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June 18, 2010

California Energy Commission
Attn Docket No. 09-AFC-8
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

Re: Genesis Solar Energy Project; 09-AFC-8

Dear Docket Clerk:

Enclosed are an original and one copy of **TESTIMONY OF SCOTT CASHEN ON BEHALF OF THE CALIFORNIA UNIONS FOR RELIABLE ENERGY ON BIOLOGICAL RESOURCES FOR THE GENESIS SOLAR ENERGY PROJECT**. Please docket the original, conform the copy and return the copy in the envelope provided.

Thank you for your assistance.

Sincerely,

/S/

Rachael E. Koss

REK:bh
Enclosures

2364-079a

STATE OF CALIFORNIA

Energy Resources Conservation and Development Commission

In the Matter of: The Application for Certification for the GENESIS SOLAR ENERGY PROJECT	Docket No. 09-AFC-8

TESTIMONY OF SCOTT CASHEN ON BEHALF OF THE CALIFORNIA UNIONS FOR RELIABLE ENERGY ON BIOLOGICAL RESOURCES FOR THE GENESIS SOLAR ENERGY PROJECT

June 18, 2010

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I. INTRODUCTION

I have been working for the California Unions for Reliable Energy ("CURE") as a consultant on the Application for Certification ("AFC") for the Genesis Solar Energy Project ("Project") since the data adequacy phase. I have reviewed numerous documents and have conducted my own investigations and analyses regarding the Project's potential environmental impacts and alternatives.

I have a Master's of Science Degree in Wildlife and Fisheries Science from the Pennsylvania State University, University Park. The degree program included coursework in Landscape Ecology, Biometrics, Statistics, Conservation Biology, and Wetland Ecology. For my thesis, I conducted seven seasons of independent research on avian use of restored wetlands. The U.S. Fish and Wildlife Service subsequently used my technical report as a model for other habitat restoration monitoring projects in Pennsylvania.

My employment experience has included work in the fields of wildlife biology, forestry, and natural resource consulting. Much of my work over the past two and a half years has involved review of environmental documents associated with development of large-scale solar energy facilities. To date, I have served as an expert on 12 different solar projects, 9 of which are being sited in the Mojave or Sonoran Desert. I am currently concluding a two-year contract I hold with the State of California to conduct surveys for the Peninsular bighorn sheep near Anza-Borrego Desert State Park. I serve as a member of the scientific review team responsible for assessing the effectiveness of the U.S. Forest Service's implementation of the Herger-Feinstein Quincy Library Group Act.

For the past two and a half years I have operated my own consulting business. I previously served as a Senior Biologist for TSS Consultants and ECORP Consulting. Other positions I have held have included conducting wildlife research for the National Park Service, the Point Reyes Bird Observatory, and the University of California. While in graduate school I served as an instructor of Wildlife Management and as a teaching assistant for a course on ornithology.

My testimony is based on the activities described above and the knowledge and experience I have acquired during more than 18 years of working in the field of natural resources management. A summary of my education and experience is attached to this testimony as Attachment 1.

II. THE PROJECT MAY RESULT IN UNMITIGATED SIGNIFICANT IMPACTS TO GILA WOODPECKERS

The Gila woodpecker (*Melanerpes uropygialis*) is listed as endangered under the California Endangered Species Act. The Revised Staff Assessment ("RSA") lists it

as a species that is "known to occur or could potentially occur in the Project area and vicinity."[1] The RSA subsequently lists it as a species with "no or low-to-moderate potential to occur in the Project area."[2] The RSA ultimately concludes the Gila woodpecker is not expected to occur at the Project site.[3] To support this conclusion, the RSA stipulates: (a) the Gila woodpecker is currently known only from the Colorado River; (b) the Project site does not contain suitable nesting habitat for the species; and (c) the closest California Natural Diversity Database (CNDDB) record for the species is a 1986 occurrence east of the Project site at the Colorado River.[4] I have reviewed the literature associated with each of these pieces of evidence, and I have concluded the evidence presented in the RSA is neither entirely accurate, nor sufficient to conclude that the Gila woodpecker does not occur on the Project site. In the subsequent sections, I discuss the evidence provided in the RSA, as well as recent information supporting an inference that Gila woodpeckers may occur at the Project site.

A. The RSA Does Not Accurately Report the Range of the Gila Woodpecker

The RSA states Gila woodpeckers formerly occurred in desert washes up to one mile from the Colorado River, and that they are currently limited to areas along the Colorado River.[5] Staff has not cited the source of this information. However, based on the verbiage, Staff's information appears to have been derived from either the 1987 petition to list the species,[6] or the 2002 NECO Plan.[7] While technically correct at the time the documents were published, the information presented in these sources is now outdated. Since the documents were published, researchers have discovered populations of Gila woodpeckers at several locations west of the Colorado River. These locations are documented in the California Natural Diversity Database (CNDDB) (illustrated in Attachment 2),[8] and in the Desert Bird Conservation Plan published by California Partners in Flight and Point Reyes Bird Observatory (illustrated in Attachment 3).[9]

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[1] RSA, p. C.2-22.
[2] Id.
[3] RSA, p. C.2-56.
[4] Id.
[5] Id.
[6] Larsen CJ. 1987. Petition to the State of California Fish and Game Commission. http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentVersionID=3356
[7] BLM and CDFG. 2002. Final Environmental Impact Statement. Proposed Northern & Eastern Colorado Desert Coordinated Management Plan. Bureau of Land Management, California Desert, Riverside, CA. p. 2-2.
[8] California Natural Diversity Database. 2009. Rarefind [computer program]. Version 3.1.0. Mar 2, 2010. Sacramento (CA): Wildlife & Habitat Data Analysis Branch. California Department of Fish and Game.
[9] CalPIF (California Partners in Flight). 2009. Version 1.0. The Desert Bird Conservation Plan: a Strategy for Protecting and Managing Desert Habitats and Associated Birds in California. California Partners in Flight. http://www.prbo.org/calpif/plans.html.

B. The RSA Does Not Accurately Report Nesting Habitat for Gila Woodpeckers

The RSA concludes that the Project area does not contain suitable habitat for the Gila woodpecker.[10] However, the RSA does not provide a citation or any information to justify this conclusion. Several studies and surveys have documented Gila woodpeckers breeding in dry desert wash woodlands such as those that occur in the Project area. Grinnell and Miller (1944) reported Gila woodpecker habitat as:

> [m]ainly riparian cottonwoods and willows, of old growth; but also up *desert washes where ironwood and palo verde reach large size*. Availability of diggable tree-trunks for nesting seems to be primary factor for presence; a favoring one is *presence of berry-bearing mistletoe as parasitic especially on mesquite*.[11]

The conditions reported by Grinnell and Miller (1944) may be present in the Project area. The RSA states:

> The Applicant has identified a stand of desert dry wash woodland as occurring east of the Project area, within the large Palen Wash, but had described this habitat type as absent from the Project area (GSEP 2009a). In their revised delineation the Applicant describes areas of areas of microphyllous riparian vegetation occurring in washes along the linear Disturbance Area. The microphyllous vegetation identified in these washes consists of three tree species (palo verde, ironwood, and honey mesquite) and totals 16 acres (TTEC 2010). Within the proposed Project area ironwood and palo verde occur in low densities but one wash along the linear facility route, identified as Wash 24-26 in the jurisdictional delineations report (TTEC 2010l) supports a relatively dense concentration of 270 palo verde trees. Wash 31 consists of honey mesquite and is also relatively dense.[12]

According to the Applicant's estimate, 888 palo verde, ironwood, and honey mesquite trees greater than 4" in diameter occur along desert washes in the Project area.[13] These tree species also occur at lower densities in other portions of the Project area.[14] Anderson et al. (1982) observed Gila woodpecker nests in honey

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[10] RSA, p. C.2-56.
[11] Grinnell J, AH Miller. 1944. The distribution of the birds of California. Pac. Coast Avifauna No. 27. 608pp. [emphasis added].
[12] RSA, p. C.2-17.
[13] Tetra Tech. 2010 Mar 15. Revisions to the Jurisdictional Waters at the Genesis Solar Energy Project. Appendix C.
[14] AFC, Bio Tech Report, Table 3.

mesquite trees along the lower Colorado River.[15] McCreedy et al. (2006) surveyed Milpitas Wash in Imperial County and reported every Gila woodpecker nest they detected occurred in blue palo verdes.[16] The Desert Bird Conservation Plan, a joint effort between California Partners in Flight and Point Reyes Bird Observatory, states that the presence of blue palo verde has been found to positively influence presence and abundance of the Gila woodpecker.[17] According to the California Natural Diversity Database, 9 of the 34 (26%) documented occurrences of Gila woodpeckers within the State of California are associated with vegetation communities similar to those present on the Project site (Reproduced below in Table 1).[18]

[15] Anderson et al. 1982. Evidence for social regulation in some riparian bird populations. American Naturalist. 120:340-352.
[16] McCreedy, C., C. Howell, and L. Culp. 2006. Xeric Riparian Songbird Project: 2004 progress report. PRBO Conservation Science, 4990 Shoreline Highway, Stinson Beach, CA, 94970. PRBO Contribution No. 1309.
[17] The Desert Bird Conservation Plan: A Strategy for Protecting and Managing Desert Habitats and Associated Birds in the Mojave and Colorado Deserts. 2009. Version 1.0. California Partners in Flight and Point Reyes Bird Observatory Conservation Science. Table 8-2. p.70.
[18] California Natural Diversity Database. 2009. Rarefind [computer program]. Version 3.1.0. Mar 2, 2010. Sacramento (CA): Wildlife & Habitat Data Analysis Branch. California Department of Fish and Game.

Table 1. CNDDB records of Gila woodpecker occurrences in habitat comparable to habitat on the Project site.

Record No	Ecological community
24	HABITAT CONSISTS OF SALT CEDAR, MESQUITE, AND PALO VERDE WITH A QUAIL BRUSH UNDERSTORY; GOOD HABITAT EXCEPT FOR THE PRESENCE OF SALT CEDAR.
25	HABITAT CONSISTS OF PALO VERDE, MESQUITE, AND SALT CEDAR; OPEN AREAS ARE CREOSOTE GROUND COVER.
28	HABITAT IS PALO VERDE, SALT CEDAR, AND MESQUITE; MANY TRAILER PARKS AND SOME ORV USE IN THE AREA, OTHERWISE GOOD HABITAT.
30	DESERT WASH WOODLAND WITH PALO VERDE & IRONWOOD SURROUNDED BY DISTURBED CREOSOTE BUSH SCRUB.
31	DESERT WASH SCRUB WITH PALO VERDE AND IRONWOOD
32	DESERT WASH SCRUB WITH PALO VERDE AND IRONWOOD SURROUNDED BY CREOSOTE BUSH SCRUB.
33	DESERT WASH WOODLAND WITH PALO VERDE, IRONWOOD, CREOSOTE BUSH AND MESQUITE.
34	BRAIDED WASH WITH OLNEYA TESOSA, CERCIDIUM MICROPHYLLA, & LARREA TRIDENTATA
35	MICROPHYLL WOODLAND DOMINATED BY PALO VERDE, CREOSOTE AND IRONWOOD. AREA USED FOR OHV RECREATION AND CAMPING.

C. The Revised Staff Assessment has Misused the CNDDB

Staff suggests that there is a low potential for occurrence of the Gila woodpecker due to the Project's distance from the nearest CNDDB record (which is along the Colorado River).[19] Staff's reasoning is not justifiable for the following reasons. First, the CNDDB is a positive sighting database. As a result, a lack of records in the CNDDB cannot be used to conclude an animal does not occur in a given area. Second, isolated populations of Gila woodpeckers have been reported at distant, disconnected locations, such as Griffith Park in Los Angeles (among other locations).[20] This information indicates that Gila woodpeckers will disperse to, and colonize, suitable habitat disjunct from the Colorado River. Third, the Gila woodpecker has been documented at several locations south of the I-10, which are approximately as far west from the Colorado River as the Project site.[21] Fourth, Staff's conclusion that the Gila woodpecker is absent from the Project area appears to be largely due to an absence of prior survey efforts rather than a lack of habitat. According to the 2009 Desert Bird Conservation Plan, Milpitas Wash (Imperial County) is the only xeric riparian habitat that has been specifically surveyed for Gila woodpeckers. Information associated with the CNDDB occurrence records south of I-10 (e.g., several unique detections made on the same date), and the proximity of Gila woodpecker occurrences to Highway 78, suggest the records were obtained as part of a survey route or other focused effort. Although the Project site is slightly further north of the core of the species' range, there is nothing to suggest that the same pattern of distribution does not occur north of I-10 as occurs south of I-10.

The Project would result in direct impacts to at least 298 desert wash tree species and 16 acres of dry desert wash woodland.[22] Based on the information described above, and the lack of information provided in the Applicant's survey reports, it is my professional opinion that the Gila woodpecker has the potential to occur on the Project site. Without appropriate mitigation, the Project may cause a significant impact on the species and its habitat.

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[19] RSA, p. C.2-56.

[20] Edwards, Holly H. and Gary D. Schnell. 2000. Gila Woodpecker (Melanerpes uropygialis), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/532 doi:10.2173/bna.532

[21] See Attachment 2.

[22] Tetra Tech. 2010 Mar 15. Revisions to the Jurisdictional Waters at the Genesis Solar Energy Project. Appendix C; RSA, p. C.2-17.

III. THE REVISED STAFF ASSESSMENT DOES NOT PROVIDE ADEQUATE BASELINE INFORMATION OR MITIGATION MEASURES FOR THE COUCH'S SPADEFOOT TOAD

The Genesis Project is located at the western border of the Couch's spadefoot toad range.[23] With respect to the species occurring on the Project site, the RSA concluded: (a) "because the [Applicant's] surveys were not conducted during the proper season (i.e., after summer rains), the lack of observations does not suggest the species is absent from the Project site";[24] and (b) "[w]ithout species-specific survey results and with limited occurrence information, it is difficult to assess the potential for direct and indirect impacts to Couch's spadefoot toads."[25] Without species-specific survey results (including presence of toads and presence of habitat elements), Staff cannot provide an adequate assessment of Project impacts on Couch's spadefoot toads. Without an adequate impact assessment, Staff is unable to devise an appropriate mitigation strategy.

Couch's spadefoot toads have three principal habitat requirements.[26] These are:

1. Temporary desert rainpools with water temperatures >15 ^{o}C in which to breed. The breeding pool must last for at least seven days for metamorphosis to occur;
2. Subterranean refuge sites (with a loose enough substrate to permit burial) must occur in the vicinity of the breeding pool; and
3. An insect food base (that probably includes alate termites) and primary production that sustains the food base.

There is evidence that suggests the presence of breeding ponds is the limiting factor in the distribution of Couch's spadefoot toads.[27] Therefore, in the absence of site-specific survey results (on toads), the presence of suitable breeding ponds can be used as an index of toad presence. During the 2009 surveys, the Applicant contends it searched for artificial or temporary water catchments that could serve as breeding pools for Couch's spadefoot toads.[28] No water catchments were identified during the surveys.

Staff has concluded that impacts to breeding ponds within the westernmost range of the Couch's spadefoot toad would be a significant impact.[29] However,

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[23] RSA, p. C.2-86.
[24] Id., p. C.2-39.
[25] Id., p. C.2-86.
[26] Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division.
[27] RSA, p. C.2-86.
[28] Id., p. C.2-39.
[29] Id., p. C.2-86.

despite the obvious data gaps reported in the RSA, Staff "agrees with the Applicant that it is unlikely the solar facility site supports breeding pond habitat thought [*sic*] it may provide habitat for subterranean burrows if there is a breeding pond within dispersal distance."[30] This is not a reliable conclusion for the several reasons.

First, the Applicant has provided information that suggests its search for breeding pond habitat was limited to a few select locations, most of which lie outside of the Project area.[31]

Second, Couch's spadefoot toads breed in temporary pools that form after summer rains.[32] The Applicant's search for pools did not occur after summer (or other) rains.[33]

Third, the Applicant reported "[n]o artificial or temporary water catchments that could serve as breeding pools for Couch's spadefoot toad" occur in the Project area.[34] Staff has determined the Applicant's statement is incorrect. Specifically, Staff reviewed Project site aerials and "identified some *areas* that appear to sustain or that could potentially sustain surface water," including a *large* ponded area along the Project transmission line route.[35]

Fourth, the Project transmission line corridor overlaps a known breeding site for Couch's spadefoot toads.[36]

Fifth, Staff's analyses were limited primarily to aerial photo interpretation. The RSA does not provide the methods that were used in Staff's analyses, including the date(s) of the imagery; its scale and resolution; the methods used to identify areas that potentially sustain water; and the extent of ground-truthing (i.e., field verification). Couch's spadefoot toads may breed in small pools that cannot be identified through use of aerial imagery. Furthermore, given Couch's spadefoot toads are able to exploit ponds that contain water for as few as nine days, the imagery used by Staff would need to have been generated within nine days of rainfall for it to provide a reliable depiction of breeding habitat.

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[30] RSA, p. C.2-86.
[31] *See* AFC, Bio Tech Report, p. 29; *See* Map associated with Applicant's response to CURE Data Request #32; *See also* Applicant's response to CURE Data Request #45 and Figure 6 in Genesis Solar, LLC. 2009 Dec 31. Application for Incidental Take of Threatened and Endangered Species.
[32] Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division.
[33] *See* Tetra Tech. 2010 Jun 11. Fall 2009 and Spring 2010 Biological Resources Technical Report for the Genesis Solar Energy Project. Table 2.
[34] Applicant's response to CURE Data Request #44; AFC, Bio Tech Report, p. 49.
[35] RSA, p. C.2-39 (emphasis added).
[36] RSA, p. C.2-86.

Sixth, the Carsitas soil series occurs in the Project area.[37] According to the Applicant, torrential summer thundershowers occasionally produce enough runoff to flood Carsitas soils for brief periods.[38] This suggests at least some of the soils in the Project area provide a suitable substrate for the formation of breeding ponds.

Finally, the RSA does not provide any information to justify its conclusion that the Project site is unlikely to support Couch's spadefoot toad breeding habitat, other than it is the Applicant's contention. The Applicant's contention has proven to be unreliable and is contradicted by the information presented above.

Since the issuance of the RSA, the Applicant has submitted the results of its Spring 2010 surveys. The results of the surveys confirm suitable breeding habitat for Couch's spadefoot toads occurs along the Project transmission line routes.[39] However, the critical limitations identified in the RSA have not been resolved. Specifically, appropriately timed surveys have not been conducted, and the Applicant has yet to provide reliable information on toad breeding habitat within the main Project site boundaries. Without reliable data, an accurate impact assessment cannot be developed, and without an accurate impact assessment, one cannot conclude that Staff's proposed mitigation to avoid impacts to breeding ponds would reduce Project impacts to less than significant levels. This is reflected in the RSA's discussion of impacts associated with the Colorado River Substation:

> Staff has concluded that SCE's proposed expansion of the Colorado River Substation has the potential to result in significant direct, indirect and cumulative impacts to biological resources, in particular for sensitive dune-dependent plant species such as Harwood's eriastrum. Avoidance, minimization and compensation measures such as those described in staff's proposed Conditions of Certification BIO-19 ***could*** potentially reduce these impacts to less than significant levels. However, implementation of the avoidance measures described in these conditions of certification would ***require site specific information*** about the location of proposed project features in relation to sensitive plant species. Staff does not currently have that project-specific information and therefore ***cannot address the feasibility of implementing effective avoidance measures*** as a means of reducing significant impacts.[40]

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[37] Tetra Tech. 2009 Aug. Survey for Jurisdictional Waters and Wetlands at the Genesis Solar Energy Project Eastern Riverside County, California. Appendix B.
[38] Id.
[39] Tetra Tech. 2010 Jun 11. Fall 2009 and Spring 2010 Biological Resources Technical Report for the Genesis Solar Energy Project. ES-1.
[40] RSA, p. C.2-126 (emphasis added).

