrain with less common and site-specific conditions allowing for saltbush scrub in the southwestern portion of the Project Area. Developments in this area include the Burlington Northern Santa Fe (BNSF) railway, a maintained north-south dirt access road for the existing transmission line on the eastern border of the assessment area connecting to the existing Pisgah substation south of the site, and several east-west dirt roads that cross the site. The past land uses within the assessment area include a history of cattle grazing and limited mining, and some current disturbance from off-road vehicle (ORV) activities.

The AFC Assessment Area is not included within an area designated as Critical Habitat for a listed species; however, the southwest corner of the Project site is just north of U.S. Fish and Wildlife Service (USFWS) Designated Critical Habitat for desert tortoise that is located south of Interstate 40 (I-40). The BLM has designated the Pisgah Area of Critical Environmental Concern (ACEC) for known populations of white-margined beardtongue and Mojave fringed-toed lizard in the area east of the transmission line corridor. The BLM has proposed an area north of the assessment area for designation as wilderness. The AFC Assessment Project Area is included in the West Mojave Plan (BLM 2006, as amended).

SECTION 4 DESERT TORTOISE BIOLOGY

4.1 STATUS

The Mojave Desert population of the desert tortoise was listed as threatened under the Federal Endangered Species Act (USFWS 1990) by USFWS on April 2, 1990. The determination was made due to loss and degradation of habitat caused by numerous human activities including urbanization, agricultural development, military training, recreational use, mining, and livestock grazing and loss of individual desert tortoises to increased predation by common ravens, collection by humans for pets or consumption, collisions with vehicles on paved and unpaved roads, and mortality resulting from diseases. The tortoise was listed as threatened in California by the California Department of Fish and Game (CDFG) in 1989. Prior to state and federal listing, BLM initiated efforts to protect the tortoise in 1988 with a range-wide management plan (BLM 2001).

4.2 NATURAL HISTORY, DISTRIBUTION, ABUNDANCE, AND HABITAT

Desert tortoise is widely distributed in the deserts of California, southern Nevada, extreme southwestern Utah, western and southern Arizona, and throughout most of Sonora, Mexico. Desert tortoise populations are declining due to various factors including the spread of a fatal respiratory disease, increases in raven populations that prey on juvenile tortoises, and habitat loss and degradation due to various extensive and intensive land uses. Typical tortoise habitat consists of firm but not hard ground - usually soft sandy loams and loamy sands - to allow for burrow construction (Karl 1983). Desert tortoise mostly occur in four sub-populations in the California Mojave Desert (Ord-Rodman, Superior-Cronese, Fremont-Kramer, and Joshua Tree Desert Wildlife Management Areas [DWMAs]) and outside of these areas tortoise tend to occur in at much lower densities. This species is mostly found in creosote bush scrub, with lower densities occurring in Joshua tree woodland and saltbush scrub. The topography where this species is typically found includes flats, low valleys, bajadas, and low hills between 2,000 and 3,300 feet and occasionally above 4,100 feet.

The diet of desert tortoise consists mainly of annual plants and grasses, but also perennial plants such as cacti and native forbs when available, certain non-native plant species are also eaten (West Mojave Planning Team 1999). Desert tortoise are most active when plants are available for forage or when pooled water is available for drinking, usually March through early June and again between September and early November (Marlow 1979). They typically have home ranges from 27- averaging between 5-131 acres, which additionally can fluctuate in size on a year to year basis based on several factors such as sex, rainfall, availability of resources, and others factors (Berry 1986, Duda 1999, CDFG 2000). Individuals commonly traverse 1,476-2,624 feet/day within their home range, and males have been recorded to travel up to 0.62 miles within their home range. Mojave desert tortoise are also known to disperse more extended distances (1.9 miles in 16 days and 4.5 miles in 15 months; Berry 1986).

Desert tortoise sign and burrows were detected throughout the Project area, with 5 live desert tortoises and 1 active burrow detected within the Project area during the focused desert tortoise plot surveys. During other field efforts within the Project area, an additional 13 live desert tortoises were incidentally detected along with 8 active burrows. The total number of desert tortoise and active burrows found in the larger Stirling Energy Systems (SES) Assessment Area during desert tortoise focused surveys was 17 and

6, respectively, with 24 live desert tortoise and 14 active burrows incidentally detected during other field efforts. The total number of desert tortoise and active burrows found in the BLM ACEC during focused surveys was 11 and 9, respectively, and an additional 5 live tortoise and 1 active burrow found incidentally during other field efforts.

SECTION 5 MOJAVE FRINGE-TOED LIZARD BIOLOGY

5.1 STATUS

The Mojave fringe-toed lizard is currently listed as a CDFG Species of Special Concern (since 1998) and BLM Sensitive Species. The status of the Amargosa River population of the species is currently under review as USFWS has petitioned to list this population as threatened or endangered in the state of California under the Federal Endangered Species Act (USFWS 2008). The reasoning behind the current status determinations and recent call for status review of the Amargosa River population is attributed to the fact that the species inhabits fragile ecosystems comprised of fine, aeolian sand. These areas are becoming more commonly disturbed and impacted by anthropogenic activities such as habitat loss or damage from urban development, off-highway vehicles (OHV), and agriculture, and indirect disturbances including the disruption of the dune ecosystem source sand, wind transport, and sand transport corridors (USFWS 2008).

