United States Department of the Interior

FISH AND WILDLIFE SERVICE
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IN REPLY REFER TO:
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June 10, 2010

Memorandum

To: Field Manager, Barstow Field Office, Bureau of Land Management, Barstow, California

From: Field Supervisor, Ventura Fish and Wildlife Office, Ventura, California

Subject: Biological Opinion for the Lucerne Valley Chevron Solar Project, San Bernardino County, California (3031 (P) CA-680.33) (8-8-10-F-6)

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the Bureau of Land Management's (Bureau) proposed issuance of a right-of-way grant to Chevron Energy Solutions (CES) for the Lucerne Solar Electric Generating Plant and its effects on the federally threatened desert tortoise (*Gopherus agassizii*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). The proposed project involves phased construction, operation, maintenance, and decommissioning of a 45-megawatt photovoltaic power plant and associated infrastructure and facilities on approximately 516 acres of public land managed by the Bureau east of the community of Lucerne Valley. We received your request for formal consultation on December 10, 2009.

This biological opinion is based on information that accompanied your request for consultation, including the draft biological assessment (Bureau 2009), and the draft environmental impact statement (Bureau 2010). A complete record of this consultation is on file in the Ventura Fish and Wildlife Office.

The proposed action is not located within critical habitat of the desert tortoise; the nearest critical habitat unit is approximately 9 miles to the north. The proposed action will not affect critical habitat of the desert tortoise; consequently, we do not address effects to critical habitat in this biological opinion.

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BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Introduction

We summarized the following description of the proposed action from your request for consultation and the biological assessment (Bureau 2009). CES is proposing to construct and operate an approximate 516-acre solar energy plant, just south of State Route 247, approximately 8 miles east of the junction of Barstow Road and Old Woman Springs Road. The proposed project site is located south of Foothill Road and is bordered by Donaldson Road on the west and a drainage that runs approximately 1,300 feet east of Santa Fe Fire Road on the east in Sections 19, 20, 29, and 30 of Township 4N, Range 2E, and in Section 24 of Township 4N, Range 1E. The facility would be constructed in two phases: The first, approximately 180 acres on the east side of the project site, would begin late 2010 and produce 20 megawatts. The second phase, of approximately 240 acres and 25 megawatts, could begin as early as late 2011. CES would also install a switchyard, operation and maintenance building, parking area, and a drainage and storm water diversion system. A small portion of the Bureau-designated open route, Zircon Road, would be rerouted and a new distribution line would be constructed and interconnect across Foothill Road to an existing line north of the project. In addition, a fiber-optic line would be installed on the new distribution line. The facility would have an expected operating life of 30 years.

Construction

Construction of the CES facility would take approximately 16 months (8 months for each phase) and require an average workforce of approximately 25 (peak workforce of 45). All equipment would be confined to the roadways and within the fenced area. CES estimates that up to 59 construction vehicles, in addition to 20 personal vehicles, would drive in and out of the proposed action area daily during construction.

Eighty-five percent of the right-of-way would be composed of solar panels encompassing approximately 420 acres. At this time, the Bureau is recommending that this area be cleared of vegetation and covered with a soil binder or pea gravel. The areas proposed for the switch yard, operation and maintenance building, access road, power line and the parking/laydown area, encompassing 12.5 acres, would be graded and kept clear throughout the life of the project. Although a small amount of relatively undisturbed habitat would be left on site intermixed with the facilities, the entire 516-acre site will be fenced with desert tortoise exclusion fencing.

Construction stages for Phase I and Phase II would generally occur in a similar order. It would begin by surveying and staking/flagging the perimeter of the project boundary and access roads (5 days), construction of the desert tortoise exclusion and 8-foot high security fencing (5 days), access roads (5 days), site grading and vegetation removal (25 days), assembly and installation of all facilities (190 days), cleanup, and site reclamation of any temporary work areas (10 days).

Once fencing is installed, all further construction would occur inside the fenced boundary, except when installing the new fiber-optic line and the tie-in power line. Phase II would take less time because the same facilities and access roads will be used for its construction and operation activities.

Roads that transverse and border the proposed project (Foothill, Santa Fe Fire, and Zircon) are designated by the Bureau as open routes and would remain open after construction of the project. The portion of Zircon Road that runs through the eastern section (Phase II) of the proposed project area would be relocated, positioned directly between photovoltaic blocks running in an east/west direction.

The photovoltaic panel supports and frames would be installed after the installation of the underground conduit, overhead distribution lines, and inverter and transformer pads. The final proposed project would comprise an estimated 18,000 panels; each panel would measure approximately 40 inches by 55 inches and lay approximately 6 feet above ground level. Next, the operation and maintenance building/substation would be constructed. A 33-kilovolt distribution line that would carry power from this substation east across Santa Fe Fire Road then north across Foothill Road would interconnect with the existing Southern California Edison distribution line. A new fiber-optic line would also be installed from the substation, using the same route and poles as the distribution line; this line would continue north to State Highway 247.

During construction, water would be needed for dust control and soil compaction. Approximately 1.75 million gallons (5.4 acre-feet) would be needed for the construction of Phase I and Phase II would require approximately 1.25 million gallons (4.6 acre-feet). The water would be brought in by truck from an outside source, provided through contract with a local large industrial company or municipal water companies.

Operation and Maintenance

The project is intended to be in operation for 30 years. During operation, approximately two to three full-time employees would work on-site and a total of five personal vehicles are likely to drive in and out of the project area on a daily basis.

The various power components on the proposed site would be completely automated, turning on in the morning and off at night. The main anticipated operation and maintenance needs would include inverter inspection, vegetation control, routine switchgear inspection, inspection and repair of the perimeter and desert tortoise exclusion fencing, and repairs of various components in the solar field. Exposure to the elements and equipment failure would require unscheduled maintenance activities such as troubleshooting, repair, and replacement of inverters, switchyard equipment, and/or digital control systems, in addition to solar panel replacements.

CES estimates the solar panels would require washing once per year. The washing would occur during the summer and require between 10,000 to 20,000 gallons for Phase I and 12,000 to

25,000 gallons for Phase II. Water would be provided by truck from an outside source.

Decommissioning and Restoration

Should the proposed project site be removed from power generation service, the site will be made suitable for reclamation. All equipment, buildings, concrete foundation, and driven piles will be removed from the site. The site will be restored to its original condition as much as feasibly possible. To prevent excess erosion after decommissioning, CES will document the topographic and erosional condition of the site before and after decommissioning. CES will develop and implement a post-project erosion control plan and inspect the site quarterly for 5 years following decommissioning to determine the erosional status. A yearly report will be submitted to the Bureau documenting the status and the Bureau will determine if corrective actions are necessary to reduce the amount of erosion taking place. A detailed decommissioning plan, consistent with the Bureau's requirements, will be developed in a manner that both protects public health and safety and is environmentally acceptable. When the Bureau begins to consider decommissioning, it will contact the Service to determine whether additional consultation, pursuant to section 7(a)(2) of the Endangered Species Act, would be appropriate. Consequently, we will not analyze the potential effects of decommissioning on the desert tortoise at this time.

Avoidance and Minimization Measures

To minimize adverse effects to the desert tortoise, CES will implement the following protective measures during construction, operation, and maintenance activities. We have summarized these measures from the biological assessment (Bureau 2009) and modified them slightly as a result of discussions with the Bureau.

1. CES will smooth out ephemeral drainages and create swales that will allow the movement of water to cross the site and allow sheet drainage at the far north end of the site. Laydown areas will be located at least 100 feet away from drainages. No refueling, equipment repair, or lubrication activities will be allowed within 100 feet of the drainages. Proper spill containment materials to isolate potential spills will be used.

2. All leaks, spills, or releases of fuel or other hazardous materials will be reported immediately to the Bureau. All material that leaks, spills, or is otherwise released into habitat of the desert tortoise will be removed immediately. The authorized biologist will ensure all appropriate measures, including those proposed by CES and the biological opinion's terms and conditions, are implemented during the removal of the hazardous materials.

3. Ground clearing or grading will occur only within the fenced project right-of-way. Some vegetation within the right-of-way will be permanently removed. Healthy Joshua trees (*Yucca brevifolia*) and all cacti, except cholla species, will be salvaged in accordance with a protocol approved by the Bureau prior to the initiation of ground-disturbing events. No vegetation will be removed outside of the project right-of-way.

4. CES will employ authorized biologists, approved by the Service, California Department of Fish and Game (CDFG), and the Bureau, and desert tortoise monitors, approved by the Bureau and CDFG, to ensure compliance with protective measures for the desert tortoise. The most up-to-date Service guidance will be required for monitoring of any construction, operation, or maintenance activities that may result in injury or mortality of desert tortoises. The Service is currently using the *Desert Tortoise Field Manual* (Service 2009a).

5. CES will provide the credentials of all individuals seeking approval as authorized biologists and monitors to the Bureau. The Bureau will review the credentials and provide those of appropriate individuals to the Service and CDFG for approval at least 30 days prior to the time they must be in the field.

6. CES will designate a field contact representative (FCR) who will oversee compliance with protective measures during construction, operation, and maintenance activities that may result in injury or mortality of desert tortoises. If the FCR, authorized biologist, or desert tortoise monitor identifies a violation of the desert tortoise protective measures, they will halt work until the violation is corrected. The FCR will have a copy of the Bureau stipulations and the biological opinion at all times.

7. Desert tortoises will be handled only by the authorized biologist (or desert tortoise monitors given approval by the authorized biologist) and only when necessary.

8. The authorized biologist will conduct a desert tortoise education program, approved by the Bureau, for construction personnel, subcontractors, and all other visitors to the construction site that will address the following: a) types of construction activities that may affect the desert tortoise, b) the required desert tortoise protective measures, c) desert tortoise life history, distribution, general behavior, ecology, and threats, d) legal protections (under the State and Federal laws), including prohibitions and penalties, and e) reporting requirements.

9. Until the exclusion fence is complete, the authorized biologist will conduct preconstruction clearance surveys for desert tortoises within 48 hours prior to the start of any ground-disturbing activity. He/she will follow the guidance in the field manual (Service 2009a) when handling desert tortoises and their eggs during examination, excavating burrows, and constructing artificial burrows. Work area boundaries will be delimited with flagging or other marking to minimize surface disturbance associated with vehicle straying. Project personnel will use previously disturbed areas to the extent feasible. Special habitat features, such as burrows and drinking sites identified by the authorized biologist, will be avoided to the extent possible. Discovered burrows will be checked for desert tortoises and eggs. If desert tortoises or eggs are found, the burrows will be flagged so that equipment operators and drivers will clearly see the flagging and avoid the burrows. Unoccupied burrows will be flagged in a manner that contrasts with occupied burrows.

10. The assigned desert tortoise monitor will ensure desert tortoises are not injured or killed during construction of the fence. If a desert tortoise cannot be avoided during this work, it

will be moved to a safe location outside the project area. When possible, the fence will be placed so that occupied burrows are located outside of the project area.

11. Until construction of the exclusion fence is complete and for vehicles working outside of the fenced area at any time, vehicles or equipment will be inspected for desert tortoises underneath before moving them. If a desert tortoise is encountered, project personnel will contact an authorized biologist. The desert tortoise will be allowed to move a safe distance away on its own accord, prior to moving the vehicle. Alternatively, an authorized biologist or desert tortoise monitor may move the desert tortoise to a safe location to allow for movement of the vehicle.