The Applicant has indicated surveys (related to Couch's spadefoot toad) have been scheduled for summer or early fall 2010.[41] As a result, Staff does not have the necessary "site specific information" to adequately mitigate significant impacts to Couch's spadefoot toad habitat. Furthermore, I reserve the right to submit supplemental testimony on this topic after the Applicant has provided the information necessary to evaluate existing conditions, Project impacts, and mitigation measures for the Couch's spadefoot toad.

A. The RSA Does Not Ensure Mitigation of Project Impacts to the Couch's Spadefoot Toad

While mitigation for impacts to Couch's spadefoot toad is necessary, the measures proposed by Staff must be revised to ensure they achieve their intended purpose. Condition of Certification BIO-27 (BIO-27) requires the Applicant to prepare and implement a Couch's Spadefoot Toad Protection and Mitigation Plan (Protection and Mitigation Plan) to avoid, minimize or mitigate impacts to Couch's spadefoot toads and their breeding habitat during construction and operation of the Project.[42] As part of the Protection and Mitigation Plan, the Applicant is supposed to provide habitat surveys (including methods and results); an impact assessment; and avoidance, minimization and mitigation measures.[43] BIO-27 requires the Applicant to submit the final Protection and Mitigation Plan no less than 30 days prior to construction-related ground-disturbance.[44]

The RSA establishes that Project mitigation plans "***cannot defer establishing reasonable performance standards and goals.***"[45] These plans "***must explicitly state***" the goals and they must provide guidelines for developing milestones and specific, quantitative success criteria.[46] Furthermore, they must establish thresholds that would trigger remedial actions, and provide information on what those remedial actions would be.[47] The plans should also provide an approximate outline and schedule for monitoring the success of the effort.[48] BIO-27 lacks many of these elements, which the RSA has established cannot be deferred to the future.

If complete avoidance of the pond south of I-10 or other breeding sites identified during yet to be conducted surveys is not possible, BIO-27 requires the Applicant to create "additional breeding habitats (ephemeral pond) at least equal in

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[41] Tetra Tech. 2010 Jun 11. Fall 2009 and Spring 2010 Biological Resources Technical Report for the Genesis Solar Energy Project. p. 17.
[42] RSA, p. C.2-276.
[43] Id., p. C.2-276, 277.
[44] Id., p. C.2-277.
[45] Id., p. C.2-123 (emphasis added).
[46] Id.
[47] Id., p. C.2-124.
[48] Id.

area to the acreage of ponds being impacted."[49] BIO-27 does not ensure mitigation of Project impacts to Couch's spadefoot toad for the following reasons.

1. BIO-27 Does Not Meet the Habitat Requirements of the Couch's Spadefoot Toad

Couch's spadefoot toads have three principal habitat requirements.[50] The mitigation proposed in BIO-27 addresses only *one* of these habitat requirements, and provides *no assurance* that this single habitat requirement will be met. Specifically, the only habitat requirement addressed by Staff's proposed mitigation is the need for the Applicant to create ponds capable of holding water for at least nine days during the spadefoot toad breeding season. Furthermore, the "breeding season" has been only loosely defined, and criteria for establishing it need to be provided in Staff's mitigation. Because BIO-27 does not require the created ponds to have water temperatures >15 ºC, there is no assurance they will serve as suitable breeding sites.

Further, Staff's proposed mitigation has no provision for subterranean refuge sites or a sustainable food base—the other two habitat requirements for Couch's spadefoot toads.[51] These criteria must be incorporated into BIO-27 for the mitigation measure to have a reasonable possibility of success. Moreover, the proposed mitigation lacks any discussion of where created ponds would be located how they would be conserved in perpetuity, a funding mechanism for their creation, preservation, and management; and the water supply for meeting Staff's condition that they hold water for a minimum of nine days.

2. Performance Criteria Central to Reserve Design Are Not Incorporated into the Mitigation Scheme

The RSA suggests water quality, vehicle noise, and other anthropogenic disturbances may negatively affect Couch's spadefoot toads.[52] BIO-27 does not require the Applicant's mitigation to meet any minimum standards associated with these potentially influential variables. In addition, BIO-27 does not establish performance criteria for any of the issues (or considerations) central to reserve design. These include site selection, corridors, buffers, isolation, and fragmentation.[53] As noted by Staff, the Genesis Project is located at the western

[49] Id., p. C.2-277.
[50] Jennings MR, MP Hayes. 1994. Amphibian and reptile species of special concern in California. Rancho Cordova, CA: California Dept. of Fish and Game, Inland Fisheries Division.
[51] Id.
[52] RSA, p. C.2-39.
[53] Morrison ML. 2002. Wildlife restoration: techniques for habitat analysis and animal monitoring. Washington (DC): Island Press.

edge of the Couch's spadefoot toad range.[54] Thus, any ponds that are created west of existing breeding ponds (i.e., outside the species' range) may be of no value to the existing population of spadefoots.[55]

3. Mitigation Does Not Impose Limits on Patch Size

Scientists that developed the California Wildlife Habitat Relationship model considered patch size to be an important consideration in habitat suitability for Couch's spadefoot toads.[56] In particular, once a certain patch size is reached, area alone does not increase habitat suitability. This is especially important because Staff's proposed mitigation does not require the Applicant to replicate the distribution and number of pools impacted by the Project; the condition only requires that mitigation be implemented for those acres that are impacted (e.g., the Applicant could create one "mega" pool to replace impacts to 10 well-distributed pools). Because distribution and abundance of pools may affect overall habitat suitability for Couch's spadefoot toads, minimum standards associated with them need to be incorporated into Staff's mitigation.

4. Potentially Significant Adverse Impacts of BIO-27

The RSA suggests the proposed mitigation may require ground disturbance (for example, soil compaction).[57] However, it does not appear to require an environmental impact analysis for the associated ground disturbance activities, habitat conversion, or water use (if an artificial water source is used). At a minimum, these elements of BIO-27 must be evaluated to ascertain whether there are any potentially adverse impacts stemming from Staff's proposed mitigation.

5. Monitoring Requirements

A management approach (e.g., creation of spadefoot toad breeding ponds) that is unsubstantiated by research is, in essence, a management experiment. Therefore, in the absence of empirical information, it cannot be relied on as a management solution. A rigorous monitoring program with built-in adaptive management measures is almost always necessary to achieve the desired outcome.[58]

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[54] RSA, p. C.2-86.

[55] Due to limitations in survey data, the precise border of the species' range is unknown. However, the example provided illustrates the need to consider variables central to reserve design when designing mitigation for the Couch's spadefoot toad.

[56] Laudenslayer WF Jr, California Department of Fish and Game. 2007. Species Notes for Couch's Spadefoot (*Scaphiopus couchii*): California Wildlife Habitat Relationships (CWHR) System Level II Model Prototype. Available at: nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=7135

[57] RSA, p. C.2-277.

[58] Morrison ML. 2002. Wildlife restoration: techniques for habitat analysis and animal monitoring. Washington (DC): Island Press.

However, the monitoring program established by the RSA lacks rigorous monitoring or adaptive management.

To establish an effective monitoring program, the parameters for monitoring need to reflect the goal(s) of the management action. In this case, Staff's goal is to mitigate Project impacts to Couch's spadefoot toads and their breeding habitat by creating substitute breeding habitat if avoidance is not possible. However, the only established monitoring requirement is to ensure created ponds hold water for at least nine days during the spadefoot toad breeding season.[59] The difference is subtle but extremely significant: the goal is to create substitute breeding habitat, ***not*** to create a pond that holds water for nine days (i.e., not all ponds that hold water for nine days provide breeding habitat). Therefore, Staff must incorporate monitoring that confirms spadefoot toads are breeding in any pond habitat that is created as mitigation.

IV. ADDITIONAL DATA IS NECESSARY TO ESTABLISH A COMPENSATORY MITIGATION PLAN

The RSA requires the Applicant to acquire compensation land in order to offset some of the Project's potentially significant impacts to biological resources.[60] However, Staff cannot conclude Project impacts would be fully mitigated by compensatory mitigation until details of the compensation plan have been provided by the Applicant. Such details would, at a minimum, include: the location and environmental qualities associated with the proposed compensation lands; an evaluation of the degree of disturbance, dumping, and historical structures (among other factors) that may require cleaning, fencing, repair, or demolition; the timeframe associated with the aforementioned work (if required) and whether additional lands or monies will be required to off-set the aforementioned impediments; and an evaluation of the threats and limiting factors at the compensation lands, including a discussion of how the threats and limiting factors affect desert tortoise populations and other sensitive biological resources for which the compensation lands are intended.[61]

A monitoring and adaptive management process is necessary to ensure compensation lands fully mitigate Project impacts. The RSA lacks criteria or an enforcement mechanism for this process. To ensure Project impacts are fully mitigated, expectations for long-term monitoring of compensation lands must be incorporated into the impact mitigation plan, including expectations for the establishment of success criteria and the triggers for implementing adaptive

[59] RSA, p. C.2-277.
[60] RSA, p. C.2-231.
[61] *See*, *e.g.*, Memorandum from Heather Blair, Energy Commission Staff Biologist (Aspen Environmental Group) to Craig Hoffman, Energy Commission Project Manager, February 5, 2010 regarding Abengoa Mojave Solar – Project time-sensitive issues and informational needs, attached hereto as Attachment 4.

management. These expectations should incorporate a timeframe appropriate to the desert ecosystem, baseline and desired conditions of the acquisition site, and the increases in relative abundance that will result from habitat enhancement.

Lastly, desert habitat enhancement costs can be expensive.[62] The cost of comprehensive rehabilitation may exceed $10,000 per acre. In 1999, "modest" rehabilitation techniques implemented to expedite natural recovery reportedly cost $500 to $2,000 an acre.[63] These costs suggest that few habitat enhancement (or protection) measures can be accomplished with Staff's required funding of approximately $330/acre.[64] Although Staff recognizes that actual costs for habitat enhancement may vary,[65] $330/acre does not even come close to the possible $10,000/acre that may be needed.

V. THERE IS NO ASSURANCE THAT COMPENSATORY MITIGATION WILL OFFSET IMPACTS TO SPECIAL-STATUS BATS, AMERICAN BADGER AND KIT FOX

A. Special-Status Bats

According to the RSA,

> The Project site supports foraging and roosting habitat for several special-status bat species. Roosting opportunities for bats are available in tree cavities, soil crevices and rock outcroppings primarily within dry desert wash woodland habitats. Bats likely utilize habitats throughout the study area for foraging but forage more commonly when water is present within the desert washes when insects are more abundant. Implementation of the Project would result in loss of these foraging and roosting habitat opportunities for special-status bats that might occur in the Project area. As discussed in the cumulative impact subsection, staff considers the Genesis Project to be a substantial contributor to the cumulative loss of in the NECO Planning Area's biological resources, including habitat for these special-status bats. Staff's proposed Condition of Certification BIO-12, the desert tortoise compensatory mitigation plan and BIO-22, mitigation for impacts to state waters, would offset the cumulative loss of habitat for these species.[66]

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[62] *See* Hailey J, and D Bainbridge. 1999. Desert Restoration: Do something or wait a thousand years? [abstract] Mojave Desert Science Symposium; 1999 Feb 25-27, Las Vegas. USGS, Western Ecological Research Center [internet]. Available from: http://www.werc.usgs.gov/mojave-symposium/

[63] *Id.*

[64] RSA, p. C.2-232.

[65] Id.

[66] Id., p. C.2-91.

Staff's proposed Condition of Certification BIO-12 and BIO-22 would not necessarily offset the cumulative loss of habitat for special-status bat species. As noted in the RSA, roosting opportunities for bats are available in tree cavities, soil crevices and rock outcroppings.[67] The Project would eliminate these roosting habitat opportunities.[68] Because BIO-12 and BIO-22 do not require that compensation lands contain bat roosting substrate (i.e., tree cavities, soil crevices and rock outcroppings), Staff cannot conclude the proposed mitigation would reduce impacts to a less than significant level.

B. American Badger and Kit Fox

Staff concluded the Project would be a substantial contributor to the cumulative loss of the NECO Planning Area biological resources, including American badgers and kit fox. Specifically, the Project would permanently remove approximately 1,811 acres of foraging and denning habitat for American badgers and kit foxes and would fragment and reduce the value of foraging and denning habitat adjacent to the Project site.[69] However, with respect to these two species, Staff was only able to conclude proposed mitigation measures ***could*** offset the loss of habitat and reduce the Project impact to less-than-significant.[70] As a result, Project mitigation needs to be strengthened such that it ***will*** reduce the Project impact to less-than-significant.

VI. MITIGATION FOR POTENTIALLY SIGNIFICANT NOISE IMPACTS ON BIRDS IS INADEQUATE

The RSA requires avoidance of loud construction activities (e.g., unsilenced high pressure steam blowing and pile driving, or other) from February 15 to April 15 when it would result in noise levels over 60 dBA in nesting habitat.[71] Sixty dBA is not a sufficient no-effect threshold. Research on the effects of noise on birds indicates large intra and inter-species variations. [72] Site-specific assessments are therefore necessary to demonstrate site and species-specific thresholds. Because such assessments have not been conducted, the RSA has no basis to conclude noise levels up to 60 dBA would not result in significant impacts to nesting birds.

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[67] RSA, p. C.2-91.
[68] Id., p. C.2-91.
[69] Id. at p. C.2-92.
[70] Id., p. C.2-92.
[71] RSA, p. C.2-223.
[72] National Park Service. 1994. Report to Congress: Report on effects of aircraft overflights on the National Park System; Larkin R. 1996. Effects of military noise on wildlife: A literature review. USA CERL Technical Report [internet; cited 28 Sep 2008]. Available from: http://nhsbig.inhs.uiuc.edu/bioacoustics/noise_and_wildlife.pdf; Manci KM, DN Gladwin, R Villella, MG Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. National Ecology Research Center Report # NERC-88/29.

To the contrary, research on the effects of traffic noise on breeding birds concluded ambient noise up to a given level resulted in no reduction in the density of bird populations.[73] However, once an ambient noise threshold level was exceeded, densities decreased exponentially with increased noise.[74] Threshold levels were found to range from 36 to 58 decibels, depending on the species.[75] The results of this research were supported by Reijnen et al. (1997), who concluded sound levels above 50 dBA could be considered potentially deleterious to breeding birds. The average distance (from the source of noise) at which an effect was observed in the Reijnen et al. study was reported to be 1,000 m (3,280 feet).[76]

Furthermore, California Partners in Flight (2009) reports the avian breeding season in the Colorado Desert as extending from January 15 to July 15, with peak of egg initiation occurring on April 8.[77] Therefore, the RSA has proposed mitigation for only two of the six months during which Project noise is likely to impact nesting birds. In addition, due to inter-species variation in nesting chronology, Staff's proposed mitigation would be ineffective for some species. For example, the California Department of Fish and Game reports the peak breeding season for prairie falcons (a special-status species that breeds in the Project region)[78] as occurring from April to early August (i.e., generally outside of the dates Staff has required mitigation for noise impacts).[79] Therefore, Staff's proposed mitigation should be revised to require the Applicant to avoid loud construction activities from January 15th to August 15th.

The RSA concluded "[t]he infrequent occasions when construction activities would occur near the project boundary and resultant noise levels would be temporarily elevated beyond 60 dBA surrounding the project would not significantly impact sensitive wildlife."[80] The RSA's conclusion is not supported by scientific literature. In addition, the conclusion contravenes the RSA's discussion of potential Project impacts on golden eagles. Many wildlife species are more susceptible to

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[73] Kaseloo PA. 2006. Synthesis of noise effects on wildlife populations. IN: Proceedings of the 2005 International Conference on Ecology and Transportation, Eds. Irwin CL, Garrett P, McDermott KP. Center for Transportation and the Environment, North Carolina State University, Raleigh, NC: pp. 33-35.
[74] Id.
[75] Id.
[76] Reijnen R, R Foppen, G Veenbaas. 1997. Disturbance by traffic of breeding birds: evaluation of the effect and planning and managing road corridors. Biodiversity and Conservation 6: 567-581.
[77] CalPIF (California Partners in Flight). 2009. Version 1.0. The Desert Bird Conservation Plan: a Strategy for Protecting and Managing Desert Habitats and Associated Birds in California. California.
Partners in Flight. http://www.prbo.org/calpif/plans.html.
[78] RSA, p. C.2-44.
[79] California Wildlife Habitat Relationships System. 2005. California Department of Fish and Game. California Interagency Wildlife Task Group. CWHR version 8.1 personal computer program. Sacramento (CA).
[80] RSA, p. C.2-93.

adverse effects from "startle" due to impulsive noises, rather than "annoyance" due to a change in overall noise levels.[81] In discussing potential Project impacts to golden eagles, the RSA indicated a nestling being knocked from the nest by a *startled* adult would be considered an injury, and a nestling fed inadequately because adults were agitated due to construction-related noise and activity would also be considered substantial interference.[82] Both examples constitute "take" under the Bald and Golden Eagle Protection Act, and thus would be considered a significant impact. Accordingly, appropriate mitigation measures need to be developed to avoid and minimize the adverse effects associated with all Project noise regardless of its duration.

VII. THE PROJECT WOULD RESULT IN POTENTIALLY SIGNIFICANT IMPACTS TO GOLDEN EAGLES

A. The RSA Fails to Establish Existing Conditions for Golden Eagles

The USFWS has established *minimum* inventory and monitoring efforts that "are essential components" to avoiding and minimizing disturbance and other kinds of take of golden eagles.[83] The USFWS reports "[t]hese field efforts are the mutual responsibility of agencies authorizing activities and their permittees."[84]

The RSA indicates that the Applicant participated in funding helicopter surveys for golden eagle nests, but to date the results of the surveys are not available.[85] I concur with the USFWS that inventory data are essential to evaluating the impacts of a proposed activity and for avoiding and minimizing take of eagles. Consequently, data that conform to the minimum inventory requirements specified by the USFWS need to be provided before the RSA's proposed mitigation measures can be evaluated. I reserve the right to provide additional testimony on this topic after the Applicant has provided the requisite golden eagle inventory data.

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[81] National Park Service. 1994. Report to Congress: Report on effects of aircraft overflights on the National Park System; Larkin R. 1996. Effects of military noise on wildlife: A literature review. USA CERL Technical Report [internet; cited 28 Sep 2008]. Available from: http://nhsbig.inhs.uiuc.edu/bioacoustics/noise_and_wildlife.pdf; Manci KM, DN Gladwin, R Villella, MG Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. National Ecology Research Center Report # NERC-88/29.

[82] RSA, p. C.2-89.

[83] Pagel JE, DM Whittington, GT Allen. 2010 Feb. Interim Golden Eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Birds, United States Fish and Wildlife Service. p. 2.

[84] Id.

[85] RSA, p. C.2-42.

B. The RSA Fails to Provide Adequate Mitigation for Potentially Significant Project Impacts to Golden Eagles

Staff concluded that Project construction activities could potentially injure or disturb golden eagles if nests were established sufficiently close to Project boundaries to be affected by the sights and sounds of construction.[86] However, Staff concluded this impact would be reduced to less than significant levels through implementation of a Golden Eagle Monitoring and Management Plan ("BIO-28"). The triggers identified in this proposed mitigation include "evidence of Project-related disturbance to nesting golden eagles, including but not limited to: agitation behavior (displacement, avoidance, and defense); increased vigilance behavior at nest sites; changes in foraging and feeding behavior, or nest site abandonment."[87] Adaptive management is an important part of a monitoring program, but the triggers identified by Staff constitute disturbance, which is considered a take and prohibited under the Bald and Golden Eagle Protection Act ("Eagle Act").[88] If Project-related disturbance to golden eagles is a possibility, the Applicant needs to apply for a take permit and receive authorization from the USFWS. Aside from this issue, the adaptive management measures discussed by Staff are *reactive* (i.e., implemented after disturbance has occurred). Given the sensitivity and apparent decline of eagle populations in the West, Staff should require measures that are *proactive* (i.e., designed to avoid a disturbance).