5.2 NATURAL HISTORY, DISTRIBUTION, ABUNDANCE, AND HABITAT

The Mojave fringe-toed lizard is endemic to southern California and a small area of western Arizona, where it is restricted to aeolian sand habitats in the deserts of Los Angeles, Riverside, and San Bernardino Counties in California, and La Paz County in Arizona (USFWS 2008, Hollingsworth and Beaman 1996). The species' distribution is not continuous over its range as the species is restricted to only areas containing fine, aeolian sands including both large and small dunes, margins of dry lakebeds and washes, and isolated pockets against hillsides. Mojave fringe-toed lizards also require shrub cover (mainly creosote bush scrub habitats) and other sources of shade in order to thermoregulate. The majority of known locations for the species occur along or adjacent to present-day and historical drainages and associated sand dune complexes of the Mojave and Amargosa Rivers. Along the Amargosa River, this species is found at Ibex Dunes, north of Saratoga Springs, and at Dumont Dunes on the west slope of the Kingston Mountains, San Bernardino County. Along the present-day Mojave River it is found at the following localities: Peck's and Wilson Butte, Los Angeles County; El Mirage Dry Lake, Harper's Dry Lake, Lenwood, Daggett, Yermo, Newberry Springs, Pisgah, Ludlow, the west slope of Alvord Mountain, Cronese Lake, Silver Lake, Crucero, Sands Siding, Devil's Playground, Coyote Lake, and Kelso Dunes, San Bernardino County (Hollingsworth and Beaman 1996).

The Mojave fringe-toed lizard is omnivorous for most of its life, feeding mainly on arthropods (insects and scorpions) as juveniles, and more so seeds, flowers, grasses, and leaves in addition to arthropods as the juveniles grow into adults. Food preferences vary throughout the year and most likely parallel seasonally induced changes to habitat structure (Hollingsworth and Beaman 1996, USFWS 2008). Home ranges for male Mojave fringe-toed lizards typically average around 0.25 acres. These ranges are aggressively protected by the males during the species' active months (March - October); even more so during the breeding season which typically runs between April and July.

Common predators of the Mojave fringe-toed lizard include badgers (*Taxidea taxus*), coyotes (*Canis latrans*), hawks (*Buteo* spp.), loggerhead shrikes (*Lanius ludovicianus*), roadrunners (*Geococcyx californianus*), burrowing owls (*Athene cunicularia*), leopard lizards (*Gambelia wislizenii*), and various

snakes (Hollingsworth and Beaman 1996). Ravens are also a potential predator for this species, although little is known about raven predation on Mojave fringe-toed lizards.

The Project area supports one patch of Mojave fringe-toed lizard occupied habitat between the railroad and I-40. Most of the Mojave fringe-toed lizard observations were found within the adjacent BLM ACEC, supporting up to five locations of occupied Mojave fringe-toed lizard habitat.

SECTION 6 RAVEN BIOLOGY

6.1 OVERVIEW OF RAVEN BIOLOGY

Bird species found in the Corvidae family include magpies, jays, crows, and ravens. These medium to large-sized passerine birds are typically bold, vocal, and resourceful. In general, these species are highly intelligent and are able to quickly adapt to human-dominated landscapes. Species such as crows and ravens have expanded their geographical distribution with the aid of irrigation, agriculture, landscaping, and organic trash accumulation that accompanies human encroachment. The population density of ravens and crows has also increased in areas dominated by development.

The common raven has expanded its distribution in arid regions of the Western United States largely due to introduced food and water resources accompanying increasing human development. Increased human disturbance in and around the Project site has likely increased the abundance of ravens in the area. Additional local development has the potential to further increase occurrence of ravens in the vicinity. Measures directed at discouraging ravens by minimizing the availability of human-subsidized resources is an important component of controlling the further spread and propagation of ravens in the Mojave Desert.

The common raven is a large, adaptive bird that occupies a wide range of habitats in North America. They are found in both forested and open natural communities, and have adapted to human disturbance, particularly agricultural and suburban development. Raven abundance and distribution is increasing and expanding in some areas largely due to human encroachment. Human occupation has the potential to introduce food, water, and structural resources. In the In the Mojave desert region, raven populations have grown beyond the natural carrying capacity of the desert habitat due to their association with humans (Boarman 1992).

Ravens are opportunistic omnivores and are successful scavengers consuming carrion, agricultural fruits and grains, as well as organic material from landfills. They have been known to travel long distance between their territories and roost sites to visit human created food resources. Ravens are also effective predators that prey upon a variety of wildlife including juvenile and hatchling desert tortoises. Raven foraging is typically concentrated in the morning and late afternoon, which is also when desert tortoise are typically most active.