12. If a desert tortoise requires relocation offsite, only the authorized biologist (or desert tortoise monitor given approval by the authorized biologist) will handle each desert tortoise when necessary. Guidance for relocating desert tortoises in the field manual (Service 2009a) will be followed.

13. After fence installation (within 30 days), the authorized biologist will conduct a 100 percent coverage protocol survey for desert tortoises within the project area. This survey will be conducted during the spring (April and May) or fall (late August through mid-October) at times conducive to desert tortoise activity. All desert tortoises found will be marked and removed from the enclosure outside the nearest fence onto land managed by the Bureau. (Desert tortoises will not be moved onto private land.) Clearance surveys are complete when no additional desert tortoises are detected during two consecutive surveys. The area will be considered cleared of desert tortoises unless a breach in the fence occurs. Guidelines provided by the Service (2009a) pertaining to clearance surveys and procedures for marking, handling, and relocating individuals will be used.

    CES will inspect the desert tortoise exclusion fence (permanent and temporary) during construction and operation of the project on a regular basis sufficient to maintain an effective barrier to movement. Inspections will be documented in writing and include any observations of entrapped animals, repairs needed, desert tortoises, their burrows, and carcasses; and recommendations for supplies and equipment needed to complete repairs and maintenance. Fences will be inspected quarterly and after each significant precipitation event, throughout the life of the project. GPS coordinates of the problem areas, such as those prone to washing out and vandalism will be recorded. All fence repairs will take place within 7 days of detection. If a breach in the fencing last more than 7 days, CES will contact the Bureau immediately; additional clearance surveys of the interior may be required at the discretion of the Bureau, based on the likelihood of desert tortoises entering the facility.

14. Project construction, operation, and maintenance activities will be confined to the project right-of-way and approved access roads. The only exception is to connect the proposed distribution line and fiber-optic line to the existing power lines along Foothill Road. If fence repairs require the use of mechanized equipment or vehicles, all vehicles will access the damaged fence area from within the right-of-way. Only foot traffic will occur outside the

right-of-way to repair fences, to minimize disturbance to desert tortoise habitat. An authorized biologist will accompany any fence repair crews to prevent impacts to desert tortoises. If unforeseen circumstances require disturbance beyond the project right-of-way, CES will notify the Bureau immediately. Except under emergency conditions, any disturbance outside the project right-of-way will not take place until CES receives written authorization from the Bureau.

15. A construction monitoring team, which will include an appropriate number of authorized biologists and desert tortoise monitors, will be present during connection of the distribution line between the solar field and Southern California Edison's existing line and the installation of the entire length of the fiber-optic line. The authorized biologist will ensure that desert tortoises are not injured or killed during this phase of the project by implementing appropriate protective measures, such as conducting a survey directly before activity begins, flagging any burrow or drinking site in the vicinity that potentially could be affected by the activity, and ensuring desert tortoises have not taken shelter underneath vehicles or equipment before moving them.

16. Areas used for stockpiles, vehicle turn-around, service of vehicles, and storage of equipment and material will be restricted to the project right-of-way within the desert tortoise exclusion fence. Leftover excavated material will not be left in place, but will be disposed of in designated areas and in a manner approved by the Bureau.

17. CES will prohibit project personnel from driving off road or performing ground-disturbing activities outside of designated areas during construction, operation, or maintenance, except to deal with emergencies.

18. To reduce the potential for vehicle strikes of desert tortoises on unfenced access roads (i.e., Santa Fe Fire Road and Foothill Road) during construction, CES will temporarily fence them with exclusion fencing prior to the onset of construction. During construction, operation, and maintenance of the proposed project, vehicle speeds will not exceed 20 miles per hour within the right-of-way or on unpaved roads.

19. Firearms and domestic dogs will be prohibited from work areas and the proposed project site.

20. Trash and food items will be disposed of promptly in predator-proof containers with re-sealable lids. Trash containers will be inspected at the end of each work day and will regularly be removed from the project site to reduce the attractiveness of the area to common ravens (*Corvus corax*) and other desert tortoise predators.

21. Encounters with desert tortoises will be immediately reported to the authorized biologist. The authorized biologist will maintain records of all desert tortoises encountered during construction, operation and maintenance activities. Information recorded will include: the location (narrative, vegetation type, and maps); date of observation; location of damaged area of fence, if any; general condition of health and apparent injuries and state of healing; if

moved, location moved from and to and whether the desert tortoise voided its bladder; digital photographs of each handled desert tortoise; and diagnostic markings (i.e., identification numbers, marked lateral scutes).

22. Upon locating injured or dead desert tortoises, CES will notify the Bureau and Service immediately. Written notification will be made within 72 hours of the date and time of finding or incident, and will include location, a photograph, cause of death or injury (if known), and other pertinent information. Carcasses will be left in place (or just outside of the constructed fence or project footprint). Desert tortoises injured through CES activities will be transported to a veterinarian for treatment at the expense of CES and, if the animal recovers, the Service will be contacted to determine its final disposition.

23. During construction, monthly electronic mail reports will be provided to the Bureau. No later than 90 days after completion of construction, the FCR and authorized biologist will prepare a written report for the Bureau and the Service. If the proposed project will take place over the course of 2 or more years, these written reports will be submitted annually, due December 31 of each year of construction. The report will document the effectiveness and practicality of the protective measures, the number of desert tortoises excavated from burrows, moved from the site, and injured or killed, and the specific information for each animal. The report will make recommendations for modifying the stipulations to enhance desert tortoise protection or to make it more workable for the operator. The report will provide an estimate of the actual acreage disturbed by various aspects of the operation and will note any deviations from the approved disturbance footprint, if any.

24. In an emergency, a desert tortoise monitor will evaluate the site and, if required, monitor the activities. If desert tortoises must be handled, an authorized biologist or desert tortoise monitor given approval by the authorized biologist will conduct these activities. If an authorized biologist cannot reach the site in time to conduct the emergency activity, CES personnel may handle the desert tortoise only after specific approval from the Bureau and the Service or CDFG.

25. This measure has been modified from that originally proposed as a result of discussions among the Bureau, Service, and CDFG. To minimize the proposed project's impacts on desert tortoises from increased predation by common ravens, CES will develop a site-specific management plan with the goal of ensuring that the project does not attract common ravens or provide subsidies during all phases of development and use, including construction, operation and maintenance, and decommissioning. This plan will be approved by the Service, Bureau, and CDFG. The management plan will: identify conditions associated with the project that might provide subsidies or attractants to common ravens; describe management practices to avoid or minimize conditions that might increase the numbers and predatory activities of common ravens; describe control practices for common ravens; address monitoring and nest removal during construction and for the life of the project; and discuss reporting requirements. To mitigate for this proposed project's portion of the cumulative and indirect effect of increasing the population of common ravens in the desert

region, a fee will be collected to contribute to an account established with the National Fish and Wildlife Foundation (NFWF) to implement a regional management plan for common ravens that will implement recommendations in the environmental assessment for the reduction of predation by the common raven on the desert tortoise in the California desert (Service 2008c). The account was established by the Bureau, CDFG, Service, Californian Energy Commission, and NFWF to manage the funds that will be used to implement the regional management plan. The environmental assessment identifies several activities to reduce predation by common ravens on desert tortoises, including reduction of human-provided subsidies (e.g., food, water, sheltering and nesting sites), education and outreach, the removal of common ravens and their nests, and evaluation of effectiveness and adaptive management. The fee for cumulative and indirect effects is part of the CDFG requirements for its consistency determination. CES will contribute a one-time fee of $105 per acre of disturbance to 516 acres of desert tortoise habitat affected by this project. This total fee of $54,180 will fund the project's portion of the regional management plan for the 30 year right-of-way grant by the Bureau. The management plan will be complete and payment made prior to any ground-disturbing activities being authorized.

Restoration and Weed Control Plan

CES has submitted a draft plan to the Bureau that provides monitoring, preventative, and management strategies for weed control during construction activities and a long-term strategy for weed control and management during the operation of the project. This plan must be approved by both the Bureau and Service prior to the initiation of any ground-disturbing activity.

1. CES will coordinate with the weed specialist at the Bureau's Barstow Field Office. Only herbicides approved by the Bureau for use on public land will be used (i.e., glyphosate). In areas where solar photovoltaic panels will be placed, the ground will be cleared of vegetation and covered with a soil binder or pea gravel. Herbicide treatment will be conducted in accordance with the weed management plan. This plan stipulates, among other provisions, that only a state and federally certified contractor, approved by the Bureau, will apply herbicides. Additionally, application will be suspended when limiting conditions exist (i.e., excessive wind velocity, snow or ice covers the foliage of weeds, precipitation is occurring or is imminent, and/or air temperatures exceed 90°F).

2. Areas outside the solar panel fields can be spot treated by applying a post-emergent herbicide prior to seed dissemination to manage the seedbank.

3. All herbicide application will end by mid-May and not resume until the following December.

Compensation

The compensation that the Bureau described in the biological assessment has changed as a result of discussions among the agencies since the beginning of consultation. Consequently, the

following description represents the current requirements by the Bureau and CDFG (Fesnock 2010).

Both the Bureau and CDFG will require CES to compensate for the loss of habitat. According to the provisions of the amended California Desert Conservation Area Plan (Bureau et al. 2005), the Bureau would require compensation at the rate of one to one. To meet its "fully mitigated" standard under the California Endangered Species Act, the CDFG will require a compensation ratio of two to one. Because the CDFG has agreed to accept the Bureau's one to one ratio as part of its two to one requirement, the total compensation ratio will be two to one.

For the Bureau's portion of the compensation, CES will deposit funds based on the price to acquire land into an account managed by the National Fish and Wildlife Foundation (NFWF); these funds will be used for enhancement of desert tortoise habitat within the Ord-Rodman Desert Wildlife Management Area. Habitat enhancement actions for this project will include some or all of the following: construction of a fence along State Route 247 from Barstow to Lucerne Valley to prevent desert tortoises from entering the roadway, with the primary focus area being Barstow to Stoddard Ridge; signing open routes within Ord-Rodman Desert Wildlife Management Area and visually obscuring routes that have been administratively closed but continue to be used by vehicles; and installation of barrier fencing in the Stoddard Valley area to prevent unauthorized use of the desert wildlife management area. These funds may also be used to support for a headstarting program for desert tortoises that would be developed in coordination with the Service's Desert Tortoise Recovery Office.

The portion of the compensation required by the CDFG will be used to acquire 516 acres of desert tortoise habitat in the Ord-Rodman, Superior-Cronese, or Fremont-Kramer desert wildlife management area. This acquisition can be done by CES and donated to the Bureau or CES can deposit sufficient funds for this acquisition into the NFWF account for the NFWF to then contract the purchase of these lands. The CDFG will also require a long-term management fee for the acquired lands and a long-term maintenance fee for the habitat enhancement projects that would be implemented on lands managed by the Bureau. The amount of these fees will be determined using a property analysis record-type evaluation (Center for Natural Lands Management 2010).

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 Code of Federal Regulations 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the range-wide condition of the desert tortoise, the factors responsible

for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the desert tortoise in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the desert tortoise; (3) the Effects of the Action, which determine the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the desert tortoise; and (4) the Cumulative Effects, which evaluate the effects of future, non-Federal activities in the action area on the desert tortoise.