Staff assessed the impacts of the Project to golden eagle foraging habitat, and concluded that the Project would contribute to the cumulative loss of golden eagle foraging habitat within the NECO planning area.[89] In addition, Staff concluded the Project would reduce the availability of foraging habitat in the Project area and could degrade foraging habitat through the introduction and spread of noxious weeds and an increase in human activity in the area.[90] With respect to these impacts, the RSA states:

> The potential for impacts to golden eagle foraging habitat can be minimized by the implementation of staff's proposed Conditions of Certification BIO-12 (acquisition of desert tortoise compensatory mitigation lands), BIO-22 (acquisition of state waters compensatory mitigation lands) BIO-14 (implementation of Weed Management Plan). As described in BIO-12, the acquisition of desert tortoise mitigation lands would be targeted for areas within and near the Chuckwalla Bench and the Chuckwalla DWMA. Because these targeted areas are

[86] RSA, p. C.2-89.
[87] Id., p. C.2-278.
[88] *See* Pagel JE, DM Whittington, GT Allen. 2010 Feb. Interim Golden Eagle inventory and monitoring protocols; and other recommendations. Division of Migratory Birds, United States Fish and Wildlife Service. p. 2-3.
[89] RSA, p. C.2-90.
[90] Id., p. C.2-90.

> also within 10 miles of potential nesting sites for golden eagles, acquisition of these desert tortoise mitigation lands would also provide protected golden eagle foraging grounds.[91]

I have the following comments related to these statements:

First, the RSA has not made any conclusions regarding the significance of Project impacts after the proposed conditions (i.e., BIO-12, BIO-14, and BIO-22) have been implemented. I suspect this is because Staff *cannot* make any conclusions on significance until robust inventory data have been provided. It is my professional opinion that without the inventory data, one cannot conclude the proposed mitigation will reduce potentially significant Project impacts on golden eagles.

Second, acquisition of desert tortoise and state waters within 10 miles of *potential* nesting sites for golden eagles does not necessarily mitigate Project impacts. To help stem the decline in eagle populations, acquisition lands need to be within the foraging territory of *actual* nesting sites.

Third, research indicates golden eagles selectively use available habitat, and that they concentrate their foraging activities in select "core" areas.[92] In a study on spatial use and habitat selection of golden eagles in Idaho, Marzluff et al. (1997) concluded that there was substantial variation in home range size and habitat use among eagles, and that if such variation was ignored (by focusing on population averages), conservation strategies and biological descriptions will be inaccurate and rarely effective.[93] During the breeding season, eagles in Marzluff's study had home ranges as small as 480 acres, with 95% of the activity concentrated in core areas as small as 74 acres.[94] Home range size and behavior were a function of the types and configuration of prey habitat in the vicinity of the nest, and perhaps individual eagles.[95]

The results of this research have two important implications on the Project. First, in the absence of more appropriate empirical data, one should conclude Marzluff's results apply to the Project site, and thus the Project could eliminate a substantial amount of core habitat (perhaps all) used by at least one pair of breeding eagles. Under CEQA guidelines, such an impact is "substantial" and significant. Second, whereas acquisition of compensation land may help conserve foraging habitat for *some* eagle(s), it may be of little consequence to *the* eagle(s) whose core habitat has been eliminated by the Project. This is important because

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[91] Id.
[92] Marzluff JM, ST Knick, MS Vekasy, LS Schueck, TJ Zarriello. 1997. Spatial use and habitat selection of golden eagles in southwestern Idaho. The Auk 114(4):673-687.
[93] Id.
[94] Id.
[95] Id.

not all eagles contribute equally to maintenance of the population.[96] For example, if all the suitable nest locations are fully-occupied, impacts leading to abandonment of a territory (either through destruction of the nest substrate or through not being re-occupied by either the original nesting pair or a new pair from the floater population) may have a significant negative impact to the area population.[97] Available prey base or intra-species competition may be additional relevant factors.[98]

Finally, The USFWS' Interim Golden Eagle Inventory and Monitoring Protocol[99] provides excellent recommendations for avoiding and minimizing take of golden eagles, and strong scientific (and legal) justification for implementing the recommended measures. In lieu of reproducing the content of the recommendations in my testimony, I have provided the USFWS Interim Golden Eagle Inventory and Monitoring Program as Attachment 5 to this testimony. The Commission should implement the recommendations in the USFWS' Interim Golden Eagle Inventory and Monitoring Protocol to conserve the golden eagle population and ensure Project compliance with the Eagle Act.

VIII. THE PROJECT WOULD RESULT IN POTENTIALLY SIGNIFICNAT IMPACTS TO NELSON'S BIGHORN SHEEP, BURRO DEER, AND YUMA MOUNTAIN LION

Nelson's bighorn sheep, burro deer, and Yuma mountain lion are special-status species that occur, or have the potential to occur in the Project area.[100]

A. Nelson's Bighorn Sheep

Staff has concluded that the Project site does not represent significant direct or indirect impacts to bighorn sheep habitat connectivity or foraging.[101] These conclusions were at least in part based on (1) the lack of sign or evidence of Nelson's bighorn sheep during field surveys; and (2) the Project Area not being within a known bighorn sheep corridor as identified in the NECO Plan.[102] These reasons do not provide sufficient rationale to conclude the Project would not cause significant impacts.

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[96] US Fish and Wildlife Service, Division of Migratory Bird Management. 2009. Final Environmental Assessment, Proposal to Permit Take. Provided Under the Bald and Golden Eagle Protection Act. Washington: Dept. of Interior.
[97] US Fish and Wildlife Service, Division of Migratory Bird Management. 2009. Final Environmental Assessment, Proposal to Permit Take. Provided Under the Bald and Golden Eagle Protection Act. Washington: Dept. of Interior.
[98] Id.
[99] Pagel et al. 2010.
[100] RSA, Biological Resources Table 3.
[101] Id., p. C.2-92.
[102] Id., p. C.2-47.

Specifically, bighorn sheep are known to opportunistically, and unpredicatably use habitat. Bighorn sheep are a naturally wary animal that is difficult to observe, even when present. Although sign (e.g., fecal pellets, tracks) can be used as an index of presence, the ability to detect it is subject to favorable environmental conditions (e.g., absence of wind, rain, or anthropogenic distrubance). Through my own scientific research on the Peninsular bighorn sheep, I have observed abundant bighorn sheep sign at my study site during one week, and a complete lack of sign at the ***same*** study site during the subsequent week following a rain event. Because the Applicant's surveys of the main Project site were conducted within a very narrow timeframe during the spring of 2009, chance alone would dictate a low probability of bighorn sheep detection, even if animals use the site.

In addition, during spring 2009 field surveys, the Applicant reported detecting tracks of burro deer in one location south of I-10 along the southern transmission line route.[103] Burro deer tracks were also reported along the transmission line and buffer area during spring 2010 field surveys.[104] It can be nearly impossible to distinguish deer tracks from bighorn tracks. It's unclear whether Staff considered this fact in formulating the conclusion that bighorn sheep sign were not observed during field surveys.

Without supporting information, the Project Area not being within a known bighorn sheep corridor as identified in the NECO Plan means very little. According to the NECO Plan, "[t]hese areas were mapped during a NECO workshop of several Bighorn Sheep biologists in June of 1997."[105] Additionally, Staff, the Applicant, and BLM have all indicated that the habitat modeling procedures used for the NECO Plan are inferior (in accuracy) to ground-based and field-verified delineation of habitats.[106] Thus, the NECO Plan is not evidence that the Project will not significantly impact bighorn sheep.

Finally, the conclusion presented in the RSA conflicts with the Applicant's conclusion regarding the Project's impacts to bighorn sheep. The Applicant concluded that the cumulative development of foreseeable projects ***would*** result in large-scale habitat loss and fragmentation that would potentially cause significant cumulative impacts to biological resources, including bighorn sheep.[107]

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[103] Id.
[104] Id.
[105] BLM and CDFG. 2002. Final Environmental Impact Statement. Proposed Northern & Eastern Colorado Desert Coordinated Management Plan. Bureau of Land Management, California Desert, Riverside, CA. Appendix H.
[106] RSA, p. C.2-160.
[107] AFC, p. 5.3-33.

B. Burro Deer

The RSA concluded burro deer movement between the eastern portion of Ford Dry Lake and the Palen Wash ironwood forest would be impacted by the proposed Project.[108] However, the RSA further concluded the impact is not expected to be significant "because the importance of this linkage is already compromised by OHV and other human disturbance from the Wiley Well Rest Stop, and because the western portion of the ROW will be returned to BLM, thus allowing continued movement upslope into the Palen Wash and Palen Mountain Range from the west."[109]

The RSA's conclusion is contradicted by statements within the RSA itself. First, the RSA states "Ford Dry Lake and Dunes were formerly designated for OHV recreation, but now are closed to vehicles; therefore staff does not anticipate a significant increase in OHV use elsewhere in desert tortoise habitat as a result of the proposed Project."[110] Second, the RSA states "[t]he remote location of the site and the BLM's existing OHV use restrictions limit the direct impacts to these recreation uses."[111] Finally, the RSA states "[t]he GSEP site currently consists of largely undisturbed desert land."[112] Thus, the RSA's conclusion that the Project will not significantly impact burro deer movement is unsupported.

C. Yuma Mountain Lion

The Yuma mountain lion is a California Species of Special Concern. The RSA concluded the Yuma mountain lion likely uses the Project site.[113] However, the RSA lacks any discussion of Project impacts to the species, including whether mitigation is necessary to offset potentially significant impacts.

The Yuma mountain lion is a keystone species (a species that makes an unusually large contribution to community structure or processes).[114] Furthermore, because it regularly travels long distances, it can be used as a focal species in assessing landscape-level connectivity. With respect to the Project's impact on connectivity, the RSA concludes:

> The combined effect of the Project and all existing and probable future projects in NECO on connectivity within Chuckwalla Valley and the Palen-Ford WHMA is significant and thus the Project will contribute,

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[108] RSA, p. C.2-156.
[109] RSA, p. C.2-156.
[110] Id., p. C.2-195.
[111] Id., p. C.6-27.
[112] Id., p. C.6-4.
[113] Id., p. C.2-61.
[114] Meffe GK, CR Carroll. 1997. Principles of Conservation Biology, 2nd edition. Sinauer Associates, Inc., Sunderland, MA.

> at least incrementally, to a cumulatively considerable effect. The requirement in BIO-20 and BIO-22 to acquire habitat within Chuckwalla Valley and within the identified connectivity linkages would reduce the Project's contribution to cumulative effects to connectivity in Chuckwalla Valley and the Palen-Ford WHMA to a level less than cumulatively considerable.[115] Mitigation for cumulative effects to connectivity could be enhanced if desert tortoise acquisitions were targeted for areas that would enhance wildlife connectivity within the same WHMA and corridor, as described in Biological Resources Appendix B. Kit foxes, coyotes, and badgers are not NECO species and were not the reason for the establishment of the WHMAs; however, the acquisition of lands within the connectivity linkages described in Appendix B would also benefit kit fox, coyote, badger, and burro deer.[116]

The rationale used to support the conclusion that Staff's proposed mitigation would reduce impacts to a level less than cumulatively considerable is unsupported for several reasons. First, BIO-20 does not appear to require acquisition of habitat within an "identified" connectivity linkage. Second, BIO-22 does not require acquisition of habitat within the Chuckwalla Valley and within the "identified" connectivity linkages. Third, the RSA ***recommends***, but does not ***require***, the Applicant to acquire lands identified in Biological Resources Appendix B. Finally, the RSA enables the Applicant to satisfy mitigation requirements through fee payment instead of acquiring compensation lands. Thus, significant impacts to connectivity that may occur as a result of the Project remain unmitigated.

IX. THE PROJECT WILL RESULT IN SIGNIFICANT IMPACTS TO MOJAVE FRINGE-TOED LIZARD

The RSA indicates that the Project would indirectly affect 151 acres of Mojave fringe-toed lizard habitat downwind of the Project Disturbance Area.[117] The Applicant disagrees with Staff's assessment of the indirect impacts to Mojave fringe-toed lizard habitat, and asserts that the downwind "sand shadow" area that Staff considered affected by intrusion into the Palen-McCoy Valley Sand Transport Corridor does not provide suitable habitat for Mojave fringe-toed lizards.[118] Although the Applicant's assertion conflicts with the scientific literature,[119] and although the RSA identifies numerous flaws with the Applicant's argument, Staff

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[115] RSA, p. C.2-157.
[116] RSA, p. C.2-158.
[117] Id., p. C.2-1.
[118] Id., p. C.2-75.
[119] *See* Cablk ME, JS Heaton. 2002 Nov. Mojave Fringe-Toed Lizard surveys at the Marine Corps Air Ground Combat Center at Twentynine Palms, California and nearby lands administered by the Bureau of Land Management. California: Marine Corps Air Ground Combat Center. Report M67399-00-C-0005. 115 p.

has indicated it is willing to reconsider conclusions about the suitability of the 151 acres if the Applicant is able to provide additional information.[120] The information in the record clearly indicates the 151 acres in question *are* Mojave fringe-toed lizard habitat. As such, a reversal of Staff's assessment would constitute a remarkable change to the Project description, impact assessment, and mitigation measures. Consequently, I reserve the right to provide additional testimony on this topic once Staff has made a final decision on the issue.

The RSA provides a relatively thorough discussion of the numerous indirect impacts of the Project on Mojave fringe-toed lizard habitat. These include mortality from vehicle strikes; introduction and spread of invasive plants; erosion and sedimentation of disturbed soils; fragmentation and degradation of remaining habitat; increased road kill hazard from operations traffic; harm from accidental spraying or drift of herbicides and dust suppression chemicals; and an increase in access for avian predators (such as loggerhead shrikes) due to new perching structures.[121] In addition, the Project's effect on sand transport is expected to gradually eliminate habitat for Mojave fringe-toed lizards in downwind areas.[122] The Mojave fringe-toed lizards in the Chuckwalla Valley are at the southernmost portion of the species range, and the proposed Project could increase the risks of local extirpation of an already fragmented and isolated population.[123]

Staff notes that in many cases, "the anticipated indirect impacts are more significant, or adverse, then the direct loss of habitat."[124] In this case, the Project would result in numerous indirect impacts, which would predictably be severe on Mojave fringe-toed lizard populations. Nonetheless, Staff has recommended a mitigation ratio of only 0.5:1 for indirect impacts to habitat.[125] This ratio needs to be increased to at least 1:1 so that it is commensurate with the predicted impacts and Staff's conclusion on the severity of those impacts.

X. THE PROJECT POSES POTENTIALLY SIGNIFICANT UNMITIGATED IMPACTS TO SPECIAL-STATUS PLANTS

Based on consultation with recognized experts in the flora of the California Desert region, Staff concluded that late season surveys must be conducted to determine the Project's potentially significant impacts to special-status plants.[126] I concur. However, I disagree with Staff's conclusion that the RSA's proposed mitigation will reduce potentially significant impacts to special-status plants.

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[120] RSA, p. C.2-76.
[121] RSA, p. C.2-75.
[122] Id., p. C.2-205.
[123] Id.
[124] Id., p. C.2-173.
[125] Id., p. C.2-68.
[126] Id., p. C.2-101.

Without reliable information on the species that occur—and as a result, the level and types of Project impacts on those species—the RSA cannot conclude proposed mitigation would reduce Project impacts to less than significant levels. A conclusion of this nature would rely on the presumption that all impacts can be mitigated to a less than significant level. Such a presumption is unrealistic for two reasons. First, it is difficult to predict the outcomes of surveys due to the new and unexpected discoveries that have been occurring in the desert (and thus the inability to pre-assign mitigation). Second, the flora of the Desert Floristic Province is poorly understood and therefore surveys may yield completely unexpected results that cannot be mitigated by standard conditions.

The RSA acknowledges these limitations. In reference to plant species that may occur in the location of the proposed Colorado River Substation expansion, it states,

> implementation of the avoidance measures described in these conditions of certification would require site-specific information about the location of proposed project features in relation to sensitive plant species. Staff does not currently have that project-specific information and therefore ***cannot address the feasibility of implementing effective avoidance measures*** as a means of reducing significant impacts.[127]

I agree with Staff's conclusion that it is impossible to determine the feasibility of avoidance measures without the knowing the location of Project features in relation to special status plant species. The location of special status plant species in relation to the Project footprint will be unknown until fall surveys are conducted. As a result, Staff cannot conclude that proposed mitigation will reduce the Project's potentially significant impacts on special-status plants. In addition, I reserve the right to provide additional testimony on this topic once the Applicant has provided the fall survey data necessary to evaluate the feasibility of implementing effective avoidance measures as a means of reducing significant impacts.

XI. THE RSA DOES NOT ADEQUATELY ESTABLISH THE BASELINE FOR GROUNDWATER-DEPENDENT VEGETATION COMMUNITIES THAT WILL BE POTENTIALLY IMPACTED BY THE PROJECT

The RSA states that the "study area" supports desert wash dry woodland, a vegetation community characterized by the presence of groundwater-dependent, or "phreatophytic" plant species. Desert dry wash woodlands are designated a special natural community by the California Department of Fish and Game (CDFG) and the Bureau of Land Management (BLM), and they are designated as Waters of the State.[128] Although the RSA does not clearly define the "study area," it cites to the

[127] RSA, p. C.2-126.
[128] Id., p. C.2-17.

AFC and suggests that the "study area" refers to the area surveyed for the Project.[129] I searched the Biological Resources section of the AFC[130] and the Biological Resources Technical Report[131] submitted by the Applicant, and neither document defines the study area. For the public and resources agencies to be able to analyze the environmental effects of the Project, the "study area" considered in Staff's analysis needs to be defined.

The RSA states that the Project pumping impact zone "includes an area extending 2 to 3 miles from the Project pumping well during construction and approximately 10 miles by the end of the Project operation."[132] The RSA depicts a substantial amount of desert wash dry woodland within a 10-mile radius of the Project.[133] Additionally, an old growth desert ironwood (*Olneya tesota*) stand, a documented groundwater-dependent, keystone species[134] within the Sonoran Desert ecosystem, is located approximately five miles north of the Project site.[135] Field data submitted by the Applicant does not indicate that these desert dry wash woodland communities were included in the study area. Therefore, neither the Applicant nor Staff have provided a thorough assessment of the groundwater-dependent vegetation communities that may be affected by the Project.

XII. THE RSA HAS NOT RESOLVED SUBSTANTIAL UNCERTAINTIES REGARDING THE PROJECT'S SHORT- AND LONG-TERM IMPACTS ON GROUNDWATER-DEPENDENT RESOURCES

A. Hydrologic Associations Between Chuckwalla Valley Aquifers and Communities of Groundwater Dependent Vegetation

Throughout the RSA, Staff repeatedly points to the overwhelming uncertainties associated with the Project's predicted influence on groundwater resources and the consequent impacts on groundwater-dependent vegetation communities. The Applicant has used reports by Worley Parsons[136] to support its assertion that groundwater pumping for the construction and operation of the Project will not adversely affect the shallow-water aquifer on which groundwater-dependent plant species rely. While I am not testifying on the scientific findings of

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[129] Id., p. C.2-14.
[130] Genesis Solar Energy Project/T. Bernhardt . (2009) Application for Certification for the Genesis Solar Energy Project. Submitted to California Energy Commission Docket Unit on August 31, 2009.
[131] Genesis Solar Energy Project Biological Resources Technical Report (2009). Prepared by Tetra Tech EC, Inc. August 2009.
[132] RSA, p. C.2-117.
[133] RSA, Biological Resources Figure 11-B.
[134] Suzan, Humberto, Gary P. Nabhan, and Duncan T. Patten. (1996) The Importance of Olneya tesota as a Nurse Plant in the Sonoran Desert. *Journal of Vegetation Science*, 7(5), 635-644.
[135] RSA, p. C.2-118.
[136] WorleyParsons (2009) *Technical Memorandum - Groundwater Resources Cumulative Impact Analysis for Genesis Solar Power Project*, Riverside County, CA.

these reports, it is pertinent to underscore that both Staff and Worley Parsons have expressed widespread uncertainty in the information that has been presented.