Breeding raven pairs defend year-round territories with an average nesting territory size of up to approximately 2.0 square miles in California (Kristan and Boarman 2003). Territories and home ranges are highly variable, dependent on the abundance of local food resources. Juvenile or unpaired birds rely on a home range for foraging and often return to communal roosts located in trees, cliffs, or human structures near important food resources. The number of birds roosting at an individual site is dependent on the abundance of local food resources. Nest sites are often located on cliffs and trees and elevated structures such as utility poles/towers, billboards, and abandoned buildings (Leibezeit and George 2002).

The feeding behavior of breeding common ravens is different from that of non-breeding juveniles. Large numbers of non-breeding ravens are attracted to concentrated human-subsidized sources of food, water, and roost sites, but are spatially restricted in the California desert. Breeding ravens are more evenly distributed throughout the California desert area. Raven crowds frequently feed at concentrated food

sources such as landfills and illegal dumps in the California desert. Fledgling chicks will usually move to human-subsidized resources where other ravens congregate (Kristan and Boarman 2003).

6.2 RAVEN PREDATION OF DESERT TORTOISE, MOJAVE FRINGE-TOED LIZARD, EXISTING RAVEN ATTRACTANTS, AND THREATS

The raven is a resourceful scavenger and predator that has effectively expanded its range and/or presence in various locations in large part due to their close association with human encroachment. The expansion of this range has introduced a new or increased threat to the recovery of several at-risk species. Although much of the management emphasis in North America is given to raven nest predation of other bird species' eggs and nestlings, ravens are also known to prey on a variety of small to medium-sized mammals, amphibians, and reptiles. Studies have shown that ravens tend to be more common along heavily-traveled roads (Boarman *et al.*, 1997).

Desert dwelling juvenile or non-breeding ravens are typically concentrated at areas with dependable food resources; while breeding pairs are more evenly distributed throughout the desert (Kristan and Boarman 2003). As a result of the difference in distribution, non-breeding and breeding ravens have varying effects on desert tortoise predation. Non-breeding ravens likely have a more concentrated effect on desert tortoises nearby their reliable human-created food resources while breeding ravens have a more widespread effect. The predation risk to desert tortoises posed by nesting ravens can be widespread from year-to year due to changes in nesting locations (Kristan and Boarman 2003).

Evidence of raven predation of juvenile tortoise has been observed in the Mojave Desert by the remains of tortoise carcasses under raven nests, direct observations, and carcasses with damage distinctive to raven predation (Boarman 1992). Raven predation primarily occurs on smaller tortoises from hatchling to 8-year-olds due to their softer shells (USFWS 1994). Although juvenile tortoises are unlikely an important component of the raven's diet in the Mojave, no other birds species are known to prey on juvenile tortoises in as great a quantity (Boarman 2002).

Little is known about raven predation on Mojave fringe-toed lizards, though studies have shown that this species and other small reptile species are potential prey for the birds. Other potential predators of Mojave fringe-toed lizards include badgers, coyotes, hawks, loggerhead shrikes, roadrunners, burrowing owls, leopard lizards, and various snakes (Hollingsworth and Beaman 1996).

6.3 THREATS AND ATTRACTANTS IN THE PROJECT AREA

Ravens depend on human encroachment to expand into areas where they were previously absent or in low abundance. Ravens adapt to human activities and are sustained by the food and water, as well as roosting and nesting resources that are introduced or enhanced by human encroachment. Man-made structures, such as buildings, signs, lamps, and utility poles provide roosting and nesting opportunities that otherwise would be unavailable. Landscape irrigation, swimming pools, decorative fountains and ponds provide valuable water. The nearest established community occurs approximately 15 miles west of the Project site with several agricultural fields and a highway rest area within approximately ten miles of the site. A transmission line runs along the eastern edge of the Project area creating potential roosting areas for

ravens. Small mammal and reptile road kill along I-40, Hector Road, and other local roads provides potential food resources for opportunistic predators/scavengers such as ravens.

The common raven is rated anywhere from fairly common to uncommon as a breeding resident in the Mojave Desert, depending on the location. Ravens are frequently observed perching and occasionally nesting on utility poles, water tanks, grain silos, and similar man-made structures (Patten *et al.*, 2003). It has been estimated that raven populations have increased by more than 1,000 percent between 1968 and 1992 in the Mojave Desert largely due to the increase in development. A current estimate for ravens in the California desert is approximately 37,500 birds (USFWS 2007). It is expected that raven populations will continue to increase in the Mojave Desert as development continues.

Large-scale raven management plans have been drafted for the purposes of desert tortoise recovery, but not for Mojave fringe-toed lizard. The BLM drafted their own raven management plan in 1990 (BLM 1990), and raven management goals are also stated in the Northern and Eastern Mojave Desert Management Plan (NEMO, BLM 2006), and it has become standard for Project applicants to implement a raven management plan as a result of Endangered Species Act Section 7 or Section 10 consultations with USFWS.