In accordance with policy and regulation, we determine whether the proposed action may result in jeopardy to the species by evaluating the effects of the proposed federal action in the context of the current status of the desert tortoise, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both its survival and recovery in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the desert tortoise and the role of the action area in its survival and recovery as the context for evaluation of the significance of the effects of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

STATUS OF THE SPECIES

Basic Ecology of the Desert Tortoise

The desert tortoise is a large, herbivorous reptile found in portions of the California, Arizona, Nevada, and Utah deserts. It also occurs in Sonora and Sinaloa, Mexico. In California, the desert tortoise occurs primarily within the Creosote, Shadscale, and Joshua Tree Series of Mojave Desert Scrub, and the Lower Colorado River Valley subdivision of Sonoran Desert Scrub. Optimal habitat has been characterized as creosote bush scrub in areas where precipitation ranges from 2 to 8 inches, diversity of perennial plants is relatively high, and production of ephemerals is high (Luckenbach 1982, Turner and Brown 1982, Schamberger and Turner 1986). Soils must be friable enough for digging of burrows, but firm enough so that burrows do not collapse. In California, desert tortoises are typically associated with gravelly flats or sandy soils with some clay, but are occasionally occur in windblown sand or in rocky terrain (Luckenbach 1982). Desert tortoises occur in the California desert from below sea level to an elevation of 7,300 feet, but the most favorable habitat occurs at elevations of approximately 1,000 to 3,000 feet (Luckenbach 1982, Schamberger and Turner 1986). Recent range-wide monitoring efforts have consistently documented desert tortoises above 3,000 feet (Service 2006a).

Desert tortoises may spend more time in washes than in flat areas outside of washes; Jennings (1997) notes that, between March 1 and April 30, desert tortoises "spent a disproportionately longer time within hill and washlet strata" and, from May 1 through May 31, hills, washlets, and washes "continued to be important." Jennings' paper does not differentiate between the time

desert tortoises spent in hilly areas versus washes and washlets; however, he notes that, although washes and washlets comprised only 10.3 percent of the study area, more than 25 percent of the plant species on which desert tortoises fed were located in these areas. Luckenbach (1982) states that the "banks and berms of washes are preferred places for burrows;" he also recounts an incident in which 15 desert tortoises along 0.12 mile of wash were killed by a flash flood. Desert tortoises are most active in California during the spring and early summer when annual plants are most common. Additional activity occurs during warmer fall months and occasionally after summer rain storms. Desert tortoises spend most of their time during the remainder of the year in burrows, escaping the extreme conditions of the desert; however, recent work has demonstrated that they can be active at any time of the year. Further information on the range, biology, and ecology of the desert tortoise can be found in Burge (1978), Burge and Bradley (1976), Hovik and Hardenbrook (1989), Luckenbach (1982), Weinstein et al. (1987), and Service (1994).

Food resources for desert tortoises are dependent on the availability and nutritional quality of annual and perennial vegetation, which is greatly influenced by climatic factors, such as the timing and amount of rainfall, temperatures, and wind (Beatley 1969, 1974, Congdon 1989, Karasov 1989, Polis 1991; all in Avery 1998). In the Mojave Desert, these climatic factors are typically highly variable; this variability can limit the desert tortoise's food resources.

Desert tortoises will eat many species of plants. However, at any time, most of their diet consists of a few species (Nagy and Medica 1986 and Jennings 1993 in Avery 1998). Additionally, their preferences can change during the course of a season (Avery 1998) and over several seasons (Esque 1994 in Avery 1998). Possible reasons for desert tortoises to alter their preferences may include changes in nutrient concentrations in plant species, the availability of plants, and the nutrient requirements of individual animals (Avery 1998). In Avery's (1998) study in the Ivanpah Valley, desert tortoises consumed primarily green annual plants in spring; they ate cacti and herbaceous perennials once the winter annuals began to disappear. Medica et al. (1982 in Avery 1998) found that desert tortoises ate increased amounts of green perennial grass when winter annuals were sparse or unavailable; Avery (1998) found that desert tortoises rarely ate perennial grasses.

Desert tortoises can produce from one to three clutches of eggs per year. On rare occasions, clutches can contain up to 15 eggs; most clutches contain 3 to 7 eggs. Desert tortoises generally lay eggs from mid-May to early July, but occasionally as late as October (Ernst et al. 1994). The eggs typically hatch from late August through early October. At the time of hatching, the desert tortoise has a substantial yolk sac; the yolk can sustain them through the fall and winter months until forage is available in the late winter or early spring. However, neonates will eat if food is available to them at the time of hatching; when food is available, they can reduce their reliance on the yolk sac to conserve this source of nutrition. Neonate desert tortoises use abandoned rodent burrows for daily and winter shelter; these burrows are often shallowly excavated and run parallel to the surface of the ground.

Neonate desert tortoises emerge from their winter burrows as early as late January to take advantage of freshly germinating annual plants; if appropriate temperatures and rainfall are present, at least some plants will continue to germinate later in the spring. Freshly germinating plants and plant species that remain small throughout their phenological development are important to neonate desert tortoises because their size prohibits access to taller plants. As plants grow taller during the spring, some species become inaccessible to small desert tortoises.

Neonate and juvenile desert tortoises require approximately 12 to 16 percent protein content in their diet for proper growth. Desert tortoises, both juveniles and adults, seem to selectively forage for particular species of plants with favorable ratios of water, nitrogen (protein), and potassium. The potassium excretion potential model (Oftedal 2001) predicts that, at favorable ratios, the water and nitrogen allow desert tortoises to excrete high concentrations of potentially toxic potassium, which is abundant in many desert plants. Oftedal (2001) also reports that variation in rainfall and temperatures cause the potassium excretion potential index to change annually and during the course of a plant's growing season. Therefore, the changing nutritive quality of plants, combined with their increase in size, further limits the forage available to small desert tortoises to sustain their survival and growth.

Bjurlin and Bissonette (2004) determined that 74 percent of desert tortoise nests survived and, over 2 years, 84 and 91 percent of the neonates survived the initial period of post-hatching dispersal. They predicted that 40 percent of eggs produce hatchlings that survive to hibernation at their study site. We do not have sufficient information on the demography of the desert tortoise to determine whether this rate is sufficient to maintain viable populations; however, it does indicate that maintaining favorable habitat conditions for small desert tortoises is crucial for the continued viability of the species.

In summary, the ecological requirements and behavior of neonate and juvenile desert tortoises are substantially different from those of subadults and adults. Smaller desert tortoises use abandoned rodent burrows, which are typically more fragile than the larger ones constructed by adults. They are active earlier in the season. Finally, small desert tortoises rely on smaller annual plants with greater protein content; the smaller plant size allows them to gain access to food and the higher protein content promotes growth.

Status of the Desert Tortoise

On August 4, 1989, the Service published an emergency rule listing the Mojave population of the desert tortoise as endangered (54 *Federal Register* 32326). In its final rule, dated April 2, 1990, the Service determined the Mojave population of the desert tortoise to be threatened (55 *Federal Register* 12178). The Mojave population of the desert tortoise includes those animals living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, southwestern Utah, and in the Colorado Desert in California (55 *Federal Register* 12178). All of the following discussions refer to the Mojave population.

The Service listed the desert tortoise in response to loss and degradation of habitat caused by

numerous human activities including urbanization, agricultural development, military training, recreational use, mining, and livestock grazing. The 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 also contributed to the Service's listing of this species.

Recovery Plan for the Desert Tortoise

The recovery plan for the desert tortoise (Service 1994) is the basis and key strategy for recovery and delisting of the desert tortoise. The recovery plan divides the range of the desert tortoise into 6 distinct population segments or recovery units and recommends the establishment of 14 desert wildlife management areas throughout the recovery units. Within each desert wildlife management area, the recovery plan recommends implementation of reserve level protection of desert tortoise populations and habitat, while maintaining and protecting other sensitive species and ecosystem functions. The recovery plan also recommends that desert wildlife management areas be designed to follow the accepted concepts of reserve design and be managed to restrict human activities that negatively affect desert tortoises. The delisting criteria established by the recovery plan are:

1. The population within a recovery unit must exhibit a statistically significant upward trend or remain stationary for at least 25 years;

2. Enough habitat must be protected within a recovery unit or the habitat and desert tortoises must be managed intensively enough to ensure long-term viability;

3. Populations of desert tortoises within each recovery unit must be managed so discrete population growth rates (lambdas) are maintained at or above 1.0;

4. Regulatory mechanisms or land management commitments that provide for long-term protection of desert tortoises and their habitat must be implemented; and

5. The population of the recovery unit is unlikely to need protection under the Endangered Species Act in the foreseeable future.

The recovery plan based its descriptions of the six recovery units on differences in genetics, morphology, behavior, ecology, and habitat use over the range of the Mojave population of the desert tortoise. The recovery plan contains generalized descriptions of the variations in habitat parameters of the recovery units and the behavior and ecology of the desert tortoises that reside in these areas (pages 20 to 22 in Service 1994). The recovery plan (pages 24 to 26 from Service 1994) describes the characteristics of desert tortoises and variances in their habitat, foods, burrow sites, and phenotypes across the range of the listed taxon. Consequently, to capture the full range of phenotypes, use of habitat, and range of behavior of the desert tortoise as a species, conservation of the species across its entire range is essential.

In 2003, the Service established the Desert Tortoise Recovery Plan Assessment Committee, which was composed of scientists familiar with the desert tortoise and other disciplines relevant to the conservation of this species, to assess whether the 1994 recovery plan needed to be revised; the group concluded that the recovery plan was "fundamentally strong but could benefit substantially from modification" by recognition of new patterns of diversity within the Mojave population of the desert tortoise, explicit implementation of the prescriptions in the original recovery plan, greater appreciation of the implications of multiple, simultaneous threats facing desert tortoise populations, and applying recent advances in analytical techniques to desert tortoise recovery (Tracey et al. 2004). As a result of these recommendations, the Service has released a draft revised recovery plan for public review (Service 2008b). The draft revised recovery plan includes discussions of reducing the number of recovery units to five based on information that has been generated since the release of the original document and of the other recommendations contained in the assessment.

Relationship of Recovery Units, Evolutionary Distinct Populations, Desert Wildlife Management Areas, Critical Habitat Units, and Areas of Critical Environmental Concern

The recovery plan for the desert tortoise defines a "recovery unit" as "a geographic area harboring an evolutionarily distinct population of the desert tortoise" (Service 1994). Over the years, workers have commonly used the term "recovery unit" in reference to these geographic areas defined in the recovery plan; the term "evolutionarily distinct population" has not been in common use.

The recovery plan (Service 1994) recognized six recovery units or evolutionarily significant units across the range of the listed taxon, based on differences in genetics, morphology, behavior, ecology, and habitat use of the desert tortoises found in these areas. The boundaries between these areas are vaguely defined. In some cases, such as where the Western Mojave Recovery Unit borders the Eastern Mojave Recovery Unit, a long, low-lying, arid valley provides a fairly substantial separation of recovery units. In other areas, such as where the Eastern Mojave Recovery Unit borders the Northern Colorado Recovery Unit, little natural separation exists. Because of the vague boundaries, the acreage of the recovery units has not been quantified.

The recovery plan recommended that land management agencies establish one or more desert wildlife management areas within each recovery unit. The recovery plan recommended that these areas receive reserve-level management to remove or mitigate the effects of the human activities responsible for declines in the number of desert tortoises. As was the case for the recovery units, the recovery plan did not determine precise boundaries for the desert wildlife management areas; the recovery team intended for land management agencies to establish these boundaries, based on the site-specific needs of the desert tortoise. At this time, desert wildlife management areas have been established throughout the range of the desert tortoise.