The Applicant asserts that due to geologic formations termed "low permeability layers," Project groundwater pumping from deep aquifers will not affect the shallow alluvial groundwater system that supports phreatophytic communities.[137] However, Staff directly questions the reliability of this claim. The RSA cites Deacon et al (2007) to emphasize that the lack of an adverse effect cannot be accurately predicted due to the frequent fracturing of the confining layers.[138] In addition, neither the Applicant nor Staff know which basin aquifer supports the various groundwater-dependent plant communities that occur in the Project region. The RSA reports, "it is uncertain whether the phreatophytes around Ford Dry Lake are supported by the basin aquifer (from which the Project would draw its water) or mountain front aquifer, which the Applicant has stated would be essentially unaffected."[139] Although Staff was willing to provide an unsubstantiated assumption on the groundwater-dependent communities it does not "expect" to be impacted by Project water usage, Staff has admitted that it "has insufficient data on which to base such an assumption."[140] Due to the recognized uncertainty and lack of scientific data, there is no evidence to support the Applicant's conclusion that the Project will not significantly impact groundwater dependent vegetation.

B. Cumulative Impacts on Regional Groundwater Dependent Resources

In addition to the uncertainties associated with the Project's impacts, there are uncertainties associated with the analyses of the cumulative impacts to regional groundwater levels from the operations of multiple independent projects. The Chuckwalla Valley Groundwater Basin, in which the Genesis Project and many other foreseeable projects would be located, has not been thoroughly studied and the hydrological response to increased groundwater pumping is unknown. As stated by Worley Parsons, the various groundwater needs that are projected to increase in the western portion of the basin can have unforeseen consequences on regional hydrology. Specifically, it stated "the western portion of the basin ***may*** be expected to respond differently than the eastern portion of the basin during pumping. Thus, although they are part of the same groundwater basin, a more detailed analysis of these two portions of the basin is warranted."[141] In the RSA, Staff reports it expects that the effects of the proposed Palen project pumping well, located directly to the west of the Genesis Project, "would be greater and be felt as much as a decade

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[137] RSA, p. C.2-118.
[138] Deacon, JE, AE Williams, C. Deacon Williams, and JE Williams. (2007) Fueling Population Growth in Las Vegas: How large-scale groundwater withdrawl could burn regional biodiversity. *BioScience*, 57(8), 688-698.
[139] RSA, p. C.2-118.
[140] Id., p. C.2-122.
[141] WorleyParsons, 2009 p. 6 (emphasis added).

sooner than the end-of-operation effects of the Genesis Project."[142] Both statements demonstrate the extreme level of uncertainty associated with this Project, its direct and cumulative impacts to groundwater levels, and the associated ecological ramifications.

C. Ecological Ramifications

The high level of uncertainty on Project impacts is of utmost importance in an ecosystem already stressed by water shortages and subject to climate change. Water is the most limiting factor to ecosystem health and viability in the Sonoran Desert.[143] Research cited in the RSA indicates, "lowering the local water table from groundwater pumping has also been demonstrated to induce habitat conversions."[144] Thus, not only would the Project have a potentially significant impact on sensitive phreatophytic vegetation communities, but it may also cause landscape conversion that would impact habitat for multiple special-status species that occur in the Project region.[145] The extreme ecological consequences associated with alterations to groundwater resources dictate the need for reliable and accurate data before Project approval.

XIII. THE GROUNDWATER-DEPENDENT VEGETATION MONITORING PLAN DOES NOT MITIGATE POTENTIALLY SIGNIFICANT PROJECT IMPACTS

A. Clarification of the Scope of the Groundwater-Dependent Vegetation Monitoring Plan

Because of the considerable uncertainty regarding the impact that the Project's groundwater usage will have on groundwater-dependent vegetation communities, Staff has required the Applicant to prepare and implement a Groundwater-Dependent Vegetation Monitoring Plan ("Monitoring Plan"). The RSA states that the Monitoring Plan "shall focus on areas containing obligate or facultative phreatophytes (mesquite, ironwood, bush seep-wood, palo verde, cat's claw, smoke tree, and tamarisk) in areas that are most likely to be influenced by groundwater (low-lying areas in the basin floor)."[146] By definition, all phreatophytes are influenced by groundwater,[147] and thus to provide proper

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[142] RSA, p. C.2-118.
[143] Dimmitt, Mark A., "Plant Ecology of the Sonoran Desert Region." http://www.desertmuseum.org/books/nhsd_plant_ecology.php Accessed on 6/17/2010.
[144] RSA, p. C.2-119.
[145] Genesis Solar Energy Project/T. Bernhardt (2009) ; Solar Millennium (2009), *Application for Certification Vol 1 & 2 for the Palen Solar Power Project*. as cited in California Energy Commission 2009.
[146] RSA, p. C.2-272.
[147] Wikipedia contributors. Phreatophyte [Internet]. Wikipedia, The Free Encyclopedia; 2009 Jun 8, 21:45 UTC [cited 2010 Jun 18]. Available from: http://en.wikipedia.org/wiki/Phreatophyte.

mitigation, all areas with groundwater-dependent communities must be monitored (i.e., not just low-lying areas). This is critical due to the fact that groundwater is not uniform in distribution or extent, pumping impacts on groundwater levels are uncertain, and the impacts become increasingly uncertain with distance from the pump.[148]

B. Weaknesses of Vegetation Monitoring Plan

I concur with Staff that the Monitoring Plan requires baseline data prior to the start of groundwater pumping.[149] However, the design of the Monitoring Plan itself is inadequate based upon the minimal information outlined in the RSA. As noted in the RSA, Staff cannot defer the establishment of a plan's performance standards and goals.[150] Specific shortcomings of the Groundwater-Dependent Vegetation Monitoring Plan ("BIO-25") are detailed below:

First, BIO-25 specifies the use of reference monitoring sites as control locations to compare groundwater-dependent communities within the Project impact zone to those unaffected by potential groundwater pumping impacts. However, the RSA establishes few selection criteria for the reference sites. Because hydrological and geological parameters must be consistent between the reference sites and the Project monitoring sites, and because scientific certainty of these parameters is lacking even within the Project area, the selection of reference sites will be extremely problematic and unreliable. As stated by Staff, "the calculations and assumptions used to evaluate potential Project impacts to groundwater levels are imprecise and have limitations and uncertainties associated with them."[151]

Additionally, the RSA does not establish the minimum number of reference sites that need to be included in the study, nor does it establish whether each unique vegetation assemblage in the Project "impact zone" will be represented by reference sites.

Also, in addition to groundwater, numerous other variables may impact plant vigor and health, (e.g., insects, disease, age, slope, aspect and various microclimatic variables). To effectively isolate the effect of groundwater pumping, the Monitoring Plan needs to consider these variables in its analyses. The reference monitoring sites will be critical indicators of adverse impacts from which decisions to take remedial action will be made. They must therefore be incorporated into a much more comprehensive and appropriately designed Monitoring Plan before the Commission makes a decision on the Project. As currently written, the RSA defers preparation of the Plan to the Applicant, after the Energy Commission's final

[148] RSA, p. C.2-120.
[149] Id., p. C.2-273.
[150] Id., p. C.2-123.
[151] Id., p. C.2-120.

decision. In my opinion, such deferral almost certainly ensures an inadequate plan given the Applicant's insistent argument that the Project would have no effect, and that remedial actions should not be required.[152] As a result, Staff must establish a more rigorous and scientifically defensible study plan that has undergone peer review by the appropriate experts.

Second, BIO-25 states that the Monitoring Plan must include field techniques for measuring drought response. While Staff acknowledged that the list of field measurements in the RSA represents a minimum requirement, the list is incomplete and cannot be deemed sufficient. Specifically, the RSA states "Staff ***expects*** that stress to woody species, such as mesquite, from declines in groundwater levels would be detected in measures of plant vigor, such as die-back, long before plant cover changes might be measureable in an aerial photo."[153] ***Expectations*** of stress responses in vegetation that have not yet been thoroughly studied cannot form the basis of a robust scientific monitoring program. Many drought-tolerant species have physiological responses to reduced water availability that are not immediately obvious in changes in plant vigor.[154] Recruitment and reproductive capacities of target species may decline, but not necessarily manifest through obvious changes in plant vigor. Additionally, the beneficial relationship between the groundwater-dependent vegetation species and root mycorrhizae, which are critical to plant and soil health, would be ignored.[155] Specific monitoring protocols that are both robust and supported by the scientific literature must be provided in detail before Staff can conclude the proposed mitigation will reduce impacts to a level considered less than significant.

Finally, the RSA states that the Monitoring Plan must include "a description of the biological and ecological characteristics of groundwater-dependent species and natural communities."[156] This information is a critical component of both the Project description and in determining the adequacy of the Monitoring Plan. As a result, it cannot be deferred until after Project approval. Of significant importance is a prior and robust understanding of site-specific root growth and water acquisition characteristics of all target groundwater-dependent species. A drawdown in groundwater below the effective rooting level can be deleterious, even at modest amounts of 0.3 feet. As stated in the RSA, "when groundwater levels are lowered beyond the normal reach of groundwater-dependent ecosystems, the decline in plant cover and change in species abundance can result in *severe*

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[152] Galati Blek LLP (2010), *Genesis Solar, LLC's Proposed Biology Conditions of Certification Docket No. (09-AFC-8)*. Submitted April 29, 2010.
[153] RSA, p. C.2-118.
[154] Allen, Michael F. and Michael G. Boosalis (1983) Effects of Two Species of VA Mycorrhizal Fungi on Drought Tolerance of Winter Wheat. *New Phytologist*, 93, 67-76.
[155] Cho, Keunho, Heather Toler, Jaehoon Lee, Bonnie Ownley, Jean C. Stutz, Jennifer L. Moore, and Robert M. Auge. (2006). Mycorrhizal Symbiosis and Response of Sorghum Plants to Combined Drought and Salinity Stresses. *Journal of Plant Physiology,* 163, 517-528.
[156] RSA, p. C.2-274.

consequences."[157] The Monitoring Plan should be based on specific and documented physiological data, including the effective rooting level and its relation to the current groundwater table, before data collection for Project impacts on groundwater-dependent vegetation begins. Research conducted by Cooper et al. (2006) indicates that both the magnitude and rate of water table decline can affect phreatophytic species.[158] Because water usage by the Project will vary during its construction phase and throughout the year, data on the magnitude and rate of water table decline, as well as the relation to the effective rooting level of groundwater-dependent vegetation in the Project area, is necessary before the Monitoring Plan can be considered satisfactory. These data will also be of great importance for remedial action requirements in the event of Project-induced adverse ecological impacts.

XIV. CONDITION OF CERTIFICATION BIO-26, REMEDIAL ACTION FOR ADVERSE EFFECTS TO GROUNDWATER-DEPENDENT BIOLOGICAL RESOURCES, FAILS TO ESTABLISH ADEQUATE MITIGATION

The proposed remedial action ("BIO-26") for potential adverse impacts on groundwater-dependent vegetation communities fails to address landscape-level ecological disturbances associated with water shortages. Because relocating the well or decreasing its usage are the only required remediation measures, BIO-26 fails to address any realized impacts that may have already occurred as a result of Project pumping (e.g., tree mortality).

Desert ironwood (*Olneya tesota*) and palo verde (*Cercidium* spp.) are extremely important groundwater-dependent keystone species with multiple ecological roles. These species constitute much of the desert dry wash woodland identified within the Project impact zone. Both species are considered "nurse plants" and ecological "modifiers" for their critical associations with desert biodiversity and microclimate regulation. Ironwood is known to be associated with more than 160 plant species and reports indicate up to 424 species of fauna use these trees for refuge, perching and resting.[159] Both ironwood and palo verde are leguminous, and therefore extremely important in soil nitrogen content and nutrient cycling. Therefore, if mortality to groundwater-dependent communities occurs as a result of the Project, the Applicant must provide mitigation to replace the lost functions and values. Indeed, Staff states that in many cases, "the anticipated indirect impacts are more significant, or adverse, then the direct loss of

[157] Id., pp. C.2-118-119 (emphasis added).
[158] Cooper, David J, John S. Sanderson, David I. Stannard, and David P. Groeneveld. (2006) Effects of Long-Term Water Table Drawdown on Evapotranspiration and Vegetation in an Arid Region Phreatophyte Community. *Journal of Hydrology*, 325, 21-34.
[159] Zuniga-Tovar, B. and H. Suzan-Azpiri (2010) Comparative Population Analysis of Desert Ironwood (Olneya tesota) in the Sonoran Desert, *Journal of Arid Environments*, 74, 173-178.

habitat."[160] Despite this conclusion, the RSA fails to provide mitigation for lost functions and values that groundwater-dependent communities clearly provide.

If remedial action is in fact deemed necessary, substantial uncertainty remains regarding the time required for groundwater resources to regain their previous levels. Research conducted by Webb and Leake (2006) shows that even if groundwater pumpage from well activities stop, outflow from the impacted aquifers would still be reduced until cones of depression from the well refilled.[161] Without clear and well-defined remediation guidelines to address these ecosystem disturbances and potential long-term consequences, BIO-26 is an insufficient and incomplete mitigation strategy.

[160] RSA, p. C.2-173.

[161] Webb, Robert H. and Stanley A. Leake. (2006) Ground-water Surface-water Interactions and Long-term Change in Riverine Riparian Vegetation in the Southwestern United States. *Journal of Hydrology*, 320, 302-323.

Declaration of Scott Cashen
Genesis Solar Energy Project

Docket 09-AFC-8

I, Scott Cashen, declare as follows:

1) I am an independent biological resources consultant. I have been operating my own consulting business for the past three years. Prior to starting my own business I was the Senior Biologist for TSS Consultants.

2) I hold a Master's degree in Wildlife and Fisheries Science. My relevant professional qualifications and experience are set forth in the attached testimony and are incorporated herein by reference.

3) I prepared the testimony attached hereto and incorporated herein by reference, relating to the biological resource impacts of the Genesis Solar Energy Project.

5) It is my professional opinion that the attached testimony and maps contained therein are true and accurate with respect to the issues that they address.

6) I am personally familiar with the facts and conclusions described within the attached testimony and maps, and if called as a witness, I could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 6-18-10 Signed: 

At: Walnut Creek, CA

ATTACHMENT 1

Scott Cashen, M.S.
Senior Biologist / Forest Ecologist
3264 Hudson Avenue, Walnut Creek, CA 94597. (925) 256-9185. scottcashen@gmail.com

In his 17 years in the profession, Scott Cashen has consulted on projects pertaining to wildlife and fisheries ecology, avian biology, wetland restoration, and forest management. Because of his varied experience, Mr. Cashen is knowledgeable of the link between the various disciplines of natural resource management, and he is a versatile scientist.

Mr. Cashen's employment experience includes work as an expert witness, wildlife biologist, consulting forester, and instructor of Wildlife Management. He has worked throughout California, and he is knowledgeable of the different terrestrial and aquatic species and habitats present in the state.

Mr. Cashen is an accomplished birder and is able to identify bird species by sight and sound. His knowledge has enabled him to survey birds throughout the United States and instruct others on avian identification. Mr. Cashen's research on avian use of restored wetlands is currently being used by the United States Fish and Wildlife Service to design wetlands for specific "target" species, and as a model for other restored wildlife habitat monitoring projects in Pennsylvania. In addition to his bird experience, Mr. Cashen has surveyed for carnivores, bighorn sheep, and other mammals; special-status amphibian species; and various fish species.

PROFESSIONAL EXPERIENCE

Litigation Support / Expert Witness

Mr. Cashen serves as the biological resources expert for the San Francisco law firm of Adams Broadwell Joseph & Cardozo. He is responsible for reviewing CEQA/NEPA documents, assessing biological resource issues, preparing written comments, providing public testimony, and interfacing with public resource agencies.

REPRESENTATIVE EXPERIENCE

- Victorville 2 Solar-Gas Hybrid Power Project: Victorville, CA (338-acre natural gas and solar energy facility) – Review of CEQA equivalent documents and preparation of written documents.
- Avenal Energy Power Plant: Avenal, CA (148-acre natural gas facility) – Review of CEQA equivalent documents and preparation of written documents.
- Ivanpah Solar Electric Generating System: Ivanpah, CA (3700-acre solar facility) – Review of CEQA equivalent documents and preparation of written documents.
- Carrizo Energy Solar Farm: San Luis Obispo County, CA (640-acre solar energy facility) – Review of CEQA equivalent documents. Preparation of data requests, comments on Preliminary Staff Assessment, comments on wildlife corridor model

(CEQA equivalent documents).

- Live Oak Master Plan: Hanford, CA (390-acre housing development) – Review of CEQA documents and preparation of comment letter.
- Rollingwood: Vallejo, CA (214-unit housing development) – Review of CEQA documents and preparation of comment letter.
- Columbus Salame: Fairfield, CA (430,000 ft² food processing plant) – Review of CEQA documents and preparation of comment letter.
- Concord Naval Weapons Station: Concord, CA (5028-acre redevelopment) – Review of CEQA documents, preparation of comment letters, and provision of public testimony at County hearings.
- Chula Vista Bayfront Master Plan: Chula Vista, CA (556-acre development) – Review of CEQA documents and preparation of comment letter.
- Beacon Solar Energy Project: California City, CA (2012-acre solar facility) – Review of CEQA equivalent and NEPA documents. Preparation of data requests, comments on Preliminary Staff Assessment, comments on Incidental Take Permit Application. Expert witness providing testimony at California Energy Commission hearings.
- Solar One Power Project: San Bernardino County, CA (8230-acre solar facility) – Review of CEQA equivalent and NEPA documents and preparation of data requests. Expert witness providing testimony at California Energy Commission hearings.
- Solar Two Power Project: Imperial County, CA (6500-acre solar facility) – Review of CEQA equivalent and NEPA documents. Preparation of data requests and other documents for case record. Expert witness providing testimony at California Energy Commission hearings.
- Alves Ranch: Pittsburgh, CA (320-acre housing development) – Review of CEQA documents.
- Roddy Ranch: Antioch, CA (640-acre housing and hotel development) – Review of CEQA documents and preparation of comment letter.
- Aviano: Antioch, CA (320-acre housing development) – Review of CEQA documents.
- Western GeoPower Power Plant and Steamfield: Geyserville, CA (887-acre geothermal facility) – Review of CEQA documents and preparation of comment letter.
- Sprint-Nextel Tower: Walnut Creek, CA (communications tower in open space preserve) - Review of project documents and preparation of comment letter.

Project Management

Mr. Cashen has managed several large-scale and high profile natural resources investigations. High profile projects involving multiple resources often require consideration of differing viewpoints on how resources should be managed, and they are usually subject to intense scrutiny. Mr. Cashen is accustomed to these challenges, and he

is experienced in facilitating the collaborative process to meet project objectives. In addition, the perception of high profile projects can be easily undermined if inexcusable mistakes are made. To prevent this, Mr. Cashen bases his work on solid scientific principles and proven sampling designs. He also solicits input from all project stakeholders, and provides project stakeholders with regular feedback on project progress. Mr. Cashen's educational and project background in several different natural resource disciplines enable him to consult on multiple natural resources simultaneously and address the many facets of contemporary land management in a cost-effective manner.