SECTION 7 RAVEN MANAGEMENT

7.1 MANAGEMENT GOALS

The goal of this Raven Management Plan is to implement non-lethal measures to deter raven depredation of desert tortoise and Mojave fringe-toed lizard that may increase with the construction or operation of the Project.

7.2 RAVEN MANAGEMENT MEASURES

Raven management measures were designed to discourage ravens by limiting the availability of human-created food and water resources as well as roost and nest site opportunities. Lethal methods of raven control, such as shooting or poisoning, will be avoided to the greatest extent possible. The non-lethal measures outlined below are primarily based on guidance from the preferred Alternative B in the USFWS *Draft Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2007), and modified to apply to Mojave fringe-toed lizard conservation as well.

7.2.1 Reduce Access to Anthropogenic Food and Water Resources

It is unlikely that the Project Area would provide sufficient year-round food and water resources for ravens without the availability of human-created sources. Ravens are known to make long distance daily flights of at least 40 miles in search of food and water. Water is a vital and limited resource in the desert and breeding ravens have been observed leaving their territories every day to find water (Boarman 2003). Several agricultural fields occur approximately 10 miles west of the Solar One site. Solar One construction activities and the completed solar facilities could potentially attract the attention of ravens that are bound to investigate the site. To prevent the addition of food and water resources onsite, the following measures should be implemented:

Trash management. All trash associated with the Project during construction and operation will be contained in secure receptacles to prevent the introduction of food resources for ravens, coyotes, and other predators. Self-closing trash bins will be used during construction for organic waste. Plastic bags containing trash will not be left out for pickup. In addition, the environmental awareness program will inform construction and operation personnel to not intentionally feed ravens. Any animal roadkills on the Project site and along the will be promptly removed to discourage scavenger activity.

Facility fencing. The Project site will be surrounded by a security fence that will also be designed and maintained to exclude coyotes and foxes from entering the site. The facility gates will be closed at the end of each construction day. The entry gates will be automated to open and close for individual vehicles following construction and during facility operation.

Reduce availability of water. Unnatural water sources can attract ravens by providing water during the very dry times of the year and allowing ravens to range further out in the desert from natural water sources (Boarman 2002). Access to standing water on the Project site will be limited during construction and operation. Truck cleaning areas will be kept free of standing water during construction. Water used

for dust suppression during construction will be applied at a rate that discourages puddling. Operational requirements necessitate the washing of some portion of the Project's solar mirrors on a nightly basis while ravens are inactive. Using high pressure water will limit the amount needed. The water will run off the mirrors and should be absorbed in the soil by morning.

Water used for the site will require treatment through a Reverse Osmosis (RO) system. Wastewater or brine generated by the RO unit will be discharged to a concrete-lined evaporation pond, or equivalent. The evaporation ponds could be covered to minimize wildlife access. For instance, the covers will be designed to minimize attraction of predator and scavenger species. The evaporation ponds should be designed to discourage wildlife use by constructing perimeter fences and installing wire mesh screens above the ponds. Specific design should be implemented, regarding wire mesh size and fencing design, to ensure that implementation of these exclusion methods will be successful and that smaller wildlife will not be trapped by the pond covers.

Any water used for vegetation restoration or landscape irrigation will be delivered via a drip system that will be regularly checked to prevent leaks and puddling. Operations maintenance will prevent dripping faucets, and water misters used for comfort in hot weather will not be installed or used.

7.2.2 Discourage Nesting

The addition of buildings, billboards, signs, utility poles, landscape trees, and other structures in the Mojave Desert have introduced raven nesting opportunities that were otherwise very limited. Ravens have been observed nesting on various structures such as radar towers, power poles, telephone poles, and buildings in desert areas (Boarman 2002). Transmission line structures have been shown to increase raptor and raven nesting densities (Steenhof *et al.*, 1993). The majority of raven predation on desert tortoises can be expected to occur in the late spring (April and May) when tortoises are most active and ravens are feeding their young. Nesting ravens have been observed foraging within 0.25 miles of their nest site (Boarman 2003). Therefore, the establishment of a new nest can have significant adverse effects on the desert tortoise and Mojave fringe-toed lizard populations.

An existing transmission line occurs along the eastern boundary of the Solar One site. The NEMO Desert Tortoise Conservation Strategy states that poles and towers of electrical distribution lines must be designed to discourage raven nesting (BLM 2001). The NEMO also states that structures that may function as common raven nesting or perching sites are not authorized except as specifically stated in the appropriate BLM document. Applicants must provide a graphic description of all structures to be erected onsite. To prevent nesting on structures associated with the Solar One site, the following measures shall be implemented:

Utility structures. Tie-lines will be installed on utility poles designed to be incompatible with the establishment of raven nests. As suggested in Avian Power Line Interaction Committee (APLIC) guidelines, the Project owner will attach Polyvinyl Chloride (PVC) pipe or corrugated drain pipe to transmission line structures to discourage nesting (APLIC 2006). It is important to monitor the usefulness of the deterrence measures and implement different measures if the current effort is unsuccessful. The installation of triangles, plastic owls, and spikes has also been used to discourage nesting (APLIC 2006). Nest deterrent materials or measures will require occasional maintenance and replacement.