Based on the recommendations contained in the draft recovery plan for the desert tortoise, the Service designated critical habitat throughout the range of the desert tortoise (59 *Federal Register* 5820). The 14 critical habitat units have defined boundaries and cover specific areas

throughout the 6 recovery units. (The proposed action will not affect critical habitat; it is located approximately 9 miles south of the nearest unit of critical habitat of the desert tortoise.)

The Bureau used the boundaries of the critical habitat units and other considerations, such as conflicts in management objectives and more current information, to propose and designate desert wildlife management areas through its land use planning processes. In California, the Bureau also classified these desert wildlife management areas as areas of critical environmental concern, which allows the Bureau to establish management goals for specific resources in defined areas. Through the land use planning process, the Bureau established firm boundaries for the desert wildlife management areas.

Finally, we note that the Department of Defense installations and National Park Service units in the California desert did not establish desert wildlife management areas on their lands. Where the military mission is compatible with management of desert tortoises and their habitat, the Department of Defense has worked with the Service to conserve desert tortoises and their habitat. Examples of such overlap include the bombing ranges on the Navy's Mojave B and the Chocolate Mountains Aerial Gunnery Ranges; although the target areas are heavily disturbed, most of the surrounding land remains undisturbed. Additionally, the Army has established several areas along the boundaries of Fort Irwin where training with vehicles is prohibited; desert tortoises persist in these areas, which are contiguous with lands off-base. The National Park Service did not establish desert wildlife management areas within the Mojave National Preserve, because the entire preserve is managed at a level that is generally consistent with the spirit and intent of the recovery plan for the desert tortoise.

Methods of Estimating the Number of Desert Tortoises

Before entering into a discussion of the status and trends of the desert tortoise in the Western Mojave Recovery Unit where the proposed action is located, a brief discussion of the methods of estimating the numbers of desert tortoises would be useful. Three primary methods have been widely used: permanent study plots, triangular transects, and line distance sampling.

Generally, permanent study plots are defined areas that are visited at roughly 4-year intervals to determine the numbers of desert tortoises present. Desert tortoises found on these plots during the spring surveys were registered; that is, they were marked so they could be identified individually during subsequent surveys. Between 1971 and 1980, 27 plots were established in California to study the desert tortoise; 15 of these plots were used by the Bureau to monitor desert tortoises on a long-term basis (Berry 1999). Range-wide, 49 plots have been used at one time or another to attempt to monitor desert tortoises (Tracy et al. 2004).

Triangular transects are used to detect sign (i.e., scat, burrows, footprints, etc.) of desert tortoises. The number of sign is then correlated with standard reference sites, such as permanent study plots, to allow workers to estimate the relative abundance of desert tortoises.

The third methodology, line distance sampling, involves walking transects while trying to detect live desert tortoises. Based on the distance of the desert tortoise from the centerline of the transect, the length of the transect, and a calculation of what percentage of the animals in the area were likely to have been above ground and visible to surveyors during the time the transect was walked, an estimation of the density can be made. This density only represents an estimation of the number of desert tortoises that are greater than 180 millimeters (approximately 7 inches) in size, because desert tortoises that are smaller than this size are difficult to detect. Desert tortoises that are larger than this size are typically classified as subadult or adult desert tortoises.

Each of these methods has various strengths and weaknesses. In general, permanent study plots have been used to estimate the status of desert tortoises across large areas over time. Triangular transects were used to assess the density of desert tortoises on specific sites at a point in time; this method was commonly used to determine how many desert tortoises may be affected by a specific proposed action. In 2001, the Service initiated line distance sampling to estimate the density of desert tortoises in desert wildlife management areas and critical habitat throughout the range.

Tracy et al. (2004) acknowledged, in its assessment of the recovery plan, that determining the number of desert tortoises over large areas is extremely difficult. Desert tortoises spend much of their lives underground or concealed under shrubs, are not very active in years of low rainfall, and are distributed over a wide area in several different types of habitat. Other factors, such as the inability to sample on private lands and rugged terrain, further complicate sampling efforts. Consequently, the topic of determining the best way to estimate the abundance of desert tortoises has generated many discussions over the years. As a result of this difficulty, estimations of the density of desert tortoises in each recovery unit or desert wildlife management area often reflect inconsistencies in the way in which data were gathered.

Given the difficulty in determining the density of desert tortoises over large areas, the differences in density estimates in the recovery plan and those derived from subsequent sampling efforts may not accurately reflect on-the-ground conditions. However, the absence of live desert tortoises and the presence of carcasses over large areas of some desert wildlife management areas provide an indication that desert tortoise populations seem to be in a downward trend in some regions.

Status and Trends of Desert Tortoise Population in the Western Mojave Recovery Unit

The following paragraphs provide general information on the status and trends of the desert tortoise population in the Western Mojave Recovery Unit, where the proposed action is located. Our determination regarding whether a proposed action is likely to jeopardize the continued existence of a species is conducted at the level of the listed taxon. When the range of the listed taxon is divided into recovery units, as with the desert tortoise, our level of analysis begins with the affected recovery unit; if the effects of the proposed action have the potential to compromise the ability of the species to survive and recover within the recovery unit, the next level of analysis considers how the compromised recovery unit would affect the listed taxon throughout

its range (Service 2005). Our analysis is conducted in a comprehensive manner through an iterative process. The Western Mojave Mojave Recovery Unit comprises one of six recovery units for the desert tortoise; consequently, our level of analysis in this biological opinion will begin at this level.

In the Western Mojave Recovery Unit, desert tortoises generally occur from Olancha and the northern Panamint Valley in the north to Joshua Tree National Park in the south and from the lower foothills of the southern Sierra Nevada and Tehachapi Mountains in the west east to Death Valley and the eastern side of Joshua Tree National Park. Although desert tortoises were historically widespread in the western Mojave Desert, their distribution within this region was not uniform. For example, desert tortoises likely occurred at low densities in the juniper woodlands of the western Antelope Valley and in the sandier habitats in the Mojave River valley. They were also likely largely absent from the higher elevations of the area's mountains and from playas and the areas immediately surrounding these dry lakes.

In the following paragraphs, we present information regarding the status of the desert tortoise in areas of the Western Mojave Recovery Unit that are outside of critical habitat and desert wildlife management areas. Most of these areas are at the range limits of the species or are near areas that have undergone extensive habitat disturbance as a result of human activities. Much of this area is privately owned.

We do not have extensive data on the density or status of desert tortoises in the areas of the Western Mojave Recovery Unit that lie outside of critical habitat and desert wildlife management areas. The lack of data may be because at least some of this area had been extensively disturbed prior to the listing of the desert tortoise and includes large amounts of private land; consequently, researchers have not conducted large-scale surveys in most of these areas. Where data do exist (e.g., a Bureau study of desert tortoise density west of Highway 14 between Red Rock Canyon State Park and Highway 178 (Keith et al. 2005); various surveys of the eastern Antelope Valley, Victor Valley, and near the town of Rosamond), they were collected using methods other than line distance sampling and are not comparable to the numbers obtained through the line distance sampling. Much of the information in the following paragraphs was gathered from these sources; additionally, we used anecdotal information as a partial basis for the following discussion and conclusions reached by the Service (e.g., "I saw desert tortoises all the time here when I was young but have not seen one in the last 15 years"). Finally, based on the information in the Service's report on line distance sampling conducted between 2001 and 2005 and several assumptions with regard to the amount of suitable habitat, the Service (2007) estimated that approximately 6,216 desert tortoises resided outside of desert wildlife management areas and critical habitat in the Western Mojave Recovery Unit.

Desert tortoises occur over large areas of Fort Irwin where the Army conducts realistic, large-scale exercises with large numbers of wheeled and tracked vehicles. The distribution and abundance of the desert tortoise within the boundary of Fort Irwin have been greatly affected by military exercises. They have been essentially eliminated from most of the valleys and bajadas where vehicles frequently travel off road. They persist in small numbers on the steep, rugged

slopes of the mountain ranges and in incised washes that occur throughout Fort Irwin where they are protected from vehicles by the terrain.

We do not have specific information on the numbers of desert tortoises in these areas. We expect that desert tortoises that reside away from the most active training areas will persist long into the future as small aggregations of animals that are likely isolated from desert tortoises in the remainder of the Western Mojave Recovery Unit; some exchange may occur with desert tortoises in the South Range portion of the Naval Air Weapons Station to the west of Fort Irwin and a narrow strip of Bureau lands and Death Valley National Park to the north.

Because of the Army's proposal to expand the area that is available for training at Fort Irwin, the Service and Army concluded formal consultation (Service 2004) that resulted in an agreement to remove all desert tortoises from the areas of the base south of the UTM 90 line (i.e., the southern expansion area) and in the Superior Valley (i.e., the western expansion area). To date, 569 desert tortoises of all class sizes have been translocated from the southern expansion area (Army 2009). Eighty-nine desert tortoises of all class sizes remain to be translocated. Therefore, 658 desert tortoises of all class sizes have been detected in the southern expansion area. Walde et al. (2009 in Army 2009) estimate between 583 and 895 (95 percent confidence interval) desert tortoises occupy the western expansion area; this estimate is based on transects conducted in 2009. This estimate reflects the number of adult desert tortoises; consequently, the total number of animals within the southern and western expansion areas is likely somewhat greater.

The Naval Air Weapons Station, China Lake, is divided into two large units. The southern unit lies to the west of Fort Irwin and north of the western expansion area; the northern portion of the Naval Air Weapons Station lies to the northwest of the southern unit. The Department of the Navy (Navy) has designated approximately 200,000 acres of the South Range at the Naval Air Weapons Station, China Lake as a management area for the desert tortoise (Service 1995). Through a consultation with the Service (1992), the Navy agreed to try to direct most ground-disturbing activities outside of this area, to use previously disturbed areas for these activities when possible, and to implement measures to reduce the effects of any action on desert tortoises. This area also encompasses the Superior Valley Tactical Bombing Range located in the southernmost portion of the Mojave B South land management unit of the Naval Air Weapons Station; it continues to be used as an active bombing range for military test and training operations by the Navy and Department of Defense. In the 9 years for which we had annual reports, activities conducted by the Navy did not kill or injure any desert tortoises (see Navy 1995); one carcass was found at a bombing site but the cause of mortality could not be determined. In general, desert tortoises occur in low densities on the North Range of the Naval Air Weapons Station; Kiva Biological Consulting and McClenahan and Hopkins Associates (in Service 1992) reported that approximately 136 square miles of the North Range supported densities of 20 or fewer desert tortoises per square mile. The South Range supported densities of 20 or fewer desert tortoises per square mile over an area of approximately 189 square miles and densities of greater than 20 per square mile on approximately 30 square miles. The higher elevations and latitude in this area may be responsible for these generally low densities (Weinstein 1989 in Bureau et al. 2005).

The Indian Wells Valley, which is located to the southwest of the northern portion of the Naval Air Weapons Station, likely supported desert tortoises at higher densities in the past. Urban, suburban, and agricultural development is the likely cause of the lower densities that are currently found in this area; the city of Ridgecrest and town of Inyokern are located in this valley. Rose Valley, which lies generally to the north of the Indian Wells Valley and west of the northern portion of the Naval Air Weapons Station seems to support few desert tortoises and is likely the northern extent of the species' range in this portion of the Western Mojave Recovery Unit.