REPRESENTATIVE EXPERIENCE

- Forest health improvement projects – Biological Resources *(CDF: San Diego and Riverside Counties)*
- San Diego Bark Beetle Tree Removal Project – Biological Resources, Forestry, and Cultural Resources *(San Diego Gas & Electric: San Diego Co.)*
- San Diego Bark Beetle Tree Removal Project - Forestry *(San Diego County/NRCS)*
- Mather Lake Resource Management Study and Plan – Biological Resources, Hydrology, Soils, Recreation, Public Access, CEQA compliance, Historic Use *(Sacramento County: Sacramento)*
- "KV" Spotted Owl and Northern Goshawk Inventory *(USFS: Plumas NF)*
- Amphibian Inventory Project *(USFS: Plumas NF)*
- San Mateo Creek Steelhead Restoration Project – TES species, Habitat Mapping, Hydrology, Invasive Species Eradication, Statistical Analysis *(Trout Unlimited and CA Coastal Conservancy: Orange County)*
- Hillslope Monitoring Project – Forest Practice Research *(CDF: throughout California)*
- Placer County Vernal Pool Study – Plant and Animal Inventory, Statistical Analysis *(Placer County: throughout Placer County)*
- Weidemann Ranch Mitigation Project – Mitigation Monitoring and Environmental Compliance *(Toll Brothers, Inc.: San Ramon)*
- Delta Meadows State Park Special-status Species Inventory – Plant and Animal Species Inventory, Special-status Species *(CA State Parks: Locke)*
- Ion Communities Biological Resource Assessments – Biological Resource Assessments *(Ion Communities: Riverside and San Bernardino Counties)*
- Del Rio Hills Biological Resource Assessment – Biological Resource Assessments *(The Wyro Company: Rio Vista)*

Biological Resources

Mr. Cashen has a diverse background in biology. His experience includes studies of a variety of fish and wildlife species, and work in many of California's ecosystems. Mr. Cashen's specialties include conducting comprehensive biological resource assessments, habitat restoration, species inventories, and scientific investigations. Mr. Cashen has led investigations on several special-status species, including ones focusing on the foothill yellow-legged frog, mountain yellow-legged frog, steelhead, burrowing owl, California spotted owl, northern goshawk, willow flycatcher, and forest carnivores. Mr. Cashen was responsible for the special-status species inventory of Delta Meadows State Park, and for conducting a research study for Placer County's Natural Community Conservation Plan.

REPRESENTATIVE EXPERIENCE

Avian

- Study design and Lead Investigator - Delta Meadows State Park Special-status Species Inventory *(CA State Parks: Locke)*
- Study design and lead bird surveyor - Placer County Vernal Pool Study *(Placer County: throughout Placer County)*
- Surveyor - Willow flycatcher habitat mapping *(USFS: Plumas NF)*
- Independent surveyor - Tolay Creek, Cullinan Ranch, and Guadacanal Village restoration projects *(Ducks Unlimited/USGS: San Pablo Bay)*
- Study design and Lead Investigator - Bird use of restored wetlands research *(Pennsylvania Game Commission: throughout Pennsylvania)*
- Study design and surveyor - Baseline inventory of bird species at a 400-acre site in Napa County *(HCV Associates: Napa)*
- Surveyor - Baseline inventory of bird abundance following diesel spill *(LFR Levine-Fricke: Suisun Bay)*
- Study design and lead bird surveyor - Green Valley Creek Riparian Restoration Site *(City of Fairfield: Fairfield, CA)*
- Surveyor - Burrowing owl relocation and monitoring of artificial habitat *(US Navy: Dixon, CA)*
- Surveyor - Pre-construction raptor and burrowing owl surveys *(various clients and locations)*
- Surveyor - Backcountry bird inventory *(National Park Service: Eagle, Alaska)*
- Lead surveyor - Tidal salt marsh bird surveys (*Point Reyes Bird Observatory: throughout Bay Area*)

Amphibian

- Crew Leader - Red-legged frog, foothill yellow-legged frog, and mountain yellow-legged frog surveys *(USFS: Plumas NF)*
- Surveyor - Foothill yellow-legged frog surveys *(PG&E: North Fork Feather River)*
- Surveyor - Mountain yellow-legged frog surveys *(El Dorado Irrigation District: Desolation Wilderness)*
- Crew Leader - Bullfrog eradication *(Trout Unlimited: Cleveland NF)*

Fish and Aquatic Resources

- Surveyor - Hardhead minnow and other fish surveys *(USFS: Plumas NF)*
- Surveyor - Weber Creek aquatic habitat mapping (*El Dorado Irrigation District: Placerville, CA*)
- Surveyor - Green Valley Creek aquatic habitat mapping *(City of Fairfield: Fairfield, CA)*
- GPS Specialist - Salmonid spawning habitat mapping *(CDFG: Sacramento River)*
- Surveyor - Fish composition and abundance study (*PG&E: Upper North Fork Feather River and Lake Almanor*)
- Crew Leader - Surveys of steelhead abundance and habitat use *(CA Coastal Conservancy: Gualala River estuary)*
- Crew Leader - Exotic species identification and eradication *(Trout Unlimited: Cleveland NF)*

Mammals

- Principal Investigator – Peninsular bighorn sheep resource use and behavior study (*California State Parks: Freeman Properties*)
- Scientific Advisor – Red Panda survey and monitoring methods *(The Red Panda Network: CA and Nepal)*
- Surveyor - Forest carnivore surveys *(University of CA: Tahoe NF)*
- Surveyor - Relocation and monitoring of salt marsh harvest mice and other small mammals *(US Navy: Skagg's Island, CA)*

Natural Resource Investigations / Multiple Species Studies

- Scientific Review Team Member – Member of the science review team assessing the effectiveness of the US Forest Service's implementation of the Herger-Feinstein Quincy Library Group Act.

- Lead Consultant - Baseline biological resource assessments and habitat mapping for CDF management units *(CDF: San Diego, San Bernardino, and Riverside Counties)*
- Biological Resources Expert – Peer review of CEQA/NEPA documents (*Adams Broadwell Joseph & Cardoza: California)*
- Lead Consultant - Pre- and post harvest biological resource assessments of tree removal sites *(SDG&E: San Diego County)*
- Crew Leader - T&E species habitat evaluation for BA in support of a steelhead restoration plan *(Trout Unlimited: Cleveland NF)*
- Lead Investigator - Resource Management Study and Plan for Mather Lake Regional Park *(County of Sacramento: Sacramento, CA)*
- Lead Investigator - Wrote Biological Resources Assessment for 1,070-acre Alfaro Ranch property *(Yuba County, CA)*
- Lead Investigator - Wildlife Strike Hazard Management Plan *(HCV Associates: Napa)*
- Lead Investigator - Del Rio Hills Biological Resource Assessment *(The Wyro Company: Rio Vista, CA)*
- Lead Investigator – Ion Communities project sites (*Ion Communities: Riverside and San Bernardino Counties*)
- Surveyor – Tahoe Pilot Project: CWHR validation *(University of California: Tahoe NF)*

Forestry

Mr. Cashen has five years of experience working as a consulting forester on projects throughout California. During that time, Mr. Cashen has consulted with landowners and timber harvesters on best forest management practices; and he has worked on a variety of forestry tasks including selective tree marking, forest inventory, harvest layout, erosion control, and supervision of logging operations. Mr. Cashen's experience with many different natural resources enable him to provide a holistic approach to forest management, rather than just management of timber resources.

REPRESENTATIVE EXPERIENCE

- Lead Consultant - CDF fuels treatment projects *(CDF: San Diego, Riverside, and San Bernardino Counties)*
- Lead Consultant and supervisor of harvest activities – San Diego Gas and Electric Bark Beetle Tree Removal Project *(SDG&E: San Diego)*
- Crew Leader - Hillslope Monitoring Program *(CDF: throughout California)*
- Consulting Forester – Inventory and selective harvest projects *(various clients throughout California)*

EDUCATION / SPECIAL TRAINING

M.S. Wildlife and Fisheries Science, The Pennsylvania State University (1998)

B.S. Resource Management, The University of California-Berkeley (1992)

Forestry Field Program, Meadow Valley, California, Summer (1991)

PERMITS

U.S. Fish and Wildlife Service Section 10(a)(1)(A) Recovery Permit for the Peninsular bighorn sheep

CA Department of Fish and Game Scientific Collecting Permit

PROFESSIONAL ORGANIZATIONS / ASSOCIATIONS

The Wildlife Society

Society of American Foresters

Mt. Diablo Audubon Society

OTHER AFFILIATIONS

Scientific Advisor and Grant Writer – *The Red Panda Network*

Scientific Advisor – *Mt. Diablo Audubon Society*

Grant Writer – *American Conservation Experience*

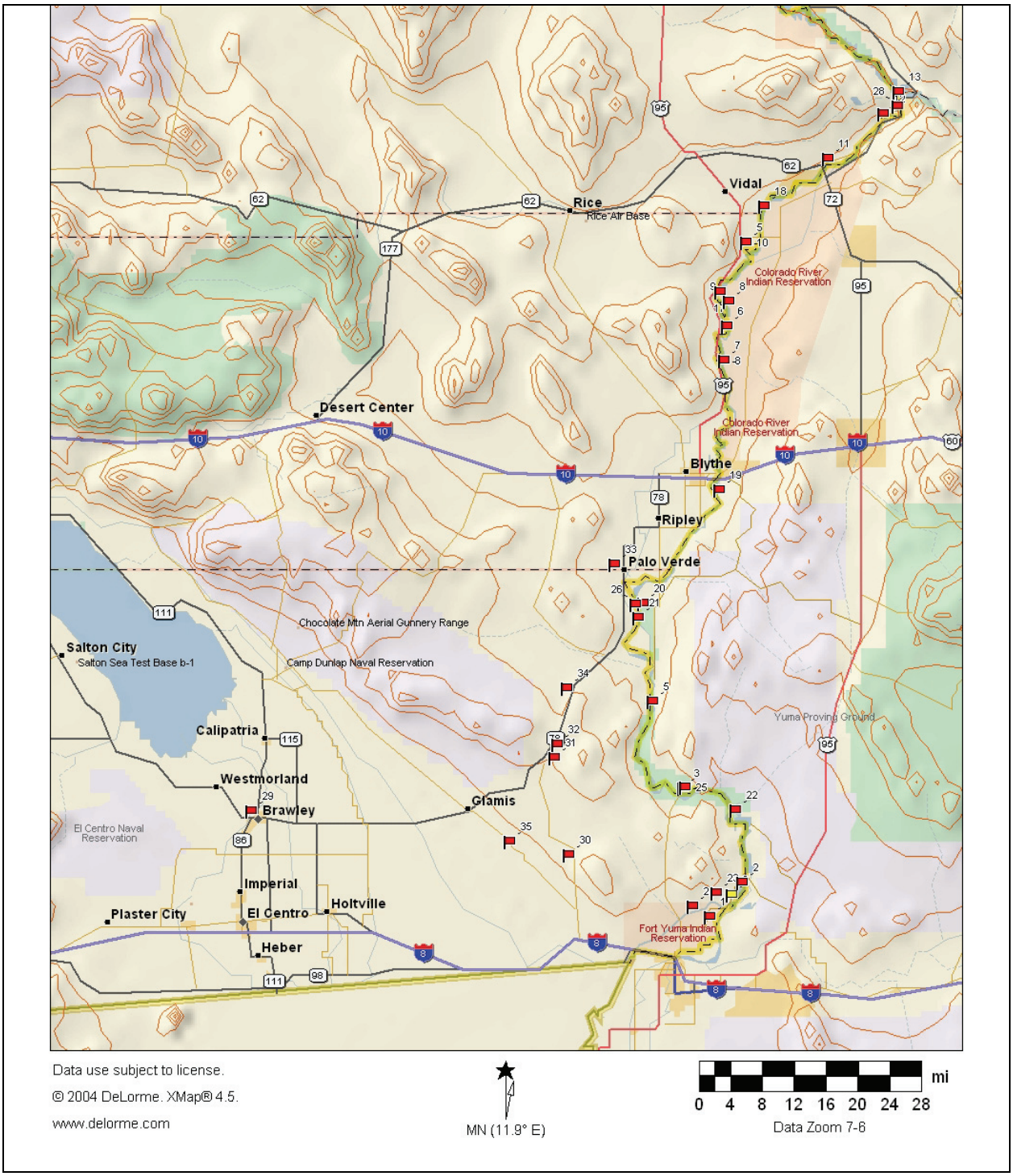
Land Committee Member – *Save Mt. Diablo*

TEACHING EXPERIENCE

Instructor: Wildlife Management, The Pennsylvania State University, 1998

Teaching Assistant: Ornithology, The Pennsylvania State University, 1996-1997

ATTACHMENT 2



Attachment 2. Documented occurrences of Gila woodpeckers (red flags).[1] Flag numbers correspond with CNDDB occurrence numbers.

[1] From California Natural Diversity Database. 2009. Rarefind [computer program]. Version 3.1.0. Mar 2, 2010. Sacramento (CA): Wildlife & Habitat Data Analysis Branch. California Department of Fish and Game.

ATTACHMENT 3

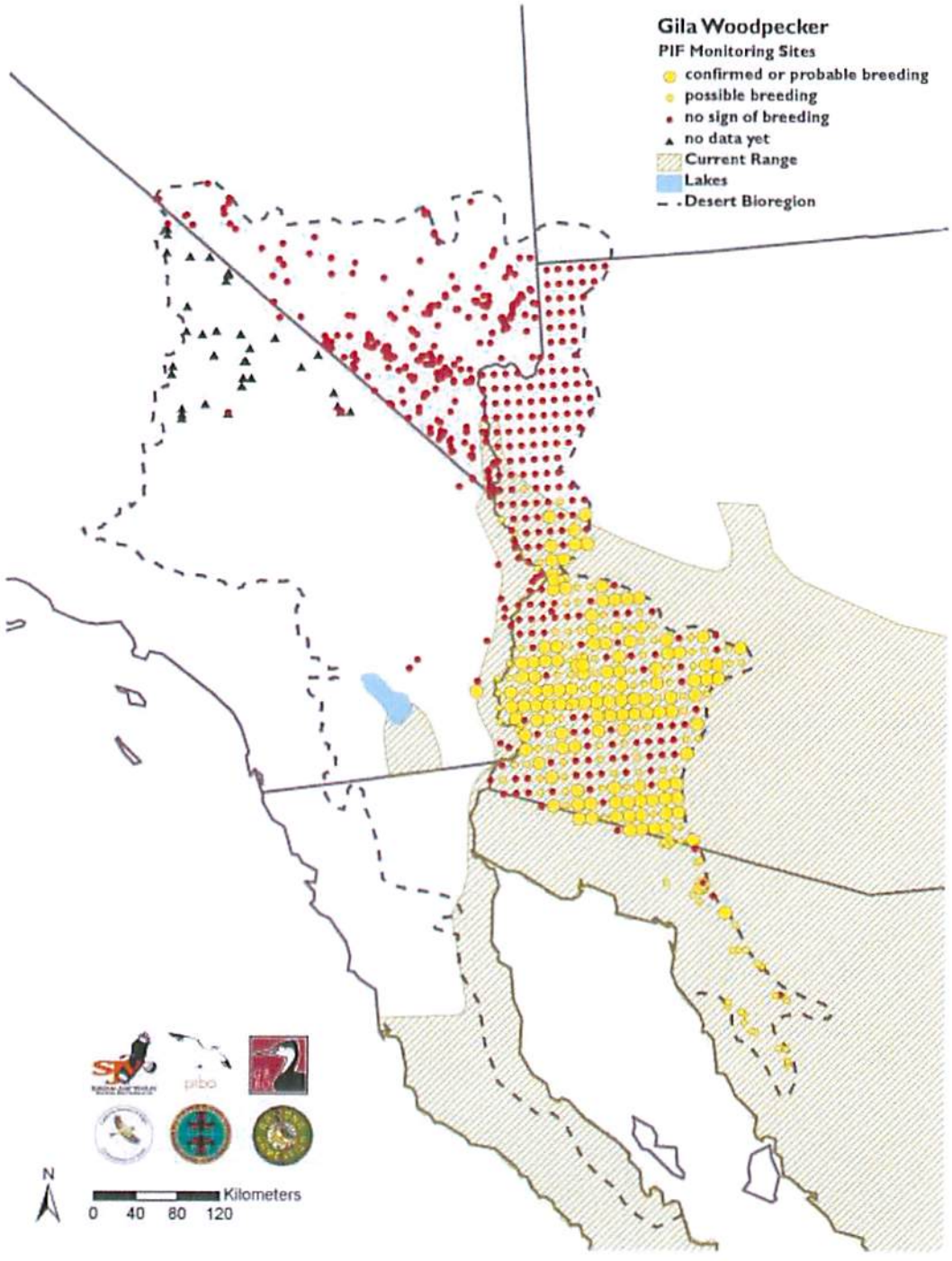


Figure 5-3. CalPIF monitoring sites, breeding status, and current range for the Gila Woodpecker in California.

ATTACHMENT 4

DOCKET
09-AFC-5
DATE FEB 05 2010
RECD. FEB 24 2010

To: Craig Hoffman, Energy Commission Project Manager

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

Date: February 5, 2010

Re: Abengoa Mojave Solar Project – time-sensitive issues and informational needs

Completion of the draft Staff Assessment and its review by USFWS and CDFG facilitated the identification of several time-sensitive issues. Staff believes it will benefit the project schedule to relay this information to the applicant now rather than wait to publish it in the Staff Assessment in March 2010. Staff strongly recommends continued coordination with USFWS (Ashleigh Blackford) and CDFG (Eric Weiss) regarding plan development, permit requirements/timing, compliance with updates to the Bald and Golden Eagle Act (e.g., survey and foraging habitat assessment procedures), and compensatory mitigation. Staff is also available to answer questions about these informational needs.

The documents and information listed below **need to be submitted** by the applicant to the Energy Commission, USFWS, and CDFG:

- Draft Desert Tortoise Exclusion Fencing, Clearance Survey, and Translocation Plan (Desert Tortoise Plan). See below.
- Draft Burrowing Owl Monitoring and Mitigation Plan (Burrowing Owl Plan). See below.
- Swainson's Hawk Survey Results – Spring 2010. As proposed by the applicant in their draft California Endangered Species Act Section 2081 Incidental Take Permit Application.
- Golden Eagle Survey Results and Foraging Habitat Assessment. Required to determine compliance with recent updates to the Bald and Golden Eagle Act, including whether the project would require a take permit. Contact USFWS for guidance on survey protocol and foraging habitat assessment methodology, as it becomes available. Analysis of the survey results and coordination between staff, the applicant, and USFWS is necessary to determine whether a take permit is required for impacts to golden eagle, including loss of foraging habitat.
- Compensatory Mitigation Details:
  - Identification of which 118.2 acre portion of the 233 acre applicant-owned parcel is proposed for mitigation;
  - Evaluation of the degree of disturbance, dumping, historical structures, etc. that may require cleaning, fencing, repairs, demolition, etc.; and
  - Determination of whether the applicant would conduct the aforementioned work (if required) prior to conserving the land or if additional lands or monies will be required to off-set the aforementioned impediments.