All new transmission lines associated with Solar One will be designed to reduce the likelihood of nesting by common ravens. The Project owner will remove any raven nests that are found on its structures in cooperation with BLM, CDFG, and USFWS (BLM 2001). Take of ravens or active nests require a permit from the USFWS' Division of Law Enforcement (BLM 2001). Even if an identified nest is free of eggs or young, BLM, CDFG, and USFWS will be contacted should those agencies be interested in attempting to trap, tag, and/or transmitter the raven pair.

When inspecting or removing nests, species identification is important to avoid disturbing the nest of a non-target species such as red-tailed hawk (*Buteo jamaicensis*). Removing unoccupied nests during or outside the breeding season may be beneficial because birds with no nest in their territory at the beginning of the breeding season were less likely to commence nesting than those ravens with an intact nest (Boarman 2002). Therefore, the Project owner will rely on a BLM approved biologist to conduct or direct any raven nest disturbance or removal during the breeding season. Because of protection provided to the raven by the Migratory Bird Treaty Act (MBTA), the USFWS rarely authorizes nest removal if birds are present in the nest, but does authorize removal after the nest becomes inactive (BLM 2001).

Building structures. The Project owner will contact BLM when raven nests are found in any of the structures associated with the Solar One site.

Structure Removal Following Decommission. Elevated structures including utility poles will be removed from the Solar One site when decommissioned and dormant.

Limiting Raptor Enhancement Measures. Utility pole and tower construction will not include raptor-friendly designs or retrofits outlined in the APLIC guidelines (APLIC 2006) intended to encourage or enhance the potential for raptor nests that could also be used by ravens.

Hazing. The long term effectiveness of hazing/harassment techniques such as noise making, displaying bright objects, pyrotechnics, and chemical agents are often limited when used to deter corvid species. To be effective, hazing must be continuous, focused on the target individual(s), and bothersome enough to drive the target animal away from the resource of attraction. The Applicant will focus on limiting raven attractants rather than hazing and hazing will only be implemented under the direction of BLM, CDFG, and USFWS in situations where it is considered the best course of action.

7.2.3 Discourage Roosting

The addition of power poles and towers and other elevated structures provides roosting opportunities that are otherwise limited in the Mojave Desert. The solar technology used at the Solar One site involves the concentration of sunlight on a PCU. The design of the solar collectors does not provide suitable roosting opportunities for ravens or other bird species. The installation of transmission lines and poles will be constructed according to the most recent "raptor-friendly" guidelines (APLIC 2006), ensuring that conductor wires are appropriately spaced to minimize the potential of raptor electrocution. Additionally, all overhead power lines will be equipped with raptor perch guards. The transmission line structures will not be designed to otherwise accommodate nesting or perching. As discussed above, this includes attaching PVC pipe or corrugated drain pipe to transmission line structures as well as the installation of triangles, plastic owls, and/or spikes to discourage nesting.

The security fence around the sites, along with faculty buildings and other facility structures, will provide likely locations for ravens to perch. If tortoises and Mojave fringe-toed lizards are allowed to remain onsite during operation, the interior structures will potentially provide optimal foraging roost opportunities for ravens. Tortoises and Mojave fringe-toed lizards outside the site and adjacent to the security fences could experience an increased predation risk if ravens regularly perch on the fence. Some studies have shown that there is little value in modifying structures to prevent perching because ravens primarily hunt on the wing and will frequently perch on shrubs or the ground (Boarman 2003). In addition, although anti-perching measures could be successful in keeping ravens from perching on particular features, ravens are too resourceful for broad-scale application to be successful. Despite this, it is important that the Project avoid the introduction of new perching opportunities for ravens. To discourage perching on structures associated with the Project, the Applicant will implement the following:

Roost Prevention as a Contingency. To avoid the introduction of new roost and nest locations for ravens (and other avian species), contingency measures will be implemented when a particular structure is providing daytime perches or evening roosting opportunities for ravens. In such a case, bird barrier spikes or the functional equivalent will be used to minimize the opportunity. Such a contingency measure will be implemented following specific discussion with the BLM, CDFG, and USFWS.

Hazing. As stated in the preceding nest deterrence section, hazing will only be implemented under the direction of BLM, CDFG, and USFWS in situations where it is considered the best course of action.

Structure Removal Following Decommission. Elevated structures including utility poles will be removed from the Solar One site when decommissioned.

7.2.4 Avoid Increased Predation Risk Associated with Desert Tortoise Translocation

Measures developed to minimize and avoid adverse effects to desert tortoise as a result of Project development may include the implementation of a desert tortoise translocation plan. This plan remains in development with the cooperation and guidance of BLM, CDFG, and USFWS. Any desert tortoise found during clearance surveys or construction monitoring will be relocated to suitable habitat that has been agreed upon by the BLM, CDFG, and USFWS. The optimal alternative is to move individuals the shortest distance possible beyond harm's way within the Project vicinity. The chosen site should avoid areas adjacent to human activity, roads, overhead utility structures, and human-created raven resources. Translocated desert tortoises will be monitored as outlined in the translocation plan.