Edwards Air Force Base, which lies in the eastern portion of the Antelope Valley, is used primarily to test aircraft and weapons systems used by the Department of Defense. Desert tortoises occur over approximately 220,800 acres of the installation. Approximately 80,640 acres of the base have been developed for military uses or are naturally unsuitable for use by desert tortoises, such as Rogers and Rosamond dry lakes. Based on surveys conducted between 1991 and 1994, approximately 160,640 acres of the base supported 20 or fewer desert tortoises per square mile. Approximately 55,040 acres supported densities between 21 and 50 desert tortoises per square mile; from 51 to 69 desert tortoises per square mile occurred on several smaller areas that totaled 5,120 acres (U.S. Air Force 2004). We expect that current densities are somewhat lower, given the regional declines in desert tortoise numbers elsewhere in the Western Mojave Recovery Unit.

Four townships of private land east of the city of California City, north of Edwards Air Force Base, and south of the Rand Mountains supported large numbers of desert tortoises as late as the 1970s. High levels of off-road vehicle use, extensive grazing of sheep, scattered development, and possibly poaching have greatly reduced the density of desert tortoises in this area.

South of Edwards Air Force Base, the direct and indirect effects of urban and suburban development have largely eliminated desert tortoises from this area of primarily private lands that extends from Lancaster in the west to Lucerne Valley in the east. A few desert tortoises remain on the northern slopes of the San Bernardino Mountains, south of Lucerne Valley; however, they seem to be largely absent from the portion of this area in Los Angeles County (Bureau et al. 2005). The Bureau manages the 24,000-acre El Mirage Off-highway Vehicle Management Area, which lies south of the eastern portion of Edwards Air Force Base; the Bureau has designated this and three other off-highway vehicle management areas in the western Mojave Desert for use by off-road vehicles. Low numbers of desert tortoises persist in the area that generally lies between the off-highway vehicle management area and Edwards Air Force Base.

Continuing to the east, the northern portion of Joshua Tree National Park is within the Western Mojave Recovery Unit. Given the general patterns of visitor use at Joshua Tree National Park (i.e., most visitors remain fairly close to established roads and trails), we expect that most of this area receives little visitor use. Private lands between the northern boundary of Joshua Tree National Park and the southern boundary of the Marine Corps Air Ground Combat Center continue to support desert tortoises; the primary threat to desert tortoises in this area is

urbanization. The cities of Twentynine Palms, Yucca Valley, Joshua Tree, and Morongo Valley are located in this area.

The Marine Corps Air Ground Combat Center is located north of the cities mentioned in the previous sentence and southeast of Barstow; the center generally supports a wide variety of training exercises that include the use of tracked and wheeled vehicles and live fire. The Marine Corps' integrated natural resource management plan for the center notes that the number of desert tortoises may have declined in its more heavily disturbed areas and that vehicles, common ravens, and dogs are responsible for mortalities (Natural Resources and Environmental Affairs Division 2001). Desert tortoises occur within the Marine Corps Air Ground Combat Center in densities of greater than 50 per square mile in limited areas; most of the installation, however, supports from 0 to 5 animals per square mile (Jones and Stokes Associates 1998 in Natural Resources and Environmental Affairs Division 2001).

The 189,000-acre Johnson Valley Off-highway Vehicle Management Area lies to the west of the Marine Corps Air Ground Combat Center. The Stoddard Valley Off-highway Vehicle Management Area lies to the west of the Johnson Valley Off-highway Vehicle Management Area. Desert tortoises remain in suitable habitat in these areas, primarily in the portions that are less heavily used for recreation.

The Mojave River valley lies to the northwest of the Marine Corps Air Ground Combat Center. It is generally a low-lying area with current and fallow agricultural use; private lands dominate this area. We are aware of a few records of desert tortoises in this area, primarily in creosote scrub habitat near the Marine Corps Logistics Base, Nebo, and around Elephant Mountain, which lie at the western end of the valley.

The city of Barstow lies at the western end of the Mojave River valley. A large expanse of primarily private land lies between Barstow and the city of Victorville. This area, which is subjected to heavy unauthorized use by off-road vehicles, likely supported high densities of desert tortoises prior to the development of surrounding areas. The cities of Adelanto, Apple Valley, and Hesperia and the Southern California Logistics Airport generally surround Victorville.

Death Valley National Park lies to the north of Fort Irwin. Desert tortoises are uncommon in the national park, primarily because much of the habitat lies either lower or higher than optimal elevations for the species; Greenwater Valley, to the east of Death Valley, seems to support a moderate number of desert tortoises. Panamint Valley lies to the west of Death Valley and east of the northern section of the Naval Air Weapons Station. It supports low densities of desert tortoises, likely because of unsuitable habitat over large areas of the valley.

The Spangler Hills Off-highway Vehicle Management Area lies to the southwest of the Panamint Valley and southeast of Ridgecrest. We do not have recent information on the number of desert tortoises in this area; we expect that the area supports low densities as a result of extensive recreational use.

Major roads include Interstates 15 and 40 and State Routes 14, 18, 58, 62, 127, 138, 178, 247, and 395. These roads fragment habitat; vehicles using these roads strike and kill numerous desert tortoises every year. Portions of Interstate 15 and Routes 58 and 395 are fenced to prevent entry by desert tortoises. Smaller paved roads and unpaved roads probably do not fragment habitat to a substantial degree but are responsible for additional mortalities of desert tortoises.

The following paragraphs describe efforts to define the density of desert tortoises in and near critical habitat and desert wildlife management areas in the Western Mojave Recovery Unit. The Pinto Mountains Desert Wildlife Management Area is located in the southeastern portion of the Western Mojave Recovery Unit, generally to the southeast of the Marine Corps Air Ground Combat Center and abutting the northeastern portion of Joshua Tree National Park. No permanent study plots are located in this desert wildlife management area. Tracy et al. (2004) noted that the distribution of carcasses and live desert tortoises appeared to be what one would expect in a "normal" population of desert tortoises; that is, carcasses occurred in the same areas as live animals and were not found in extensive areas in the absence of live desert tortoises. Through line distance sampling, the Service estimated the density of desert tortoises in this desert wildlife management area to be approximately 6.2 subadults and adults per square mile in 2007 (Service 2009).

The Ord-Rodman Desert Wildlife Management Area is located to the southeast of the city of Barstow, north of the Johnson Valley Off-highway Vehicle Management Area, and west of the Marine Corps Air Ground Combat Center. The recovery plan notes that the estimated density of desert tortoises in this area is 5 to 150 animals per square mile (Service 1994). Three permanent study plots are located within and near this desert wildlife management area. The following table contains the density estimates for these plots; the data are from Berry (1996); all data are in the approximate number of desert tortoises of all sizes per square mile.

	Stoddard Valley	**Lucerne Valley**	**Johnson Valley**
1980		176	114
1981	146		
1986		150	80
1987	178		
1990		82	18
1991	225		
1994		73	73

Berry (1996) notes that, for various reasons, surveys at the Stoddard Valley plot encountered various difficulties; some desert tortoises from this plot were taken by poachers and at least one animal became ill with upper respiratory tract disease and contained environmental contaminants. Common ravens and feral dogs have killed desert tortoises at the Lucerne Valley plot; Berry (1996) notes that little recruitment into adult size classes was occurring. Berry also notes that at least two desert tortoises from the Johnson Valley plot were killed by off-road vehicle use or cattle; at least one ill and salvaged animal contained environmental contaminants. Through line distance sampling, the Service estimated the density of desert tortoises in this

desert wildlife management area to be approximately 21.3 subadults and adults per square mile in 2007 (Service 2009). Note that, for all desert wildlife management areas, the densities estimated by different methods are not directly comparable; i.e., the differences in numbers depicted in Berry (1996) and Service (2009b) do not necessarily represent a specific change in the density of desert tortoises in the area. For example, the information from study plots may reflect changes in the density of desert tortoises in those specific areas over time, while line distance sampling provides information regarding the density of the entire desert wildlife management area.

The Superior-Cronese Desert Wildlife Management Area is located north of the Ord-Rodman Desert Wildlife Management Area; two interstate freeways and rural, urban, and agricultural development separate them. This desert wildlife management area is located south of Fort Irwin and the southern portion of the Naval Air Weapons Station, China Lake. No permanent study plots have been established in this area; the density of desert tortoises has been estimated through numerous triangular transects and line distance sampling efforts. The recovery plan notes that this desert wildlife management area supports densities of approximately 20 to 250 desert tortoises per square mile (Service 1994). Through line distance sampling, the Service estimated the density of desert tortoises in this desert wildlife management area to be approximately 16.4 subadults and adults per square mile in 2007 (Service 2009b).

The Fremont-Kramer Desert Wildlife Management Area is located west of the Superior-Cronese Desert Wildlife Management Area; the two desert wildlife management areas are contiguous. The recovery plan notes that the estimated density of desert tortoises in this area was 5 to 100 animals per square mile (Service 1994). Five permanent study plots are located within this desert wildlife management area; one plot, the Interpretive Center plot at the Desert Tortoise Natural Area, is split into two subplots. The following table contains the density estimates for these plots; the data are from Berry (1996); all data are in the approximate number of desert tortoises of all sizes per square mile.

	Fremont Valley	**Desert Tortoise Natural Area, Interior**	**Desert Tortoise Natural Area, Interpretive Center**		**Fremont Peak**	**Kramer Hills**
			Inside Fence	**Outside Fence**		
1979		387	339	296		
1980					99	223
1981	278					
1982		332				314
1985			229	134	45	
1987	179					130
1988		195				
1989			106	80	32	
1991	101					60
1992		47				

1993			61	42	8	
1995						139
1996		18				
1997		8*	34#	23#		
2001	19*					
2002			28#	10#		

* These values represent the actual numbers of desert tortoises found on the plot and do not represent a density estimate; the data are from Berry (pers. comm. 2005).
# These data are from Connor (2003).

Berry (1996) noted that the overall trend in this desert wildlife management area is "a steep, downward decline" and lists predation by common ravens and domestic dogs, off-road vehicle activity, illegal collecting, upper respiratory tract disease, and environmental contaminants as contributing factors. Through line distance sampling, the Service estimated the density of desert tortoises in this desert wildlife management area to be approximately 7.0 subadults and adults per square mile in 2007 (Service 2009b).

We estimate that the overall density of desert tortoises in critical habitat and desert wildlife management areas in the Western Mojave Recovery Unit is approximately 12.2 subadults and adults per square mile (Service 2009b). The 95 percent confidence intervals for this estimate range from approximately 7.8 to 22.1 subadults and adults per square mile (Service 2009b).

By multiplying the approximate area of desert tortoise habitat in the Western Mojave Recovery Unit by the average density of 12.2 subadults and adult desert tortoises per square mile, we estimate that approximately 125,855 subadult and adult desert tortoises may reside within the recovery unit. (To estimate of the area of desert tortoise habitat within the Western Mojave Recovery Unit, we used a model developed by Nussear et al. [2009], which is based on desert tortoise habitat across the range of the species. The Nussear et al. model does not consider habitat loss, fragmentation, or degradation associated with human-caused impacts; however, it provides a reference point relative to the amount of desert tortoise habitat. We then used urbanized areas cartographic boundary files (Census Bureau 2000) to estimate the portion of modeled habitat that has been lost as a result of human activities; this model depicts areas where human activity has caused substantial ground disturbance [i.e., urbanization, agriculture, and military training]. By subtracting the amount of area no longer considered suitable habitat [i.e., the census data] from the area of potential habitat [i.e., from the Nussear et al. model], we estimate that the Western Mojave Recovery Unit contains approximately 10,316 square miles of potential desert tortoise habitat [Waln 2010]. The Nussear et al. model does not account for habitat disturbance and variations caused by other factors that affect the density of desert tortoises [e.g., highways]. Additionally, the data from line distance sampling were collected in desert wildlife management areas, where, presumably, the density of desert tortoises is greater than in other portions of the Western Mojave Recovery Unit; however, we applied this density for the entire Western Mojave Recovery Unit. Consequently, we recognize that the number of

subadult and adult desert tortoises in the Western Mojave Recovery Unit we provide here may be an overestimate.)