It is requested that these plans, survey results, and information be submitted as soon as possible to allow time for review, analysis, and incorporation into conditions of certification, in advance of the Supplemental Staff Assessment (publication scheduled for early May 2010). Of particular importance are the draft Desert Tortoise Plan, draft Burrowing Owl Plan, Swainson's hawk and golden eagle survey results and foraging habitat assessment, and compensatory mitigation details, all of which need to be addressed by staff in the Supplemental Staff Assessment. The following measures, which were developed in coordination with USFWS and CDFG, present substantive guidance for preparation of the draft Desert Tortoise and Burrowing Owl plans. The final Desert Tortoise Plan must be submitted to USFWS with the Biological Assessment, which is currently scheduled to be submitted to the U.S. Department of Energy in February 2010; therefore, a draft plan must be submitted and reviewed as soon as possible.

Staff recommends that careful consideration be given to the timing of burrowing owl and desert tortoise clearance surveys in relation to the overall project construction schedule. As described below, the clearance surveys must be conducted within specific timing and environmental parameters. In coordination with USFWS and CDFG, staff identified two potential scenarios specific to the AMS project that would allow construction to proceed in compliance with these timing restrictions. It is understood that there are other potential scenarios and staff encourages the applicant to present these and other scenarios for approval in the draft Desert Tortoise and Burrowing Owl plans.

1. At site mobilization in Fall/Winter 2010, install temporary desert tortoise exclusion fencing partially around (within 250 feet of) all potential tortoise burrows ***while maintaining connectivity to suitable natural habitat*** adjacent to the project site. Determine presence or absence of burrowing owl during that same timeframe (to determine compensatory mitigation and the number of artificial burrows). Color-banding and passive relocation of non-nesting burrowing owl can occur outside of the temporary exclusion fence (within the proposed project area) at any time. However, if it is determined that an active nest is present onsite, a no disturbance buffer must be established within 250 feet of the active burrowing owl nest and remain until juveniles from the occupied burrows are foraging independently and are capable of independent survival. Desert tortoise clearance would be conducted April through May and/or September through October.
2. Fence the site and conduct burrowing owl and desert tortoise clearance concurrently in September or October (provided the environmental requirements below are satisfied).

Desert Tortoise Exclusion Fencing, Clearance Surveys, and Translocation Plan

A Desert Tortoise Exclusion Fencing, Clearance Surveys, and Translocation Plan shall be developed in consultation with the CPM, CDFG, and USFWS. This plan shall include detailed measures to avoid and minimize impacts to desert tortoise in and near the construction areas as well as methods for clearance surveys, fence installation, tortoise handling, artificial burrow construction, egg handling and other procedures, which shall be consistent with those described in the USFWS Desert Tortoise Field Manual (www.fws.gov/ventura/speciesinfo/protocols_guidelines) or more current guidance provided by CDFG and USFWS. At a minimum, the following measures shall be included in the plan and implemented by the project owner to manage their construction site, and related facilities, in a manner to avoid, minimize, or mitigate impacts to desert tortoise.

1. Fence Installation. Prior to ground disturbance, the entire project site shall be fenced with desert tortoise exclusion fence. To avoid impacts to desert tortoise during fence construction, the proposed fence alignment shall be flagged and the alignment surveyed within 24 hours prior to fence construction. Surveys shall be conducted by the Designated Biologist using techniques approved by the USFWS and CDFG. Biological Monitors may assist the Designated Biologist under his or her supervision. These surveys shall provide 100 percent coverage of all areas to be disturbed during fence construction and an additional transect along both sides of the proposed fence line. This fence line transect shall cover an area approximately 90 feet wide centered on the fence alignment. Transects shall be no greater than 30 feet apart. All desert tortoise burrows, and burrows constructed by other species that might be used by desert tortoises, shall be examined to assess occupancy of each burrow by desert tortoises and handled in accordance with USFWS-approved protocol.

    a. Timing and Supervision of Fence Installation. The exclusion fencing shall be installed prior to site clearing and grubbing. The fence installation shall be supervised by the Designated Biologist and monitored by the Biological Monitors to ensure the safety of any tortoise present.

    b. Fence Material and Installation. The permanent tortoise exclusionary fencing shall consist of galvanized hard wire cloth 1 by 2 inch mesh sunk 12 inches into the ground, and 24 inches above ground (refer to parameters for USFWS-approved tortoise exclusion fencing at www.fws.gov/ventura/speciesinfo/protocols_guidelines). For temporary exclusion fencing, a “folded bottom” technique shall be implemented. This method follows the same guidelines as installation of permanent fencing except instead of burying the bottom 12 inches of the fencing, it is bent at a approximately 90 degree angle (to follow the contour of the ground) and spikes or other retaining methods are driven into the ground every two linear feet in such a manner as to “anchor” the bottom of the fence. This method eliminates the need for trenching, which for short-term temporary impacts may be more beneficial to the recovery of the landscape, and thus the species.

c. Security Gates. Security gates shall be designed with minimal ground clearance to deter ingress by tortoises. The gates shall remain closed except during vehicle passage and may be electronically activated to open and close immediately after vehicle(s) have entered or exited to prevent extended periods with open gates, which might lead to a tortoise entering. Cattle grating designed to safely exclude desert tortoise shall be installed at the gated entries to discourage tortoises from gaining entry.

d. Transmission Interconnection Fencing. The Transmission Interconnection Area shall be temporarily fenced with tortoise exclusion fencing to prevent desert tortoise entry during construction. Temporary fencing must follow guidelines for permanent fencing and supporting stakes shall be sufficiently spaced to maintain fence integrity. Temporary exclusion and translocation of desert tortoise in the Transmission Interconnection Area shall be addressed in the Desert Tortoise Translocation Plan.

e. Stormwater Drainage Fencing. The onsite stormwater drainage channels, including the headwalls, outlet, and road crossings, shall be permanently fenced to ensure exclusion of desert tortoise during AMS operation.

f. Fence Inspections. Following installation of the desert tortoise exclusion fencing for both the permanent site and stormwater drainage fencing and temporary fencing in the interconnection area, the fencing shall be regularly inspected. Permanent fencing shall be inspected monthly and during/immediately following all major rainfall events. Any damage to the fencing shall be temporarily repaired immediately to keep tortoises out of the site, and permanently repaired within two days of observing damage. Inspections of permanent site fencing shall occur for the life of the project. Temporary fencing must be inspected immediately following major rainfall events. All temporary fencing shall be repaired immediately upon discovery and, if the fence may have permitted tortoise entry while damaged, the Designated Biologist shall inspect the utility corridor or tower site for tortoise.

2. Desert Tortoise Clearance Surveys. Following construction of the tortoise exclusionary fencing around the Plant Site, all fenced areas shall be cleared of tortoises by the Designated Biologist, who may be assisted by Biological Monitors. A minimum of two, 100 percent coverage protocol clearance surveys with negative results must be completed and these must coincide with heightened desert tortoise activity from April through May and September through October. Non-protocol clearance surveys may be conducted in areas of certainly unsuitable habitat (e.g., developed) with prior approval of specific areas by USFWS and CDFG (these proposed areas shall be identified in the draft Desert Tortoise Plan). To facilitate seeing the ground from different angles, the second clearance survey shall be walked at 90 degrees to the orientation of the first clearance survey. Additional clearance survey guidelines provided in the USFWS *Desert Tortoise Field Manual* (www.fws.gov/ventura/speciesinfo/protocols_guidelines).

3. Translocation of Desert Tortoise. If desert tortoises are detected during clearance surveys within the project impact area, the Designated Biologist shall safely

translocate the tortoise the shortest possible distance to the nearest suitable habitat as described below. Any handling efforts shall be in accordance with techniques described in the USFWS's *Desert Tortoise Field Manual* (www.fws.gov/ventura/speciesinfo/protocols_guidelines).

a. If a tortoise is discovered within the project site, it shall be safely translocated to the nearest desert saltbush scrub or Mojave creosote bush scrub east and south of section 33 or the nearest desert saltbush scrub west and south of section 30.

b. If a tortoise will be moved a distance greater than 5 km, disease testing and monitoring shall be conducted in accordance with the approved final Desert Tortoise Translocation Plan.

c. If a visibly diseased tortoise is encountered onsite, procedures shall be implemented in accordance with the approved final Desert Tortoise Plan.

4. Burrow Inspection. All potential desert tortoise burrows within the fenced area shall be searched for presence. To prevent reentry by a tortoise or other wildlife, all burrows shall be collapsed once absence has been determined. Immediately following excavation and if environmental conditions warrant immediate translocation, tortoises excavated from burrows shall be translocated to unoccupied natural or artificial burrows within the location approved by USFWS and CDFG per the final Desert Tortoise Translocation Plan.

5. Burrow Excavation. Burrows inhabited by tortoises shall be excavated by the Designated Biologist using hand tools, and then collapsed or blocked to prevent re-occupation. If excavated during May through July, the Designated Biologist shall search for desert tortoise nests/eggs. All desert tortoise handling and removal, and burrow excavations, including nests, shall be conducted by the Designated Biologist in accordance with the USFWS-approved protocol (Desert Tortoise Council 1999) or more current guidance on the USFWS website.

6. Monitoring During Clearing. Following the installation of exclusionary fencing and after ensuring desert tortoises are absent from the project site, heavy equipment shall be allowed to enter the project site to perform earth work such as clearing, grubbing, leveling, and trenching. A Biological Monitor shall be onsite at all times during initial clearing and grading activities. Should a tortoise be discovered, it shall be relocated as described above in accordance with the final Desert Tortoise Translocation Plan.

7. Reporting. The Designated Biologist shall record the following information for any desert tortoises handled: a) the locations (narrative and maps) and dates of observation; b) general condition and health, including injuries, state of healing and whether desert tortoise voided their bladders; c) location moved from and location moved to (using GPS technology); d) gender, carapace length, and diagnostic markings (i.e., identification numbers or marked lateral scutes); e) ambient temperature when handled and released; and f) digital photograph of each handled desert tortoise as described in the paragraph below. Desert tortoise moved from within project areas shall be marked for future identification as described in *Guidelines for Handling Desert Tortoise during Construction Projects* (Desert

Tortoise Council 1999) or more current guidance on the USFWS website. Digital photographs of the carapace, plastron, and fourth costal scute shall be taken. Scutes shall not be notched for identification.

Burrowing Owl Impact Avoidance and Minimization Measures

Prior to preconstruction surveys, a Burrowing Owl Monitoring and Mitigation Plan (Burrowing Owl Plan) shall be developed by the project owner in consultation with the CPM and CDFG. This plan shall include detailed measures to avoid and minimize impacts to burrowing owls in and near the construction areas (if indentified during surveys) and shall be consistent with CDFG guidance (CDFG 1995). In addition, the plan shall identify the optimal time to concurrently relocate both desert tortoise and burrowing owl. At a minimum, the following measures shall be included in the plan and implemented by the project owner to manage their construction site, and related facilities, in a manner to avoid, minimize, or mitigate impacts to breeding and foraging burrowing owls.

1. Pre-Construction Surveys and Nest Avoidance. The Designated Biologist shall conduct pre-construction surveys for burrowing owls within the project site and a 160-foot buffer. These surveys shall be conducted concurrent with desert tortoise clearance surveys, to the maximum extent possible. The following shall be included in the Plan and implemented to avoid and minimize impacts to burrowing owls onsite:

    a. Ground-disturbing actions should be carried out from September 1 to January 31, which is prior to the burrowing owl nesting season and also potentially within the desert tortoise active season, depending on ground and climate conditions.

    b. A 250-foot exclusion area around occupied burrows will be flagged and this area will not be disturbed during the nesting season (February 1 through August 31) unless a qualified biologist verifies through non-invasive methods that either: (1) the birds have not begun egg-laying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival. The exclusion area shall remain connected to natural area(s) to the extent possible, to avoid completely surrounding the owl with construction activities and/or equipment.

2. Artificial Burrow Installation. Prior to any ground-disturbing activities, the project owner shall install five artificial burrows for each identified burrowing owl burrow in the project area that would be destroyed, within in the approved compensatory habitat area. The Designated Biologist shall survey the site selected for artificial burrow construction to verify that such construction will not affect desert tortoise or Mohave ground squirrel or existing burrowing owl colonies in the relocation area. Installation of the artificial burrows shall occur after baseline surveys of the relocation area and prior to ground disturbance or heavy equipment staging. Design of the artificial burrows shall be consistent with CDFG guidelines (CDFG 1995) and shall be approved by the CPM in consultation with CDFG.

3. Passive Relocation. Prior to passive relocation, any owls that will be relocated shall be color banded in accordance with the guidance provided by USGS bird banding lab (http://www.pwrc.usgs.gov/bbl) to monitor relocation success; this shall not be conducted during the breeding season. During the non-breeding season, owls would

be given a minimum of three weeks to become familiar with the new artificial burrows, after which eviction of owls within the project site could begin. Use of one-way doors described by Trulio (1995) and Clark and Plumpton (2005) would be used to facilitate passive relocation of owls.

a. Monitoring and Success Criteria. The Designated Biologist shall survey the relocation area during the nesting season to assess use of the artificial burrows by owls using methods consistent with Phase II and Phase III Burrowing Owl Consortium Guideline protocols (CBOC 1993). Surveys shall start upon completion of artificial burrow construction and shall continue for a period of five years. If survey results indicate burrowing owls are not nesting on the relocation area, remedial actions shall be developed and implemented in consultation with the CPM, CDFG and USFWS to correct conditions at the site that might be preventing owls from nesting there. A report describing survey results and remedial actions taken shall be submitted to the CPM, CDFG and USFWS no later than January 31 of each year for five years.

4. Preserve and Manage Compensatory Habitat. For each individual owl or pair identified on the project site during pre-construction surveys, 6.5 acres shall be preserved and managed in perpetuity for the occupation of burrowing owls. This compensatory habitat shall be in addition to the acreage required to mitigate impacts to desert tortoise and Mohave ground squirrel.

   The compensatory habitat shall be managed for the benefit of burrowing owls, with the specific goals of:

   a. Maintaining the functionality of artificial and natural burrows; and

   b. Minimizing the occurrence of weeds (species considered “moderate” or “high” threat to California wildlands as defined by CAL-IPC [2006] and noxious weeds rated “A” or “B” by the California Department of Food and Agriculture and any federal-rated pest plants [CDFA 2009]) at less than 10 percent cover of the shrub and herb layers.

   The Burrowing Owl Plan shall also include monitoring and maintenance requirements, details on methods for measuring compliance goals and remedial actions to be taken if management goals are not met.

   The final Burrowing Owl Plan is due before preconstruction surveys begin to ensure that an approved relocation methodology will be followed for any owls occurring within the project area. Therefore, it is understood that the compensatory mitigation acreage (if required) will not be identified in the Burrowing Owl Plan. However, the Plan shall propose a location for compensatory mitigation land and the methodology to quantify the acreage required, as outlined above. If owls are identified during the pre-construction survey, the project owner shall submit an addendum to the Burrowing Owl Plan, which identifies the exact acreage to be preserved and

managed in perpetuity for burrowing owl based on the results of the preconstruction survey and as agreed to in consultation with CDFG.

ATTACHMENT 5

Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendations

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I. Purpose

This document identifies the minimum inventory and monitoring effort recommended for determining and evaluating potential Golden Eagle (*Aquila chrysaetos canadensis*) use of habitat including nest sites, roosts, and territories, as well as the rationale for identifying and evaluating foraging locations during breeding and non-breeding periods. It also outlines the minimum monitoring techniques to ascertain occupancy and reproductive success at territories. These field efforts are the mutual responsibility of agencies authorizing activities and their permittees (i.e. action agency; see Glossary). They are essential components for avoiding and minimizing disturbance and other kinds of take, including lethal take, and are a necessary component of short and long-term site specific monitoring and management of local Golden Eagles and regional Golden Eagle populations. The data gathered will provide information on the baseline circumstances for evaluation of permit applications and foundation for permit conditions, as well as assist planners so they may conduct informed impact analyses and mitigation during the National Environmental Policy Act (NEPA) process. Data collected via this effort will also help:

1. Determine the fate and reproductive trends of regional nesting populations via collating information from observed territories.
2. Document and list historical and unsurveyed habitat for future analysis to assist In determining local and regional population trajectories.
3. Provide information to document whether local Golden Eagle conservation efforts are meeting goals for improvements in the status of Golden Eagle.
4. Provide a foundation for evaluation of whether and which activities or conditions may be affecting Golden Eagle.

II. Background

Golden Eagles are protected by the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act (Eagle Act), which both Acts prohibit take. Take means *pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest,* or *disturb*. When the Bald Eagle was delisted under the Endangered Species Act (ESA), and in order to improve management of both species of eagles under the Eagle Act, the U.S. Fish and Wildlife Service (Service) undertook a series of management actions, including:

- **Codifying a regulatory definition of "disturb"** under the Eagle Act (see 72 FR 31132, June 5, 2007). *Disturb* means to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1)

injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

- **Proposing permit regulations** to (1) Create a new permit type to authorize take of Bald Eagles and Golden Eagles that is associated with, but not the purpose of, the activity; and (2) Create a second new permit type to authorize purposeful take of eagle nests that pose a threat to human or eagle safety (subsequently broadened to accommodate additional circumstances). The regulations were finalized on September 11, 2009 (74 FR 43686).

Summary of the new regulations.

Permits issued under 50 CFR § 22.26 authorize take of Bald Eagles and Golden Eagles, where the take is associated with, but not the purpose of the activity, and cannot practicably be avoided. Most take authorized under this section will be in the form of disturbance; however, permits may authorize lethal take that results from, but is not the purpose of, an otherwise lawful activity. Purposeful take will not be authorized under § 22.26.

The second new permit regulation, at 50 CFR 22.27, establishes permits for removing eagle nests where (1) necessary to alleviate a safety hazard to people or eagles, (2) necessary to ensure public health and safety, (3) the nest prevents the use of a pre-existing human-engineered structure, or (4) the activity, or mitigation for the activity, will provide a net benefit to eagles. Only inactive nests during the non-breeding season may be taken, except in the case of safety emergencies.

Regulations under § 22.27 authorize removal and/or relocation of active and inactive eagle nests in cases where genuine safety concerns for people, eagles, or both, necessitate the take. Examples include: (1) a nest tree that appears likely to topple onto a residence; (2) at airports to avoid collisions between eagles and aircraft; and (3) to relocate a nest built within a reservoir that will be flooded.

Both regulations are provided for by the Eagle Act which gives the Secretary of the Interior the authority to permit the limited take of Bald Eagles and Golden Eagles "for the protection of . . . other interests in any particular locality." Additionally, both new regulations:

- Are applicable to Golden Eagles as well as Bald Eagles.
- Authorize take only where it is compatible with the preservation of the eagle. For purposes of these regulations, "compatible with the preservation of the Bald Eagle

and the Golden Eagle" means consistent with the goal of stable or increase of breeding populations.

- Authorize take only where it cannot practicably be avoided.
- Include provisions for programmatic take. Programmatic take (take that is recurring and not in a specific, identifiable timeframe and/or location) will be authorized only where it is unavoidable despite implementation of comprehensive measures developed in cooperation with the Service to reduce the take below current levels.

Additional needs for Golden Eagle information and evaluation.

As part of an adaptive management approach to the permits and eagle management, the Service will assess, at least every five years, overall population trends along with annual report data from permittees and other information to assess how likely future activities are to result in the loss of one or more eagles, a decrease in productivity of Golden Eagles, and/or the permanent loss of a nest site, territory, or important foraging area. Therefore, implementation of the new permit regulations will entail requirements for cumulative effects analyses and identifying the impacts of an activity. We include them here to provide the context and framework for the protocols and recommendations in this document.

Cumulative effect considerations.

Whether the take is compatible with eagle preservation includes consideration of the cumulative effects of other permitted take and additional factors affecting eagle populations. Cumulative effects are defined as: *"the incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions"* (50 CFR 22.3). Numerous relatively minor disruptions to eagle behaviors from multiple activities, even if spatially or temporally distributed, may lead to disturbance that would not have resulted from fewer or more carefully sited activities. The accumulation of multiple land development projects or siting of multiple infrastructures that are hazardous to eagles can cumulatively reduce the availability of alternative sites suitable for breeding, feeding, or sheltering, resulting in a greater than additive risk of take to eagles.