Currently there is no translocation plan for Mojave fringe-toed lizard since the occupied habitat is planned to be retained onsite.

7.2.5 Removal of Problem Ravens

Corvids were not protected under the original 1918 MBTA because they were considered agricultural pests. However, a 1972 amendment to the MBTA provided legal protection of corvids, including active raven nests. If necessary, lethal removal would only be conducted by, or under the direction of the BLM, CDFG, and USFWS, and would be considered a short-term solution. It is important to note that removal does not address the issues that enable raven presence and vacated nesting territories are likely to be quickly occupied by another raven pair.

7.3 SUCCESS CRITERIA

The effectiveness of the Raven Management Plan will be monitored through the construction of all site construction phases. Reporting associated with the implementation of the plan will continue for two years following completion of the Project. The success of this Raven Management Plan will be based on how successful the Project design features and implementation of the Plan is in discouraging ravens from gaining food, water, nesting, or perching opportunities associated with the Project. Much of the plan's success lies in the effectiveness in discouraging human practices that would attract ravens to the area.

The Applicant proposes to discontinue the survey and reporting requirements after two years if it can be determined that the Project design, operation, and raven management plan have been successful. The site maintenance; waste and water management; identification of problem ravens, roost, and nest sites; and the reporting of desert tortoise predation aspects of the management plan will need to be continued for the life of the solar facility.

7.4 ADAPTIVE MANAGEMENT

Adaptive management will be required if existing raven management measures are not effective in controlling significant raven predation of the desert tortoise and Mojave fringe-toed lizard. Because ravens are highly adaptive, the need for adaptive management would be necessary. Given that ravens threaten the recovery of other at-risk species, deterrent and aversion methods continue to be developed and tested in a variety of situations. Resource agencies also continue to work on ways to better monitor and find desert tortoise and Mojave fringe-toed lizard, and learn more about the dynamics of raven territoriality, dispersal, daily movements, and use of human-created resources (Boarman 1997). A willingness to adopt new or experimental methods and measures is crucial for the effectiveness of any long-term raven management plan.

The Project owner will consult with the CDFG, BLM, and the USFWS prior to implementing adaptive management changes. The minimum two year monitoring period will be re-initiated following the implementation of any adaptive management changes.

SECTION 8 RAVEN MONITORING PLAN

8.1 RAVEN POPULATION MONITORING

The objective of raven monitoring is to determine raven abundance, distribution, nest site locations, and behavior exhibited in the Project area prior to, during, and for a minimum of two years following completion of Project facilities.

8.1.1 Methodology

Abundance and Behavior Surveys

Surveys for raven monitoring will begin following the construction of Phase I. The objective of the surveys will be to characterize raven presence in the Project vicinity and to monitor abundance and behavior in those areas over time. The purpose of the surveys will be to identify the local sources of human-created resources and raven activity relative to the Project. The investigation will consist of driving surveys that will target the within Project site, the translocation site (location yet to be determined), the nearby transmission line corridors, and the surrounding areas. The survey area will be revised if it becomes apparent that the route is not providing adequate observation of raven activity centers in the general Project area.

The roads will be driven slowly. Binoculars and spotting scopes will be used to observe raven activity within two kilometers of the site. All raven observations will be documented and will include date, time, location, habitat, number of individuals, and behavior. The locations of occupied and potential nests will also be recorded. Survey visits will occur twice monthly during the peak of breeding raven activity (March to June) and once a month for the remainder of the year (July to February). Each survey visit will consist of a two day effort. Each day the survey route will be driven once in the early morning (starting 30 minutes prior to sunrise), a second time in the midday (starting between noon and 2 p.m.), and a third time in the evening (completed within one hour following sunset).

Nest Surveys

The areas under occupied and potential nests will be surveyed during the March through June visits for sign of desert tortoise and Mojave fringe-toed lizard predation. The carcass survey will cover a 50-meter radius originating from the nest location. This area will be walked with 10-meter interval transects. The location of all desert tortoise and Mojave fringe-toed lizard carcasses or other sign of predation will be mapped and photographed. The sign will be collected or marked based on guidance from the resource agencies.

Incidental Observations

Biologists will be present on the Solar One site conducting clearance surveys, monitoring construction activity, monitoring environmental compliance, translocating desert tortoise, and monitoring translocated desert tortoise. Biologists will be instructed to document raven observations during those surveys. Incidental raven, desert tortoise, or Mojave fringe-toed lizard observations will be included in the yearly

monitoring reports and will be immediately reported to the appropriate resource agency of particular interest or concern.

8.2 SURVEY PARTICIPANTS

The desert tortoise, Mojave fringe-toed lizard, and raven surveys associated with the Project will be conducted by experienced desert biologists that will be subject to BLM, CDFG, and USFWS approval.