Using the same methodologies, we estimated that approximately 56,544 to 130,992 juvenile desert tortoises (i.e., smaller than 180 millimeters) reside within the Western Mojave Recovery Unit. This estimate is based on the assumption 125,855 subadults and adults occur in the Western Mojave Recovery Unit and that 31 to 51 percent of the total population of desert tortoises in the recovery unit are juveniles (Turner et al. 1987).

The biological opinion for the Bureau's amendment to the California Desert Conservation Area Plan for the western Mojave Desert (Service 2006b) contains a description of the results of studies done on permanent plots in the Western Mojave Recovery Unit. Based on this work, the Desert Tortoise Recovery Plan Assessment Committee (Tracy et al. 2004) concluded that the population densities of adult desert tortoises in the Western Mojave Recovery Unit exhibited a significant downward trend ($P < 0.0001$) from approximately 1975 through 2000. Some of the permanent study plots are located outside of the desert wildlife management areas; therefore, the trends within and outside of desert wildlife management areas may not be precisely the same. However, data from the permanent study plots provide the only long-term assessment of the status of the desert tortoise in this area.

Fires

Since December 2004, numerous wildfires have occurred in desert tortoise habitat across its range. Although we know that some desert tortoises were killed by the wildfires, mortality estimates are not available. We estimate that approximately 300,000 acres of potential desert tortoise habitat burned in the Northeastern Mojave Recovery unit in 2005 (Burroughs 2005). This acreage includes approximately 109,000 acres of critical habitat (Clayton 2005). In total, approximately 136,447 acres of critical habitat burned in the 2005 fires (Clayton 2005). The fires adversely affected the status of the desert tortoise by reducing the number of individuals (i.e., desert tortoises killed by the fire), possibly by reducing reproductive rates (i.e., desert tortoises in burned areas may have lower reproductive rates because of the decreased value of the habitat), and by degrading a portion of the habitat available to the species.

ENVIRONMENTAL BASELINE

Action Area

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion, we consider the action area to include the 516-acre project footprint, the public lands adjacent to the project site extending to 2,200 feet from the project area's boundary, Santa Fe Fire Road where it provides access to the site, the small area across Foothill Road that CES will need to access to connect the facility to the existing distribution line, and the area along the existing distribution

line where Verizon would install a fiber-optic line from the site to State Highway 247. By including the area of public lands extending to 2,200 feet from the edge of the project site, we are including areas that desert tortoises are likely to move within following relocation, based on home range estimates (Harless et al. 2009). The action area defined for this biological opinion is approximately 724 acres; we did not include the area where the fiber-optic line would be installed on the existing power poles in this figure because this portion of the project is linear and would not result in any ground disturbance or long-term effects. We are not including the water source or roads that project-related vehicles may use (other than Santa Fe Fire Road) in the action area because existing uses of these areas would likely mask any effects of the CES project in those areas.

Habitat Characteristics of the Action Area

The proposed project site is located on Bureau land. Land to the east of the site is also managed by the Bureau. Small sections owned by the State of California and private lands are to the west and south. We summarized the information in the remainder of the Environmental Baseline section from the draft environmental impact statement (Bureau 2010).

The surface of the site is characterized by desert scrub vegetation dominated by creosote bush (*Larrea tridentata*, 319 acres) and white-bursage (*Ambrosia dumosa*, 176 acres), desert washes (18 acres), and disturbed/sparsely vegetated soils (5 acres). The entire proposed action area is an alluvial fan consisting primarily of sandy loam soils on the flat terraces, loamy sandy soils, and loamy sand within the drainages and washes. The soils and alluvium are highly erosional.

A few residential homes exist along or just outside the 516-acre project footprint, but still inside the 2,200-foot buffer surrounding the project footprint (within the action area). During initial field surveys, the biologists documented evidence of frequent off-highway vehicle, firearm, and dump-site use, as well as widespread sightings of common ravens and dog activity.

Previous Consultations in the Action Area

The Service has issued two biological opinions relevant to the action area. On June 30, 2003, the Service issued a biological opinion to the Bureau regarding the effects of the designation of routes of travel in the western Mojave Desert on the desert tortoise and its critical habitat (Service 2003). As a result of the proposed action, the Bureau designated routes of travel on public lands as open, closed, or limited to vehicular use. The proposed action resulted in a reduction in the mileage of open routes on public lands; additionally, any route that was not designated as open was considered to be an unauthorized route. The Service concluded that the Bureau's designation of routes of travel was not likely to jeopardize the continued existence of the desert tortoise or adversely modify its critical habitat.

On January 9, 2006, the Service issued a biological opinion to the Bureau regarding the effects of a proposed amendment to the California Desert Conservation Area Plan for the western Mojave Desert on the desert tortoise and its critical habitat (Service 2006b). In this case, the Bureau's

proposed action was a substantial revision of the California Desert Conservation Area Plan, with the fundamental goal of adopting numerous management prescriptions that were intended to promote the recovery of the desert tortoise. These prescriptions addressed grazing, land use classification, recreation, and numerous other elements of the Bureau's management of the western Mojave Desert, including a minor revision of the route network considered in the consultation discussed in the previous paragraph. The Service concluded that the Bureau's amendment of the California Desert Conservation Area Plan for the western Mojave Desert was not likely to jeopardize the continued existence of the desert tortoise or adversely modify its critical habitat because the vast majority of changes addressed in the amendment reduced the intensity of use and were protective of the desert tortoise.

Status of the Desert Tortoise in the Action Area

The protocol level desert tortoise surveys, conducted between March 24 and April 10, 2009, consisted of 100 percent coverage of the area via belt transects within the proposed project site, in addition to a 500-foot buffer. In areas where higher densities of sign or desert tortoises were encountered, buffer transects were extended up to 1,200 feet from the project boundary. The zone-of-influence surveys included single line transects extending 600, 1,200, and 2,400 feet from the project boundary in areas adjacent to and surrounding existing suitable desert tortoise habitat. Survey results are summarized in the table below:

	Desert Tortoise	*Skeletal/Shell Remains*	*Burrows*	*Scat*
Within Project Footprint	1	1	33	0
Outside Project Boundary (within survey buffer/ZOI)	6	4	74	38

Table summarized from 2009 desert tortoise survey results for proposed Chevron solar project site (Bureau 2009).

The majority of the live desert tortoises, sign, suitable habitat, and forage vegetation were found to the south, southeast, and southwest outside of the project boundary. The biological assessment notes that carcasses of desert tortoises were found near areas used for shooting; however, the cause of death could not be established because many of the carcasses had been broken up.

Although only one desert tortoise was detected on the site of the proposed project, we recognize that this survey represents a single point in time and the number of individuals on the site may change by the onset of construction. For example, the desert tortoise that was found on site may leave or die. Alternatively, the number of desert tortoises present on the site may increase by the time construction commences. For example, one or more desert tortoises may not have been detected during the initial survey; other desert tortoises may have moved on to the site since the time of the surveys. Finally, desert tortoises may have emerged from a nest on the site; this scenario could increase the overall number of individuals most dramatically; for example, if a clutch of seven eggs (i.e., the number of eggs in a clutch that would be considered large)

hatched, this increase would be much more than we would expect from individuals moving on to the site.

To attempt to quantify this subjective description, we will use the lower 95 percent confidence interval that we determined for the density of desert tortoises in the Western Mojave Recovery Unit as the likely number of subadult and adult desert tortoises that are likely to be found on site. Based on this lower limit (6.8, Service 2009b), we project that no more than 5 subadult and adult desert tortoises are likely to be found within the 516-acre project site (i.e., 6.8 desert tortoises per square mile/640 acres = 5.47/516 acres). We used the lower limit because the survey results (i.e., one desert tortoise on 516 acres) seemed to indicate that desert tortoises were not abundant on the project site.

Juvenile desert tortoises are extremely difficult to detect because of their small size and their cryptic nature. Based on 4-year study of their population ecology, Turner et al. (1987) determined that juveniles accounted for 31.1 to 51.1 percent of the overall population. Using this range and a maximum of 5 subadult and adult desert tortoises on the proposed site, we estimate that the 516-acre project area may support from 2 to 5 juveniles.

To estimate the number of eggs that could be present on the project site, we used the average number of clutches per reproductive female in a given year, (i.e., 1.6, see Turner et al. 1984), multiplied by the average number of eggs found in a clutch (i.e., 5.8, see Service 1994). By approximating a 1:1 sex ratio, we assumed that 3 out of the 5 subadult and adult desert tortoises are reproductive females and that, together, they could produce approximately 28 eggs in a given year. Fewer eggs are likely to be onsite at any given time because the territories of the female desert tortoises likely extend, at least in part, off of the project site and individuals may establish nests in these areas.

EFFECTS OF THE ACTION

Construction of the Facilities

CES has proposed to permanently fence the perimeter of the project site (i.e., the 516-acre area that would support the solar facility) and temporarily fence Santa Fe Fire Road with desert tortoise exclusion fencing; once the fencing is in place, CES will remove all desert tortoises from the 516-acre site prior to ground disturbance. For this reason, construction activities would generally have no direct effect on desert tortoises.

We anticipate that construction, including construction access, is unlikely to kill subadult and adult desert tortoises because most of them would be removed prior to the onset of ground disturbance. Surveyors may miss desert tortoises during clearance surveys and construction monitoring. We cannot predict how many tortoises may be missed; however, because CES will use qualified biologists, authorized by the Service, to protect desert tortoises during these activities and because only one animal was found onsite, we anticipate that five or fewer subadult and adult desert tortoises are likely to be injured or killed during construction. We

based the estimate of six subadult and adult desert tortoises on the calculations contained in the Environmental Baseline - Status of the Desert Tortoise in the Action Area section of this biological opinion.)

Juvenile desert tortoises and eggs are difficult to detect during surveys and construction monitoring because of their small size and cryptic nature; therefore, the potential exists that surveyors may miss them and they may remain in the work areas during construction. Based on the calculations contained in the Environmental Baseline - Status of the Desert Tortoise in the Action Area section of this biological opinion, we estimate that up to 5 juvenile desert tortoises and 28 eggs may be present on site at the time of construction. The proposed flagging and checking of all burrows on the 516-acre site may enable the detection of at least some of the eggs; however, even experienced desert tortoise workers have found very few nests when conducting clearance surveys (Bransfield 2010). Because juveniles can take shelter in burrows of all sizes and they are difficult to see when they are above ground, surveyors are less likely to detect them than they are adult and subadult desert tortoises. Consequently, we expect that most of the juvenile desert tortoises and eggs within the 516-acre project site would be injured or killed as a result of construction. Substantially fewer than 28 eggs may be present onsite because construction may occur at a time of the year when eggs are not present, the number estimated likely represents the upper range of eggs that may be present, and at least some clutches were likely to have been laid in portions of the females' territories that were outside the project area.