To ensure that impacts are not concentrated in particular localities to the detriment of locally-important eagle populations, cumulative effects need to be considered at the population management level—*Service Regions* for Bald Eagles and *Bird Conservation Regions* for Golden Eagles—and, especially for project-specific analyses, at local area population levels (the population within the average natal dispersal distance of the nest or nests under consideration). Eagle take that is concentrated in particular areas can lead to effects on the larger management population because 1) disproportionate take in local populations where

breeding pairs are 'high' producers may reduce the overall productivity of the larger population; and 2) when portions of the management population become isolated from each other the productivity of the overall management population may decrease.

~~Identifying the Impacts of the Activity~~

The applicant for an Eagle Act permit (who can be a project proponent or the agency preparing the NEPA), has four subtasks to determine the likely effects of a project or activity on eagles:

a. Collection and synthesis of biological data. The applicant is responsible for providing up-to-date biological information about eagles that breed, feed, shelter, and/or migrate in the vicinity of the activity that may potentially be affected by the proposed activity. Biological information can include locations and distribution of nests, delineation of territories, prey base, general composition and relative abundance, and productivity data.

b. Identifying activities that are likely to result in take. As part of the permit application, the applicant must include a complete description of the actions that: (1) are likely to result in eagle take, and (2) for which the applicant or landowner has some form of control. For most applications, the activity will be specific and well-defined (e.g., home construction; water use development) or land use activity (e.g., forestry). For larger-scale permits, applicants will need to determine the extent of impacts they want to include in the permit authorization and, if necessary, which ones they wish to exclude.

c. Avoidance and minimization measures. Applications for a § 22.26 permit must document the measures to which the applicant will commit to avoid and minimize the impacts to eagles to the maximum degree practicable.

d. Quantifying the anticipated take. The amount of take to be authorized under a permit depends on a variety of factors, including: (1) the number of eagles that breed, feed, shelter, and or migrate within the activity area, (2) the degree to which the eagles depend on that area for breeding, feeding, or sheltering, or migration, and thus are more likely to be present and affected, (3) the potential of that type of activity in general to take eagles, (4) the scale of the activity, and (5) the measures the applicant will undertake to avoid and minimize the take.

Federal agencies have additional responsibilities to Golden Eagles under Executive Order 13186 (66 FR 3853, January 17, 2001), which reinstated the responsibilities of Federal Agencies to comply with the Migratory Bird Treaty Act of 1918. The Executive Order establishes a process for Federal Agencies to conserve migratory birds by avoiding or minimizing unintentional take and taking actions that benefit species to the extent practicable. Agencies are expected to take

reasonable steps that include restoring and enhancing habitat. Environmental analyses of Federal actions required by NEPA or other environmental review processes must evaluate the effects of actions and Federal agency plans on migratory birds, including Golden Eagles.

Golden Eagle populations are believed to be declining throughout their range in the contiguous United States (Harlow and Bloom 1989, Kochert and Steenhof 2002, Kochert et al. 2002, Good et al. 2007, Farmer et al. 2008, Smith et al. 2008, 74 FR 46836-46879). The Service has modeled current data (USFWS 2009, Appendix C), employing Moffat's equilibrium (Hunt 1998) and Millsap and Allen's (2006) analysis of anthropogenic demographic removal, and estimated that the floating (non-breeding and surplus) component of the Golden Eagle population in some areas may be limited at this time. Data from the Western EcoSystems Technology Inc. surveys from 2006 – 2009 may suggest a decline since 2006 in the total Golden Eagle population within the area covered by the surveys (Neilson et al. 2010, USFWS 2009, Appendix C). Significant Golden Eagle breeding failures have been reported in some areas of the southwestern United States (WRI 2009), and declines in counts of migratory Golden Eagles have been reported in most areas in the western United States (Farmer et al. 2008, Smith et al. 2008), although it is unclear if the latter is linked to a decrease in the number of eagles.

III. Management Need

Prior to initiating inventory and monitoring efforts, land management agencies and/or proponents of land use activities should first assess all existing recent and historical data available on eagles, including their nests, reproductive activity and chronologies, natal dispersal, pertinent data from VHF and satellite telemetry, winter roosts, migration corridors, and foraging habitats contained by and within 4 - 10 + miles of areas slated for development or authorizations for increased human activity. This background search of available information may yield few data, but is necessary to alert project proponents and regulatory staff about data gaps, and existing knowledge of Golden Eagle for that area. Inventory, monitoring, and research activities may then be identified and funded to fill in site specific information gaps to avoid take of Golden Eagle. Specific recommendations for the number of years needed for baseline data and measures to avoid take should be developed in coordination with the Service, and, to reduce redundancy between management and permitting requirements, consistent with permit requirements outlined in the Draft Implementation Guidelines for the new rules (available fall 2010).

Projects in Golden Eagle breeding home ranges on federal, state, and private land possibly will have direct, indirect, and cumulative effects associated with or exacerbated by, factors such as: recreation disturbance, electrocution, urbanization, illegal shooting, invasive species altering prey densities, lead poisoning, other contaminants, climate change, and prolonged drought

which affects predator and prey abundance and distribution. In many cases, existing data may not be adequate for NEPA, planning, or permitting purposes. Therefore, inventory and subsequent monitoring of Golden Eagles and components of their habitats are important to 1) develop a baseline prior to project planning and prior to project development in Golden Eagle habitat, 2) analyze impacts to the species, 3) continue to evaluate and report on the effects of the action and mitigation on Golden Eagles, 4) essential to adaptive management approaches, and 5) provide information that may be required for permits.

Project design, type, and siting of project footprint and infrastructure are critical to avoid disturbance and take of Golden Eagle. In the Final Environmental Assessment on the rule and in the draft Implementation Guidance, the Service recommends that when planning locations of infrastructure and project boundaries, action agencies and project proponents consider life-history components such as productivity, age-class survival, dispersal, migration, winter-concentration behavior, and foraging behavior during breeding and non-breeding seasons in a concerted effort to avoid lethal take. The Service recommends use of the best available or gathered information applicable to the location of the project or plan, but also encourages efforts to conduct further research. For permitting purposes however, and to determine the likelihood and magnitude of take, as well as effectiveness of mitigation, monitoring will need to yield productivity information.

Note: This document does not address site specific observations for transitory and wintering eagles; these protocols will be forthcoming. Although the life history for transitory and wintering eagles is not discussed at length here, that does not imply a lack importance for site-specific observations from the Service's perspective. The document provides general recommendations for factors to consider outside nesting, until more specific protocols are developed.

IV. Basic Golden Eagle Ecology

This account is not intended as a compendium of Golden Eagle natural history, biology, ethology, or ecology; please refer to Watson (1997), Palmer (1988) and Kochert et al. (2002) for more detailed information.

Where they exist, Golden Eagles are an upper-trophic aerial predator, and eat small to mid-sized reptiles, birds, and mammals up to the size of mule deer fawns and coyote pups (Bloom and Hawks 1982). They also are known to scavenge and utilize carrion (Kochert et al. 2002)

Golden Eagles nest in high densities in open and semi-open habitat, but also may nest at lower densities in coniferous habitat when open space is available, (e. g. fire breaks, clear-cuts, burned areas, pasture-land, etc.). They can be found from the tundra, through grasslands,

woodland-brushlands, and forested habitat, south to arid deserts, including Death Valley, California (Kochert et al. 2002). Historically, Golden Eagles bred in the Plains and Great Lake states. Golden Eagles currently breed in and near much of the available open habitat in North America west of the 100th Meridian, as well as in eastern United States in the northern Appalachian Mountains (Palmer 1988, Kochert et al. 2002). Lee and Spofford's (1990) review of the literature for the eastern portion of the United States suggests historical nesting Golden Eagles south of New York in the Appalachians was unlikely. Nesting of introduced Golden Eagles have been reported in Tennessee and northwestern Georgia (Kochert et al. 2002), however it is currently unknown if these territories are still extant.

A nesting territory for the purpose of this monitoring protocol has been previously defined by Steenhof and Newton (2007), i.e. an area that contains, or historically contained, one or more nests within the home range of a mated pair: a confined locality where nests are found, usually in successive years, and where no more than one pair is known to have bred at one time.

Golden Eagles avoid nesting near urban habitat and do not generally nest in densely forested habitat. Individuals will occasionally nest near semi-urban areas where housing density is low and in farmland habitat; however Golden Eagles have been noted to be sensitive to some forms of anthropogenic presence (Palmer 1988). Steidl et al. (1993) found when observers were camped 400 meters from nests of Golden Eagles, adults spent less time near their nests, fed their juveniles less frequently, and fed themselves and their juveniles up to 67% less food than when observers were camped 800 meters from nests. In studies of Golden Eagle populations in the southwest (New Mexico and Texas) and the Front Range of the Rocky Mountains (New Mexico, Colorado and Wyoming), Boeker and Ray (1971) reported that human disturbance accounted for at least 85% of all known nest losses. Breeding adults are sometimes flushed from the nest by recreational climbers and researchers, sometimes resulting in the loss of the eggs or juveniles due to nest abandonment, exposure of juveniles or eggs to the elements, collapse of the nest, eggs being knocked from the nest by startled adults, or juveniles fledging prematurely. However, Golden Eagles rarely flushed from the nest during close approaches by fixed-wing aircraft and helicopters during various surveys in Montana, Idaho, and Alaska (Kochert et al. 2002).

Golden Eagles nest on cliffs, in the upper one third of deciduous and coniferous trees, or on artificial structures (windmills, electricity transmission towers, artificial nesting platforms, etc.; Phillips and Beske 1990, Kochert et al. 2002). Golden Eagles build nests on cliffs or in the largest trees of forested stands that often afford an unobstructed view of the surrounding habitat (Beecham 1970, Menkens and Anderson 1987). Usually, sticks and soft material are

added to existing nests, or new nests are constructed to create a strong, flat or bowl shaped platform for nesting (Palmer 1988, Watson 1997, Kochert et al. 2002). Sometimes Golden Eagle will decorate multiple nests in a single year; continuing to do so until they lay eggs in the selected nest. The completed nest structure(s) can vary from large and multi-layered; or a small augmentation of sticks in caves with little material other than extant detritus (Ellis et al. 2009). Each Golden Eagle territory may have anywhere from 1 to 14 alternative nests, with 1 to 6 nests per territory being the norm (Palmer 1988, Watson 1997, Kochert et al. 2002).

Onset of courtship and nesting chronology

Courtship for Golden Eagles involves stick-carrying, display flights, and vocalization (Ellis 1979, Kochert et al. 2002). Golden Eagles partake in undulating flight, however undulating flight has been observed year- round and is thought to be associated more with aggression and territory defense than with courtship (Newton 1979, Harmata 1982, Collopy and Edwards 1989, Watson 1997).

Nesting chronologies vary however there are some generalities. In California and in Texas, courtship at territories start in mid to late December (Palmer 1988, Hunt et al. 1997, D. Bittner pers. com); in Texas eggs have been detected as early as November (Olberholser and Kincaid 1974, *in lit.*). In Utah, courtship can commence in January. In northern tier states at upper latitudes and higher elevation sites, egg laying can occur as early as February and March, before late winter snows and storms have abated (Palmer 1988).

Golden Eagles lay 1 to 4 eggs, with 4 egg clutches rare. Most nests have 2 eggs. The laying interval between eggs ranges between 3 to 5 days. Incubation commences as soon as the first egg is laid, and hatching is asynchronous and can begin as early as late January in southern California (Dixon 1937, Hickman 1968), mid April to late May in southwest Idaho (Kochert et al. 2002) and late March–early May in central and northern Alaska (McIntyre 1995, Young et al. 1995; Fig. 3). In Texas, eggs have been noted from November to June (Oberholser and Kincaid 1974, in lit.). In the northeast United States, eggs have been laid in March/April (Palmer 1988). For more detail, please refer to Kochert et al. 2002 (Appendix 2).

Migration and Wintering

Golden Eagles will migrate from the Canadian provinces and northern tier and northeastern states to areas that are milder in the winter and/or may have less snow cover. Wintering Golden Eagles have been noted in all states in the continental U.S. (Wheeler 2003, 2007). Some segments of the population are non-migratory, and can be found near their nest sites throughout the year. See Kochert et al. 2002 for detailed listing of winter range.

Roosts or gathering behavior

Golden Eagles are not known to roost communally as is common with wintering Bald Eagles in some areas of the United States, but will gather together if local food sources are abundant. A caveat to this is that Golden Eagles have perched with bald eagles where there have been large concentrations of waterfowl or carrion (Palmer 1988).

V. Golden Eagle Responses to Disturbance

Golden Eagles, as with other raptors, visibly display behavior that signifies disturbance when they are stressed by anthropogenic activities; whether it is a lone hiker walking 1000 meters or more from a nest, or extended construction or recreation activities 2000 – 5000 meters from a territory. These postures, movements and behaviors can be overt. However with Golden Eagles, disturbance behaviors are often subtle and require an experienced observer. Olendorff (1971), Fyfe and Olendorff (1976), and Olsen and Olsen (1978) identified considerations when human interactions may disturb nesting activities, and how to ascertain critical distances to avoid agitating nesting, roosting, and foraging raptors. Factors affecting critical distances included:

a. Mannerisms of intruder.

b. Size of intruder.

c. Stage of breeding cycle.

d. Topography and exposure of intruder in relation to bird.

Golden eagle behavior varies among individuals and can be affected by previous experiences. However, some behavioral generalities relative to direct and indirect disturbance include the following:

- Agitation behavior (displacement, avoidance, and defense)
- Increased vigilance at nest sites
- Change in forage and feeding behavior
- Nest site abandonment

Of the preceding behaviors, nest-site abandonment can be readily identified as constituting take under the Eagle Act, as it is specifically cited in the definition of 'disturb'. The other behaviors, when considered cumulatively, may be evidence that activities are interfering with normal breeding behavior and are likely to lead to take. Human intrusions near Golden Eagle

nest sites have resulted in the abandonment of the nest; high nestling mortality due to overheating, chilling or desiccation when young are left unattended; premature fledging; and ejection of eggs or young from the nest (Boeker and Ray 1971, Suter and Joness 1981).

VI. Overall Objectives of the Golden Eagle Survey Protocol

This survey protocol is intended to standardize procedures to inventory and monitor Golden Eagles within the direct and indirect impact area of planned or ongoing projects where disturbance or lethal take from otherwise permitted human activities is possible. This protocol will; 1) identify eagle use areas, 2) identify and minimize potential observer-related disturbance to Golden Eagles by surveys when conducted by qualified and experienced raptor biologists.

Additionally, data collected using this protocol may be used for, at a minimum, 1), sampling other geographic areas where suitable habitat may be present; 2) short and long-term analysis of Golden Eagle occupancy and productivity at known nest sites, and historical locations where observation to determine occupancy maybe necessary; 3) identification and evaluation of potential disturbance factors. If followed, this protocol will standardize data collection for potential local and regional analysis of long-term occupancy, productivity and eagle use trends. This protocol was developed as minimum standards, and as such may require additional area-specific detail if used for research purposes.

Objectives of inventory and monitoring

The first objective of these surveys is to provide methods to identify areas occupied by Golden Eagles and select factors their behavior ecology. Additional objectives of these surveys include:

1. Record and report occupancy and productivity of local Golden Eagle territories.
2. Document and list historical and unsurveyed habitat for future analysis to assist in determining local and regional population trajectories.
3. Determine nesting chronologies.
4. Provide information to document whether local Golden Eagle conservation efforts are meeting goals for improvements in the status of Golden Eagles or meeting permit conditions.
5. Provide a foundation to evaluate whether and which activities or conditions may be affecting Golden Eagles.

6. Document foraging behavior, diet and habitat use within breeding and non-breeding home ranges.

VII. Inventory Techniques

CAUTION

Golden Eagles are one of several cliff and tree dwelling species sensitive to human disturbance. Monitoring eagles in a manner that 'disturbs' them, and causes them to be 'agitated or bothered' can cause nesting failure, and permanent site abandonment, constituting take under the Eagle Act.

These monitoring protocols should facilitate observer caution and identify techniques that will minimize potential for take of Golden Eagles. For additional information regarding preventing observer disturbance while surveying raptors, please refer to Fyfe and Olendorff (1976).

Inventory

Inventories for Golden Eagles should occur if nesting, roosting, and foraging habitat are contained within the project boundary and exist within 4 – 10 air miles from the project boundary. Local and regional Golden Eagle habitat variability will dictate the distance from the project boundary where surveys will occur; distances will be greater in xeric (arid) habitat, or where local prey may not be abundant. The Service will be basing its site-specific evaluations and final determinations on local conditions, not national averages.

Nesting habitat

This account is not intended as a compendium of Golden Eagle habitat available and used in North America; please refer to Palmer (1988) and Kochert et al. (2002) for more detailed information.

Golden Eagles use a wide variety of habitat throughout North America. Small xeric mountain ranges in the Mohave and Great Basin deserts, forested habitat in the Pacific coastal, southern desert, Great Basin, Rocky, Sierra, and Cascade Mountain ranges are also key nesting areas. Local and regional variation of nesting habitat should be considered prior to surveys; however should include cliff, desert scrub, juniper woodland, and forested habitat. For example, in the northern Great Basin, Golden Eagles nest on cliff and in scrub-forest habitat; surveys of both types of substrates are urged prior to projects that have a potential to affect eagles. Identification criteria for nesting habitat at the local scale should take place in coordination with the Service, State, or Tribal wildlife agencies, and raptor experts.

VII.a. Procedures for aerial and ground inventory and monitoring surveys

Golden Eagles generally show strong fidelity to the nesting area annually. Occupancy determination is the most important goal of nest searches. Considerable suitable habitat exists in western North America which has never been adequately surveyed. Inventory surveys should examine habitat where Golden Eagles are not currently known to exist but habitat may be present, as well as previously inventoried areas to detect new activity. Monitoring surveys examine all historical and extant territories where Golden Eagles have been detected either previously or in the current survey.

A nesting territory or inventoried habitat should be designated as unoccupied by Golden Eagles ONLY after at least 2 complete aerial surveys in a single breeding season. In circumstances where ground observation occurs, at least 2 ground observation periods lasting at least 4 hours or more are necessary to designate an inventoried habitat or territory is unoccupied as long as all potential nest sites and alternate nests are visible and monitored. These observation periods should be at least 30 days apart for inventory, and at least 30 days apart for monitoring of known territories. Intervals between observations at occupied nesting territories may need to be flexible and should be based on the behavior of the adults observed, the age of any young observed, and the data to be collected (see below, Section IX). Dates of starting and continuing inventory and monitoring surveys should be sensitive to local nesting (i.e. laying, incubating, and brooding) chronologies, and would be conducted during weather conditions favorable for aerial survey and/or monitoring from medium to long range distances (+ 300 – 700 meters).

The first inventory and monitoring surveys should be conducted during courtship when the adults are mobile and conspicuous. When survey of historical territories is conducted, observers should focus their search on known alternative nests, and also carefully examine the habitat for additional nests which may have been overlooked or recently constructed. A 'decorated' nest will be sufficient evidence to indicate the probable location of a nesting attempt. If a decorated nest or pair of birds is located, the search can then be expanded to inventory likely habitat adjacent to the discovered territory to see if additional golden eagle territories can be observed.

Note: Identification of alternate nests will be required by the Service for determination of relative value of individual nests to a territory in cases of applications for permits to take 'inactive' nests, and when determining whether abandonment of a particular nest is likely to result in abandonment of a territory. The Service has determined that territory loss or permanent abandonment of a territory is a greater impact to populations than temporary abandonment of a nest.