8.3 MONITORING REPORTS

Monitoring reports will be sent to the CDFG, BLM, and USFWS no later than December 31 of each raven management year. If after two years of reporting the agencies determine that the raven management program is effective, and ravens are not adversely affecting the local desert tortoise and Mojave fringe-toed lizard populations due to Solar One site operation, then the raven surveys and reporting schedule will be phased out. Raven management practices, such as employee education, trash containment, and reporting raven nests, will be implemented for the life of the solar facility.

The annual report will include:

- The number and behavior of observed ravens
- Raven nest and perch locations
- Results of the management techniques;
- The observed effectiveness of the techniques in minimizing raven presence; and
- Suggestions for improving raven management.

Observations of raven predation of desert tortoise and Mojave fringe-toed lizard (including sign) and occupied raven nests will be reported to the designated contacts at BLM, CDFG, and USFWS by an electronic mail message within two days of the observation.

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- Bill Magdych, Ph.D. – Project Manager
- Patrick Mock, Ph.D. – Biology Task Manager
- Cheryl Rustin – Biologist
- Dallas Pugh - Biologist

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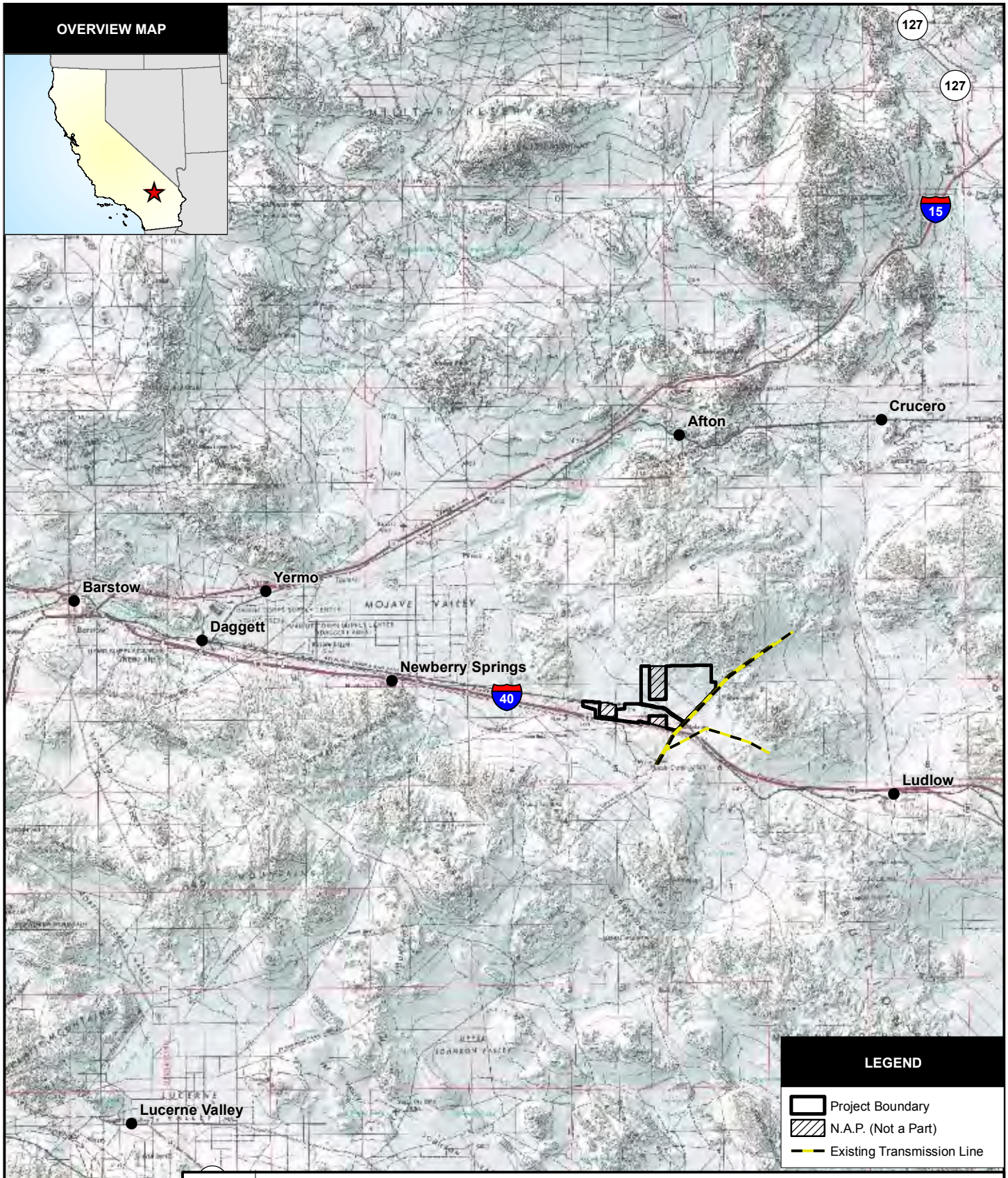

SOURCES:
Stantec Engineering (project site Oct. 2008);
ESRI (overview);
USGS (7.5' quads various dates).