Verizon would install fiber-optic line on the existing distribution line between the new solar facility and State Highway 247. Desert tortoises may be struck by vehicles or trampled by workers during the installation, resulting in injury or death of these individuals. The monitoring of the installation, as proposed by the Bureau is likely to reduce the number of animals that are injured or killed. Consequently, for that reason and because the work would be conducted in an existing disturbed area (i.e., from the road that parallels the distribution line) and would be completed in a relatively short period of time, we anticipate that few desert tortoises would be injured or killed as a result of this activity. We cannot predict precisely how many may be injured or killed because of the numerous variables involved (e.g., the duration of installation, the time of year work occurs, how many desert tortoises are in the area, whether the desert tortoises enter work areas, whether the monitors detect them before they are injured or killed).

Capture and Relocation of Desert Tortoises

CES will capture and relocate all desert tortoises that are within the 516-acre project site; any eggs that are detected would also be moved off-site. Desert tortoises that are in work areas outside of the fenced facility will also be moved from harm's way.

We cannot determine precisely how many desert tortoises within the project footprint will be relocated. According to the biological assessment and the results of focused surveys (Bureau 2009), surveyors found one desert tortoise within the southeast corner of the proposed site where ground-disturbing activities during Phase II would occur. However, additional desert tortoises may move into work areas prior to project implementation; additionally, eggs laid onsite may

have hatched since the time of the surveys. Based on survey results, we expect few desert tortoises or eggs will require relocating. As described in the Environmental Baseline - Status of the Desert Tortoise in the Action Area section of this biological opinion, we estimate that up to 5 subadult and adult and 5 juvenile desert tortoises and 28 eggs may be present on site at the time of construction; therefore, we anticipate that these individuals may be captured and relocated, if they are found during surveys.

Some potential exists that capturing desert tortoises may cause elevated levels of stress that may render these animals more susceptible to disease. Because CES will use experienced biologists approved by the Service and the Bureau and approved handling techniques, collected desert tortoises are unlikely to suffer substantially elevated stress levels.

Relocated desert tortoises occasionally try to return to their original capture site and thus spend relatively greater amounts of time above ground. This behavior may expose them to elevated risks of predation and exposure to temperature extremes that they would otherwise avoid. In such cases, relocation could result in injury to or mortality of desert tortoises. We anticipate this effect to be minor since few animals are likely to be relocated and, if so, they would not be moved out of or far from their home range.

We do not have information on how frequently eggs that are moved in the wild hatch. In captivity, experienced workers can move nests with some success; therefore, the potential exists that eggs may be moved successfully. Under natural conditions, at least some nests are likely destroyed by predators (Bjurlin and Bissonette 2004). Given this fact and because nests are difficult to detect, we expect that few nests, if any, will be found during pre-construction surveys. Consequently, we expect that any eggs that may occur onsite during construction are likely to be destroyed; as noted previously, we expect that up to 28 eggs may be present. The loss of this reproductive effort is unlikely to substantially diminish the desert tortoise's ability to persist in the area for several reasons. First, although we calculated that up to 28 eggs may occur on site, the most likely scenario is that fewer eggs would be present on the project site because at least some eggs would be laid in portions of home ranges that would not be affected by the proposed project. Second, at least a portion of desert tortoise nests are destroyed by predators; even without the proposed action, some eggs would not hatch. Last, the 516 acres on which the eggs would be laid represents a very small portion of the area where desert tortoises could nest in this region.

The relocation of any desert tortoise from the project area into surrounding habitat has the potential to disrupt the behavior and social structure of resident animals. Such disruption may impair their breeding, feeding, and sheltering by elevating the frequency and intensity of aggressive interactions between individuals. We anticipate that, overall, such an effect is likely to be minor, given that fewer than five subadult and adult and five juvenile desert tortoises are likely to be relocated and, thus, few resident animals are likely to be affected. In addition, because of the relatively small size of the proposed project, the home ranges of the desert tortoises onsite may currently overlap with those of animals offsite; therefore, interactions between those individuals would be affected minimally. Additionally, Walde et al. (2008) found

that the differences in reproduction among translocated, resident, and control desert tortoises were "not likely to be statistically significant" in a study of 132 female desert tortoises at Fort Irwin; because that translocation involved movement of desert tortoises much greater distances than they would be moved for this project, we anticipate that any differences in reproduction that may be caused by moving desert tortoises would be less pronounced in this situation.

We expect that some desert tortoises may be found in work areas outside of the fenced project site (e.g., on the access road). These animals will be handled for a short period of time and moved a relatively short distance into surrounding habitat. In most cases, they will be moved within their home ranges and, therefore, would be familiar with their surroundings; in some cases, a desert tortoise making a long-distance movement may be encountered and moved. In both of these situations, we do not expect the brief time of handling by an experienced person and movement of the desert tortoise a short distance to be likely to compromise the animal's safety or health in any manner. Some potential exists that desert tortoises residing near the project site may enter work areas and need to be moved on more than one occasion. Because of such variables, we cannot predict how many animals may be moved in this manner; generally, we expect that such handling will not occur frequently, given the low density of desert tortoises in the vicinity.

Operation and Maintenance Activities

Operation and maintenance activities within permanently fenced areas are unlikely to injure or kill desert tortoises. However, over the 30-year life of this project, desert tortoises could be injured or killed by increased traffic on existing access roads, by workers walking the perimeter of the fence during inspections, and during repair of the perimeter fence; additionally, if the perimeter fence is damaged, desert tortoises could enter the facility and be killed or injured during routine activities. Because CES has proposed several protective measures such as limiting speed limits to 20 miles-per-hour, restricting equipment to within the right-of-way, and inspecting the entire fence after every significant storm event from within the right-of-way, we anticipate few desert tortoises will be affected.

Loss of Habitat

Construction of the proposed solar facility would cause the long-term loss of a maximum of 516 acres of desert tortoise habitat. Given that the area covered by the solar panels would be covered in pea gravel and regularly sprayed with herbicide, restoration of the area to pre-project condition may not be possible.

The proposed action will temporarily, but for a period of at least 30 years, remove approximately 516 acres of desert tortoise habitat. The habitat in the fenced project area will be restored when the project is decommissioned, but is unlikely to function as suitable desert tortoise habitat for many years following facility closure. We cannot predict the amount of time required to return areas of long-term disturbance to suitable desert tortoise habitat because of numerous variables associated with restoration success.

Two additional future conditions are possible. First, the site may continue to be used for power generation beyond the currently proposed 30 years. Second, because this area of the desert is not being actively managed for the conservation of the desert tortoise and the nearby private lands may undergo development during the life of the project, the lands surrounding the project site may no longer support desert tortoises; in such a case, restoration of the project site to suitable habitat for desert tortoises would serve no useful function with regard to the conservation of the species. In either case, restoration of the site is highly unlikely to benefit desert tortoises in any manner.

The installation of the fiber-optic line on the existing distribution line will not result in the disturbance of a substantial amount of habitat because most work would be conducted from the existing road.

Miscellaneous Effects

Desert tortoises may also be killed or injured as a result of various indirect effects caused by construction, operation, and maintenance of the proposed project within their habitat. CES has proposed numerous measures to reduce or eliminate these threats. For example, by providing educational programs to workers that provide information on desert tortoises and the protective measures that must be implemented, we expect that workers are far less likely to kill, injure, or collect desert tortoises either carelessly or intentionally.

Common ravens are attracted to human activity in the desert. Securing trash will likely eliminate it as a source of food for common ravens and other predators, thereby reducing the attractiveness of the area to these predators. We expect that common ravens are still likely to frequent the site because it would offer perching, roosting, and possibly nesting sites, both within the solar field and on the connecting power line. Consequently, the proposed facility has the potential to attract common ravens to some degree and lead to further predation on desert tortoises in the vicinity; the proposed measures to monitor use of the site by common ravens and to attempt to remove any subsidies is likely to reduce the attractiveness of the facility to these birds to some degree. CES's funding of the regional management plan for common ravens will contribute to a large-scale management action that the Service and other agencies are undertaking to control and manage common ravens on a regional basis. We expect that implementation of this plan will promote the recovery of the desert tortoise by reducing the number of common ravens that prey on desert tortoises and by implementing actions that are likely to reduce subsidies for common ravens on a regional basis.

Non-native plant species could potentially invade areas disturbed by project activities and spread from the project area into surrounding habitat. If non-native species increase in abundance, the risk of fire and additional loss of habitat may increase. CES's proposal to routinely control non-native plants within the solar field through the use of herbicides should reduce the likelihood that it would be a source of seeds for offsite invasion. Disturbed areas outside of the solar field may be a seed source for weeds; however, these areas are relatively small and CES is proposing to monitor and control invasive species in these areas to further reduce the likelihood of adverse

effects.

The use of herbicide within the 516-acre project area is not likely to adversely affect desert tortoises because the Bureau will ensure it is used according to label restrictions and only within the fenced area, where desert tortoises are not present. Strict use according to the label restrictions should ensure that pesticides do not enter desert tortoise habitat outside the fenced area.

The Bureau and CDFG will require CES to compensate for the adverse effects of the proposed action on the desert tortoise. Consequently, at least 516 acres of desert tortoise habitat will be acquired to partially offset the adverse effects of the project within the Ord-Rodman, Superior-Cronese, or Fremont-Kramer desert wildlife management area. This acquisition will benefit desert tortoises because the acquired lands will be managed for the long-term conservation of the species and would no longer be available for private development.

The Bureau will also require CES to fund the implementation of measures to promote the long-term conservation of the desert tortoise. These measures include, but are not limited to the fencing of Highway 247 to prevent desert tortoises from entering the road, the restoration of disturbed areas, and installing barriers to prevent illegal vehicle use of the Ord-Rodman Desert Wildlife Management Area. These measures will benefit the desert tortoise by removing threats to individuals or increasing the value of habitat with areas determined to be important for her recovery of the species. The potential also exists to develop a comprehensive, research-based program of headstarting desert tortoises.

Because we do not have specific information regarding these future enhancement projects or acquisitions, we cannot fully analyze the benefits provided by these actions; if the Bureau, as it prepares to implement these measures on the ground, determines that they are likely to adversely affect desert tortoises or their critical habitat, it would initiate formal consultation with the Service. However, the Service (1994, 2008) has recommended that such actions be implemented in the original and draft revised recovery plan for the desert tortoise. Consequently, we expect these actions will result in some improvement in the conservation status of the species.

Summary

CES will implement numerous measures to avoid, minimize, reduce, and offset the adverse effects on the desert tortoise of the proposed action. Additionally, the proposed project footprint supports few desert tortoises. Consequently, we expect that 5 or fewer subadult and adult and 5 or fewer juvenile desert tortoises will be captured, injured, or killed during construction of the solar facility; we anticipate that up to 28 eggs may be moved or destroyed during construction. Few desert tortoises of any size will be killed or injured during operation and maintenance of the facility. We expect that most desert tortoises encountered during work activities would be moved relatively short distances out of harm's way. Because the Bureau and CES will implement a variety of measures to reduce stress to these animals and because the animals will

be released within or close to their home range, we do not anticipate that injury or mortality will result from the handling and relocation of these animals.

Regardless of the success of restoration efforts, loss of the habitat on the project site would not substantially reduce the ability of the desert tortoise to survive and recover in the wild. The Service, as noted in the recovery plan (Service 1994) and the final rule for designation of critical habitat for the desert tortoise (59 *Federal Register* 5820), does not consider this area as essential for the long-term conservation of the species. The compensation being required of CES by the Bureau and CDFG (i.e., the acquisition of 516 acres of habitat within a desert wildlife management area in the Western Mojave Recovery Unit and implementation of management actions within the Ord-Rodman Desert Wildlife Management Area to reduce threats to the desert tortoise and improve habitat quality) will promote the recovery of the desert tortoise.

To conclude, areas disturbed by the proposed solar facility would no longer support reproduction of desert tortoises. Any desert tortoises that are moved from the site of the proposed project would likely continue to reproduce in adjacent habitat. We anticipate that as many as 28 eggs may be destroyed by the proposed action; however, the loss of this number of eggs is not likely to diminish the ability of the species to persist in the area, in part because the affected area represents a small portion of the area available to desert tortoises for nesting in the region. Consequently, we anticipate that the proposed action will not appreciably diminish the reproductive capacity of the species, particularly in light of the few desert tortoises that would be affected.

Implementation of the proposed action would not appreciably reduce the number of desert tortoises in the Western Mojave Recovery Unit. Only one desert tortoise was detected in the project area during surveys; however, for the reasons we provided in the Environmental Baseline - Status of the Desert Tortoise in the Action Area section of this biological opinion, we have estimated that as many as 5 subadult and adult and 5 juvenile desert tortoises may be present at the time of construction; we also estimated that as many as 28 eggs may be present on the site. However, even if the upper limit of the estimated number of desert tortoises was present, the number of desert tortoises within the project's footprint would still comprise a minor component of the population of desert tortoises in the Western Mojave Recovery Unit (i.e., 12 desert tortoises of all sizes of approximately 125,855 subadult and adult and as few as 56,544 juvenile desert tortoises within the Western Mojave Recovery Unit). Because so few desert tortoises are likely to be affected by the proposed project, the change in the number of individuals within the recovery unit that may result from the proposed action would not be measurable.

The distribution of the desert tortoise would be minimally reduced as a result of the long-term disturbance associated with the proposed action. Previously, we had estimated that the Western Mojave Recovery Unit supports approximately 6,268 square miles of desert tortoise habitat (Service 2007); based on the Nussear et al. (2009) model and our calculations (Waln 2010), the Western Mojave Recovery Unit may support as much as 10,316 square miles of desert tortoise habitat. Consequently, the proposed action would result in the loss of form approximately 0.0078 to 0.01 percent of the habitat in the Western Mojave Recovery Unit. This percentage

does not constitute a numerically substantial portion of the recovery unit. We do not have the ability to place a numerical value on edge effects and overall fragmentation that the proposed action may cause or that occurs in the recovery unit as a whole; however, given the location of the proposed action in an area that has already experienced some degree of rural development near the edge of the desert tortoise's range, we do not anticipate that the amount of habitat to be lost as a result of the proposed action would reduce the distribution of the desert tortoise to a measurable degree.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. We performed a web search (http://www.co.san-bernardino.ca.us/landuseservices/) for permit applications that the County of San Bernardino accepted from 2002 through 2010 for projects on private lands within the action area to assess cumulative effects. According to this source, no non-federal projects are currently proposed within the action area.

CONCLUSION

After reviewing the current status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Bureau's proposed issuance of a right-of-way grant to CES for the Lucerne Solar Electric Generating Plant is not likely to jeopardize the continued existence of the desert tortoise. We reached this conclusion because the proposed action will affect a small amount of suitable habitat and very few desert tortoises. Additionally, the proposed action is located in an area that we do not consider important for the long-term conservation of this species; this area is near the edge of the species' range, supports few desert tortoises (mostly likely as a result of the combination of past and ongoing human activities and the location of the site at the edge of the range), and is adjacent to large blocks of private lands where the potential for the long-term conservation of desert tortoises in minimal. Consequently, the development and operation of the proposed solar plant will not compromise the recovery of the desert tortoise. CES will implement or fund several measures to offset the potential adverse effects of the action on the desert tortoise; therefore, the proposed action will, to some degree, promote the conservation of the species through the acquisition of lands important to its recovery and by implementing on-the-ground actions to reduce mortality and improve habitat quality.

As we noted previously in this biological opinion, the analysis we conduct under section 7(a)(2) of the Endangered Species Act must be conducted in relation to the status of the entire listed taxon. We based the analysis in this biological opinion within the context of the Western Mojave Recovery Unit because of the wide range of the desert tortoise. Because we have determined that the effects of this action would not compromise the integrity of the Western Mojave Recovery Unit or impede the survival or recovery of the desert tortoise in a measurable

manner in this portion of its range, we have not extended the analysis of the effects of this proposed action to the remainder of the range of the Mojave population of the desert tortoise.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described in this incidental take statement are non-discretionary; the Bureau must undertake these measures or make them binding conditions of any authorization provided to CES, Southern California Edison, or Verizon. The Bureau has a continuing duty to regulate the activities covered by this incidental take statement. If the Bureau fails to assume and implement the terms and conditions of the incidental take statement or make them binding conditions of any authorization provided to CES, Southern California Edison, or Verizon, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Bureau must report the progress of its action and its impact on the species to the Service as specified in the incidental take statement (50 *Code of Federal Regulations* 402.14(i)(3)). We also note that, because the Service considered the effects of the protective measures proposed by the Bureau, Southern California Edison, and CES in its analysis of the proposed action, these measures are also non-discretionary.

We anticipate that all desert tortoises within the 516-acre fenced area will be taken during construction of the proposed 516-acre solar facility. We anticipate that most of the individuals within this area will be captured and relocated to nearby suitable habitat. A small number of desert tortoises may be killed or injured during implementation of the proposed action. Based on the results of surveys conducted on the site and analysis in this biological opinion, no more than five subadult and adult and five juvenile desert tortoises are likely to be taken (i.e., captured, injured, or killed).

We anticipate that up to 28 eggs will be taken during construction of the proposed 516-acre solar facility. Some eggs may be moved to locations outside of the 516-acre facility; most would likely be destroyed because they will not be detected prior to construction.

Because we can reasonably estimate the numbers of desert tortoises and eggs that are likely to be taken within the 516-acre project area, we have provided these numbers in this incidental take statement. As required by the implementing regulations for section 7(a)(2) of the Endangered Species Act (50 Code of Federal Regulations 402.16), the Bureau must re-initiate consultation if the amount or extent of incidental take is exceeded.

We anticipate that a few desert tortoises outside of the 516-acre fenced area will be taken during construction and operation of the proposed solar facility. Because desert tortoises can move through this area (i.e., the area will not be fenced to preclude their entry), we cannot predict how many individuals will be taken. Most of these desert tortoises will be captured and relocated to nearby suitable habitat; some are likely to be injured or killed on the access road.

A limited number of desert tortoises may gain entry to the fenced area over the 30-year life of the project. Because of the numerous variables involved, we cannot predict how many desert tortoises may gain entry to the facility. Most of these desert tortoises will be captured and relocated to nearby suitable habitat; some are likely to be injured or killed on the access road.

We cannot reasonably estimate the numbers of desert tortoises that may enter work areas outside of the 516-acre fenced area during construction, be found on the access road during operation of the facility, or breach the exclusion fence (i.e., we do not know the number of animals in surrounding areas or how often they may be encountered by workers). Therefore, we have used the reasonable and prudent measures and terms and conditions of this incidental take statement to establish a threshold that, if met, would require the Bureau to re-initiate consultation.

The exemption provided by this incidental take statement to the prohibitions against take contained in section 9 of the Act extends only to the action area as described in the Environmental Baseline section of this biological opinion.

REASONABLE AND PRUDENT MEASURE

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize take of desert tortoises during the implementation of the CES Lucerne Solar Electric Generating Plant:

> The Bureau must ensure that the level of incidental take anticipated in this biological opinion is commensurate with the analysis contained herein.

Our evaluation of the proposed action includes consideration of the protective measures proposed by CES and the Bureau in the biological assessment and re-iterated in the Description of the Proposed Action section of this biological opinion. Consequently, any changes in these protective measures may constitute a modification of the proposed action that causes an effect to the desert tortoise that was not considered in the biological opinion and require re-initiation of consultation, pursuant to the implementing regulations of the section 7(a)(2) of the Act (50 Code of Federal Regulations 402.16).

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions, which implement the reasonable and prudent measure, and the following reporting and monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement the reasonable and prudent measure:

a. To ensure that the measures proposed by the Bureau and CES are effective and are being properly implemented, the Bureau must contact the Service immediately if it becomes aware that a desert tortoise has been killed or injured by project activities. At that time, the Service and the Bureau must review the circumstances surrounding the incident to determine whether the protective measures proposed by the Bureau (and described previously in this biological opinion) are effective and being properly implemented or whether additional protective measures are required. Project activities may continue pending the outcome of the review, provided that the Bureau's proposed protective measures and any appropriate terms and conditions of this biological opinion have been and continue to be fully implemented.

b. The Bureau must re-initiate consultation, pursuant to the implementing regulations for section 7(a)(2) of the Endangered Species Act at 50 Code of Federal Regulations 402.16, on the proposed action if:

   3 desert tortoises are taken (i.e., captured, injured, or killed) over the life of the proposed action or if 2 desert tortoises are taken (i.e., captured, injured, or killed) within any 12-month period within the 516-acre facility during its operation (i.e., if they breach the desert tortoise exclusion fence)

   or

   3 desert tortoises are killed or injured over the life of the proposed action or if 2 desert tortoises are killed or injured within any 12-month period outside of the 516-acre facility. Because we do not expect that capturing and removing desert tortoises from work areas outside of the 516-acre facility are likely to result in injury or mortality of desert tortoises, we are not establishing a criterion for re-initiation of formal consultation for this activity.

REPORTING REQUIREMENTS

The Bureau's proposal to provide information on the progress of construction (measure 24) partially satisfies this requirement. In addition, the Bureau must provide an annual report each year the facility is in operation. As part of these reports, the Bureau must describe the monitoring efforts that occurred during the reporting period. In addition, the report must include

information on any instances when desert tortoises were killed, injured, or handled; the circumstances of such incidents; and any actions undertaken to prevent similar instances from re-occurring. We also request that the Bureau provide us with the names of any monitors who assisted the authorized biologist and an evaluation of the experience they gained on the project; the qualifications form on our website (http://www.fws.gov/ventura/sppinfo/protocols/deserttortoise_monitor-qualifications-statement.pdf), filled out for this project, along with any appropriate narrative would provide an appropriate level of information. This information would provide us with additional reference material in the event these individuals are submitted as potential authorized biologists for future projects.

DISPOSITION OF DEAD OR INJURED DESERT TORTOISES

The Bureau's proposal to provide information on the injury or mortality of desert tortoises (measure 23) partially satisfies this requirement. The Ventura Fish and Wildlife Office may be contacted by telephone (805 644-1766), facsimile (805 644-3958), or electronic mail.

Care must be taken in handling dead specimens to preserve biological material in the best possible state for later analysis, if such analysis is needed. The Service will make this determination when the Bureau provides notice that a desert tortoise has been killed by project activities.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We have no conservation recommendations at this time.

REINITIATION NOTICE

This concludes formal consultation on the Bureau's proposal to issue a right-of-way grant to CES for the Lucerne Valley Chevron Solar Project in San Bernardino County. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding this biological opinion, please contact Danielle Dillard of my staff at (805) 644-1766, extension 315.

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