GENERAL VICINITY MAP
SOLAR ONE PROJECT

URS

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SCALE: 1" = 8 Miles(1:506,880)
SCALE CORRECT WHEN PRINTED AT 8.5X11

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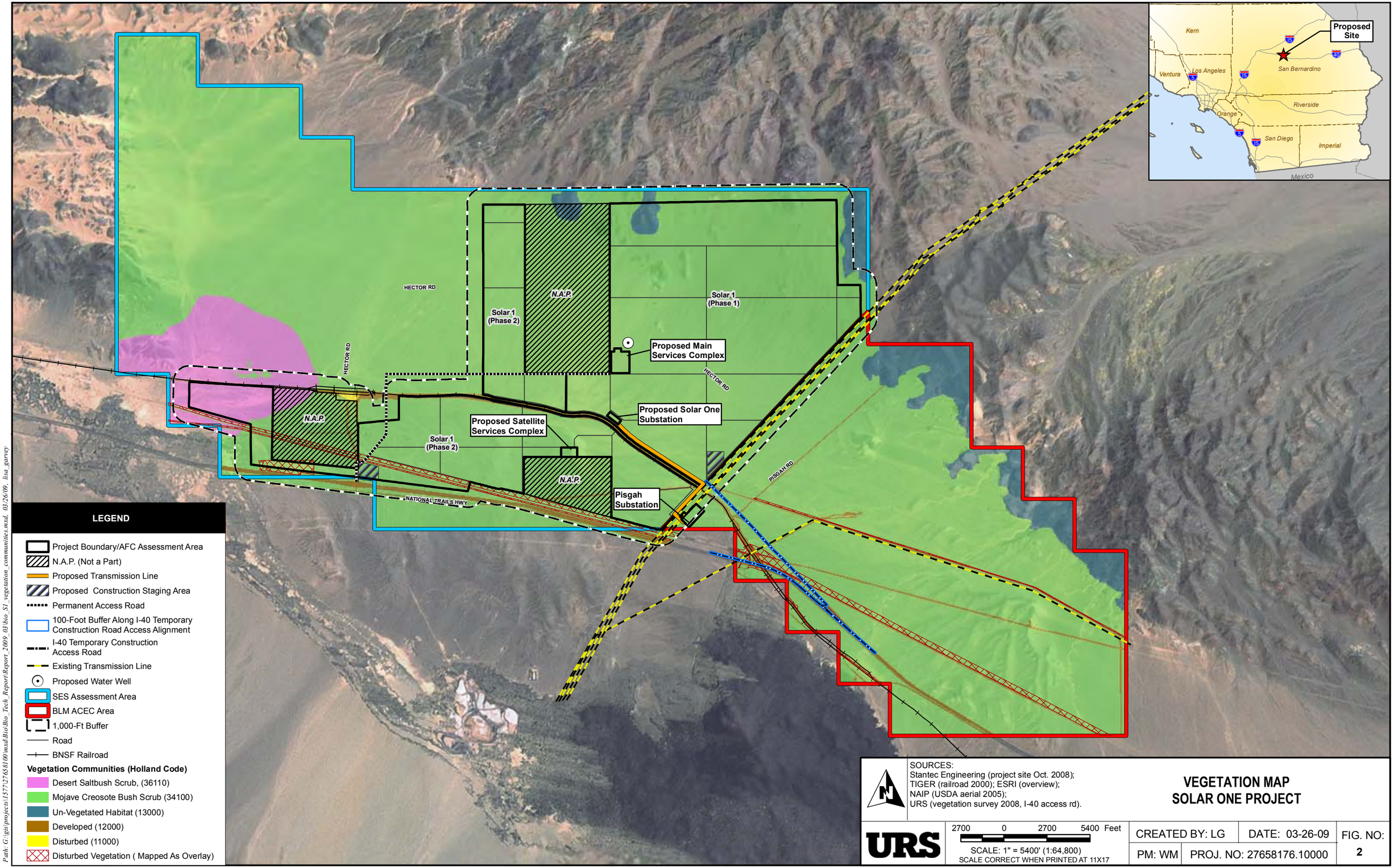

SOURCES:
Stantec Engineering (project site Oct. 2008);
TIGER (railroad 2000); ESRI (overview);
NAIP (USDA aerial 2005);
URS (vegetation survey 2008, I-40 access rd).

VEGETATION MAP
SOLAR ONE PROJECT

URS

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APPLICATION FOR CERTIFICATION
For the SES SOLAR ONE PROJECT

Docket No. 08-AFC-13

PROOF OF SERVICE
(Revised 7/14/09)

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DECLARATION OF SERVICE

I, Corinne Lytle declare that on July 17 , 2009, I served and filed copies of the attached Raven Monitoring and Control Plan , dated July 14 , 2009. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: [www.energy.ca.gov/sitingcases/solarone].

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

(*Check all that Apply*)

FOR SERVICE TO ALL OTHER PARTIES:

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

_____ by personal delivery or by depositing in the United States mail at _____ with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses NOT marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

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

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-13
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

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

Original Signed By

Corinne Lytle