Weather: Avoid searching potential and known nesting locations during periods of heavy rain, snow, high winds, or severe cold weather. Golden Eagles should not be induced to flush at any time during the survey period. Flushing when the adults are incubating or have small young can be particularly hazardous for successful nesting, and could constitute lethal disturbance take. High temperatures also may cause problems for successful viewing over long distances due to heat waves. Further, observer related incidences of causing flight of adults that are shading young to prevent overheating during high temperatures may cause mortality of the young. Observation for Golden Eagles during inclement weather is impractical, uncomfortable, and unsafe for Golden Eagles and observers. Weather will be recorded by the observer.

Time of day: Aerial surveys should be conducted, at the beginning of the day if winds permit. Likewise, ground surveys should be initiated, where possible, in morning hours when the air is still to avoid heat waves. Prime observation periods are around dawn, or shortly thereafter. In some cases the angle of the sun in relation to the cliff can be a more important issue, and some cliffs are better observed in afternoon light, however observations of adult behavior that are used to determine nesting chronologies may be conducted during most of the day. Observers should be aware of the angle of the sun in relation to the observation post and the nest. Some sites are plagued by afternoon winds, heat waves, or dust storms; local observation conditions should be taken into account prior to establishing viewing periods. Time of day will be recorded by the observer.

Time of year: Breeding surveys for Golden Eagles are latitude and elevation dependent; however, their nesting season ranges in the contiguous United States from 01 January to 31 August (Kochert et al. 2002). Nesting failures and seasonal variations should be considered as potential anomalies to 'normal' behavior and nesting chronologies. Dates to be used as a cut-off period for observation and reporting of nesting failures or non-nesting status will vary per region. The dates listed below are to be used as general guides, and should not be used as final nest site failure survey determination dates. Location-specific determination dates should be developed in coordination with the Service, State, or Tribal wildlife agencies, and raptor experts.

Duration of stay at observation points: Ground observers will survey from observation points for a minimum of 4 hours, unless observations yield Golden Eagle presence, or Golden Eagle behavior indicate eggs or young, or observation suggests the observer is disturbing the birds. Slowly walking and observing all potential nesting substrate can be used to completely inventory potential habitat. Observation periods may last longer as longer observation periods may be necessary to accurately determine nesting chronologies. Duration of stay at known or suspected territories during helicopter reconnaissance, or during ground observation periods will be recorded by the observer.

VII.b Aerial surveys

Helicopters are an accepted and efficient means to monitor large areas of habitat to inventory potential habitat and monitor known territories only if accomplished by competent and experienced observers. They can be the primary survey method, or can be combined with follow-up ground monitoring. Disturbance to eagles is minimal only WHEN accepted aerial practices and techniques are followed. NOTE: Ground surveys can be used when their use is more efficient, or when other circumstances (i.e. bighorn sheep lambing areas) require this method.

Coordination between state and federal agencies is an important aspect of aerial surveys to develop acceptable search criteria to be used for identifying likely suitable nesting habitat and locating nests, as well as to be become acquainted with potential hazards and air space restrictions. Survey pilots should be aware of potential ground hazards within the habitat to be examined, including marked and unmarked transmission and wires. Other hazards to surveyors include rock-fall or tree fall from above the helicopter, raptors or other birds colliding with the helicopter, and collision with other aircraft. Although pilots are often the first to note a flying raptor during surveys, some accidents involving wildlife researchers have been attributed to the pilots focusing on the survey, rather than giving their complete attention to flying the helicopter.

Helicopters used for surveying Golden Eagle habitat should be light utility, i.e. small to medium sized (e.g. MD-500/520, Eurocopter 145, Bell Jet-Ranger 206, UH-72,) capable of vertical mobility in warm temperatures and higher elevations. Inventories for raptors can be conducted with the main observer door(s) removed (which may provide more lateral and horizontal

visibility), or with the doors closed. The decision regarding observer doors should remain a personal choice, with the safety of pilots and observers as the primary determinant.

Cliffs should be approached from the front, rather than flying over from behind, or suddenly appearing quickly around corners or buttresses. Inventories should be flown at slow speeds, ca. 30 – 40 knots. However, detection of nests may require slower speeds, e.g. 20 knots, while between nest speeds can be higher (+ 60 knots). All potentially suitable nesting habitats (as identified in coordination with the Service) should be surveyed; multiple passes at several elevation bands may be necessary to provide complete coverage when surveying potential nesting habitat on large cliff complexes, escarpments, or headwalls. Hovering for up to 30 seconds no closer than a horizontal distance of 20 meters from the cliff wall or observed nests may be necessary to discern nest type, document the site with a digital photograph of the nest, and if possible, allow for the observer to read patagial tags, count young, and age young in the nest (Hoechlin 1976). Confirmation of nest occupancy may be confirmed during later flights at a greater horizontal distance.

Re-nesting is rare, but Golden Eagles may fail at their first nest attempt, and move to, or create, an alternate nest site. Multiple visits to known or potential nesting habitat may be necessary to provide complete observation and coverage of habitat.

To inventory for the purpose of documenting presence/absence of Golden Eagles in potential habitat, at least 2 aerial observation flights of habitat are necessary. These flights will be spaced no closer than 30 days apart. Additional inventory work in the territory is not necessary after nests have been located where Golden Eagles are found incubating, or where eggs or young and number of eggs or young are noted. At this point, the observation effort should switch to monitoring of the known territory. The nest location should be documented (see territory/nest naming convention, pp. 21).

Inventory and monitoring flights will be based on local knowledge of known nesting chronologies for that latitude and elevation, and should be timed to be the most efficient to reduce the number of visits to the nest site. Flights may occur preferentially during a) late courtship, b) egg-laying though hatch, and/or c) when the young are between 20 – 51+ days old. Productivity surveys are best scheduled when the young are approximately 51+ days old (prior to fledging). Aerial visits at known nests may be augmented or replaced by ground observation (see below).

Other raptors or special status species may be observed during the flight, and should be recorded/reported. Coordination with state and federal agencies will be necessary when state or federally listed Threatened, Endangered or special status (species of concern, sensitive, etc.) species are present in the flight survey area (i.e. big-horn sheep, peregrine falcons, etc.).

Bighorn sheep share the same type of cliff complexes Golden Eagles use for nesting, and are hyper-sensitive to helicopters (Weyhausen 1980, Bleich et al. 1990). Specifically for bighorn sheep lambing areas, helicopter reconnaissance and surveys for Golden Eagles are not possible as these flights will induce unpermitted take during the lambing season; all helicopter survey work for Golden Eagles should be avoided in known lambing areas. Ground observation will be necessary for inventory of cliff complexes and monitoring of potential and known Golden Eagle territories in bighorn sheep lambing areas.

Most Golden Eagle respond to fixed wing aircraft and helicopters by remaining on their nests, and continuing incubation or roosting (DuBois 1984, McIntyre 1995). Perched birds may flush. During aerial surveys, deference to flying eagles should be given at all times. Flights at nest sites should be terminated and the helicopter should bank away and move to the next location if Golden Eagles appear to be disturbed; i.e. behavior that indicates the birds are agitated by the presence of the helicopter. In short, observers should obtain their data, and leave as soon as possible.

Any disturbance behavior observed should be noted so that consecutive aerial surveys would be sensitive to Golden Eagles at that location. Aerial reconnaissance to inventory/survey for potential habitat and additional visits at known nests may be augmented/replaced by ground observation from a safe distance (see below). Ground observation may be the recommended alternative to additional survey flights due to convenience or necessitated by other sensitive wildlife species. Follow-up ground observation from a safe distance may also be the recommended alternative for additional nest site monitoring.

Observers in helicopters have specific duties. At least two observers may be best for aerial surveys; one the lead observer, the other(s) supplement survey effort. One observer is assigned to record data on a tape recorder (unless the verbal interchange can be recorded on the helicopters internal communication system), and the other briefly records data on hard-copy and with digital photographs. Aerial observation routes should be recorded, downloaded, and reported using Global Positioning System track routes or applicable software programs. Observation locations and time-on-site should be recorded on applicable maps to ascertain coverage of cliff systems and other potentially suitable habitat.

Summary:

- Qualified observer(s) (as defined in section VIII).
  No closer than 10-20 meters from cliff; no farther than 200 meters from cliff (safety dependent).
- Close approach and extended hovering is allowed when there are no birds on the nest to allow observers to count eggs, dead young, or confirm nest failure.
- Multiple passes or 'bands' (i.e. back and forth at different elevations above ground level) of observation across cliff habitat may be necessary to achieve complete coverage in large cliff complex'.
- Occupied territories and current and alternative nest sites will be documented; nests 'decorated' with fresh branches should also be delineated.
- Once a nest with eggs, young, or an incubating adult has been located, there is no need to search for other nests within the territory.
- Minimal hovering time at known or potential nest; ca < 30 seconds.
- At least 2 surveys of previously unsurveyed habitat will be spaced at least 30 days apart.

VII.c. Ground Surveys

Ground surveys of potential habitat

Ground surveys for Golden Eagles in potential habitat may be achieved without aerial support, or may be used to augment extant aerial surveys. Ground surveys to detect Golden Eagle nests and the selected nest at known territories are effective in habitat where observation points are established to observe areas on cliffs, utility towers, or in trees suspected to be nesting habitat. As with aerial surveys, identification criteria for nesting habitat should take place in coordination with the Service, State or Tribal wildlife agencies, and raptor specialists.

Observation posts (OP) are established during initial reconnaissance of potential or known nest cliffs, and are established in locations that are far enough from the potential nest site to effectively observe the behavior of the adults (if present) without disturbing nesting behavior. Well-placed OPs provide unobstructed viewing of the potential nest location or of the area to be surveyed; including a broad panorama of the surrounding habitat. Multiple OPs or walking surveys may be necessary to observe potential nest sites. OPs located in front of, and below the potential nest cliff or tree are best. Placing OPs below the potential nest cliff reduces stress if an incubating adult may be present. The distance from an OP to the potential nest site may range from 300 – 1600 meters (latter represents extreme circumstances) from the cliff base to the observer, and generally no greater than 700 meters.

Golden Eagles may use alternative nests. Detection of previously unknown alternate nests and observation of all known alternative nests will become important if Golden Eagles fail in their initial nesting attempt, or are not observed at the probable nest location.

~~Ground monitoring; known territories~~

Monitoring to document nesting success at known territories may occur solely via ground observations. Observation of known territories should use the methodology described for ground monitoring of potential habitat (see section VIIc). Dates of all visits to the nesting territory will be recorded; date of confirmation of nesting failure will be key data for site specific and regional analysis.

Nesting outcomes

Fledging success will be determined via the observation of young that are at least 51 days of age, or are known to have fledged from the observed nest. If there is whitewash (Golden Eagle defecation) and a well worn nest, young were previously observed in the nest to be > 4 weeks old during a previous visit, and the young would have been > 51 days old at the time of the visit, and no dead young are found after a thorough ground search, the nesting attempt can be deemed successful.

Nesting failure occurs when a nest where eggs were laid or where incubation behavior was observed fails to have any young reach 51 days of age. If necessary, nesting failure will be confirmed by using a spotting scope to view the nest to determine if dead young are observed. Nesting failures may also be determined if observations of the nest prior to the projected fledge date yields no young or fledglings where eggs or young were previously observed. In these instances observation periods should last 4 hours (consecutively), or are confirmed by aerial survey. If dead young are observed in the nest (i.e. all young are dead), monitoring efforts may cease. Nest failures may also be confirmed by an approach (walk-in) to the nest no more than 4 weeks after fledging was scheduled to occur. Observers will look for dead chicks at the base of the nest cliff or tree, where access is reasonable and safe.

Observers must document the criteria they use to conclude that success or failure occurred.

Summary

- Observation posts for monitoring known territories will be no closer than 300 meters for extended observations, and generally no further than 700 meters, where terrain allows. Maximum OP distance would be 1600 meters.

- To inventory and determine occupancy of cliff systems, there will be *at least* 2 observation periods per season. To determine fledging success, additional observations may (or may not) be necessary.
    - Observation periods will last at least 4 hours for known nest sites, or until territory occupancy can be confirmed.
    - Observation periods will last for at least 4 hours per 1.6 km of cliff system, based from the center point of that cliff complex.
    - Observation periods will be at least 30 days apart for monitoring efforts.
- To collect monitoring data at a known nest territory, there will be at least 2 observation periods per season.
    - Observation periods from ground observation points will last at least 4 hours for known nest sites or until nesting chronology can be confirmed per visit. Observation periods will be at least 30 days apart.

VIII. Observer qualifications

Surveyor experience affects the results of protocol-driven raptor surveys. All surveyors/observers should have the equivalent of 2 seasons of intensive experience conducting survey and monitoring of Golden Eagle and/or cliff dwelling raptors. That experience may include banding, intensive behavioral monitoring, or protocol-driven survey work. Experience should be detailed and confirmed with references, and provided to action and regulatory agencies. All surveyors should be well-versed with raptor research study design and Golden Eagle behavior and sign, including nests, perches, mutes, feathers, prey remains, flight patterns, disturbance behavior, vocalizations, age determination, etc. **Aerial surveys will be conducted by raptor specialists who have at least 3 field seasons experience in helicopter-borne raptor surveys around cliff ecosystems.**

In lieu of limited or no Golden Eagle experience, ground surveyors should attend at least a 2-day Golden Eagle training session convened with classroom and field components; trainers will be designated by the USFWS/USGS. Inexperienced or limited experience surveyors will be mentored by Golden Eagle specialists for at least 1-2 field seasons, depending on their experience level, and should assist with the preparation of at least 3 surveys and reports over at least 3 years. A Golden Eagle specialist is defined as a biologist or ecologist with 5 or more years of Golden Eagle or cliff dwelling raptor research/survey experience, possession of state/federal permit allowing capture, handling, and/or translocation of Golden Eagles and/or

cliff dwelling raptors; and/or relevant research on raptors published in the peer reviewed literature.

IX. Documentation and accepted notation of territory/nest site and area surveyed

Data for each territory/nest site(s) and area visited will be reported annually to the applicable regional office of the USFWS Division of Migratory Bird Management for collation into a national database.

Minimum data collected at known Golden Eagle territories

Observation of potential sites and known nest territories will produce data helpful to determine territory occupancy, productivity, and fate of the nesting attempt. Each observation and all site specific data collected should include at least;

a) date of observation,
b) time of observation(s),
c) weather during observation,
d) duration of observation,
e) name of observer(s),
f) location of observation,
g) description of observation.

Data collected during inventory and monitoring will include (at least) the following:

- Territory status [Unknown; Vacant; Occupied-1 eagle; Occupied-2 eagles- laying or non-laying; Breeding successful (chick observed to be at least +51 days-fledging), Breeding unsuccessful (failed-nesting attempt failed after eggs were laid)].
- Nest location (decimal degree lat/long or UTM).
- Nest elevation.
- Age class of Golden Eagles observed.
- Document nesting chronology;
    - Date clutch complete (estimated). Describe incubation behavior observed to derive this date, and/or use backdating from known nestling age).
    - Hatch date (estimated from age of nestlings).
    - Fledge date (known or estimated; see nesting outcomes, pp. 18).
    - Date nesting failure first observed and/or confirmed.

- Number of young at each visit and at >51 days of age.
- Digital photographs; a) landscape view of area inventoried, b) landscape view of territory, and c) nest(s).
- Substrate upon which the nest is placed (tree species, cliff, or structure).

Additional data that can be collected include (but are not limited to):

- Presence or absence of bands (USGS and VID), patagial tags (number and color), or telemetry unit.
- Forage location (if known).
- Prey items noted (if discerned).
- Height of nest on cliff or in tree, and description of technique used to estimate height.
- Species of tree, type of rock, or type of structure used to support the nest.
- Overall cliff or tree height, and description of technique used to estimate height.
- Nest aspect.
- Other nesting raptors present nearby.

Each area surveyed under the requirements of this protocol, including surveyed habitat, occupied nesting territory, historical territory, and suspected/alternative nests will be recorded in a standardized manner to allow local, regional, and national data analysis.

Recommended Golden Eagle Territory/site naming convention:

XX^1-XXX^2-$XXXXX$/XX^3-XXX^4-XX^5 Territory name

XX^1 = State (two letter alpha)

XXX^2 = County (three letter alpha)

XX^3= USGS Quad [five numeric/two letter alpha] (when the territory straddles adjacent quad maps, the quad in which the first nest was found will be used to describe the territory; XX^5 is used to document the locations of alternate nests within a territory).

XXX[4]=Assigned Territory number within USGS quad (three numeric)

XX[5]=Assigned Nest number within territory in instances of alternate nests (two numeric)

Site name=traditional site name, or if new, use local naming convention (e.g. Upper fork Amundsen Creek, Fort Peck flatland, Farmer Jane's back 40).

Example CA-KER-38512/DG-03-02 Abbot Creek

X. Additional considerations

This interim document primarily contains methods for inventorying and monitoring at nest sites, but the prohibitions against take and the new regulations apply at nest sites and foraging areas, as well as during migration and other non-breeding times. The Service will develop or adopt recommendations for surveys applicable to non-nesting in other documents.

Suitable foraging habitat

Golden Eagles forage close to and far from their nests, i.e. < 6 km from the center of their territories, but have been observed to move 9 km from the center of their territories in favorable habitat (McGrady et al. 2002). These distances may be further in xeric habitat.

Suitable wintering habitat

During winter, Golden Eagles are found throughout the contiguous United States. Inventories for wintering Golden Eagles will encompass all habitat where Golden Eagles have been known to nest, roost, and forage. Refer to Wheeler (2003, 2007) for maps elucidating suitable wintering range.

Winter surveys

Survey information gathered during the non-breeding period is needed to identify foraging areas and determine numerical estimates of use by Golden Eagles. Presence of Golden Eagles during winter surveys does not necessarily mean that breeding individuals are present; however follow-up surveys during the breeding season are necessary to denote occupancy at suspected or known territories.

Migration surveys

The location of migration routes or areas in relation to a proposal that are likely to take Golden Eagles through injury or mortality may have critical implications. Therefore, evaluations should assess whether migratory or transient Golden Eagles are likely to be present during the construction and the life of the project. Other factors to consider include numbers of Golden Eagles moving through the project area, movement patterns (including a three-dimensional spatial analysis), time of day, and seasonal patterns. In the case of wind development, surveys will need to identify the locations of migration routes and movements during migration in relation to proposed turbines and rotor-swept area.

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XIII Glossary

Action agency – an agency or entity authorizing an action or plan, or providing funding for actions and plans.

Active nest (from the regulations) — a Golden Eagle nest characterized by the presence of any adult, egg, or dependent young at the nest in the past 10 consecutive days immediately prior to, and including, at present. Applies only to applications for permits to take eagle nests.

Breeding home ranges - the spatial extent or outside boundary of the movement of individuals from Golden Eagle pairs during the course of everyday activities during the breeding season.

Inactive nest (from the regulations) — a Golden Eagle nest that is not currently being used by eagles as determined by the continuing absence of any adult, egg, or dependent young at the nest for at least 10 consecutive days immediately prior to, and including, at present. An inactive nest may become active again and remains protected under the Eagle Act.

Inventory –systematic observations of the numbers, locations, and distribution of Golden Eagles and eagle resources such as suitable habitat and prey in an area.

Local area population — the population within the average natal dispersal distance of the nest or nests under consideration (43 miles for bald eagles, 140 miles for golden eagles). Effects to the local area population are one consideration in the evaluation of the direct, indirect, and cumulative effects of take, and the mitigation for such take, under eagle take permits.

Migration corridors - the routes or areas where eagles may concentrate during migration. Golden Eagles begin migrating across a broad front, but tend to concentrate along leading lines (geographical features such mountain ridges) as they move between geographic locations. Golden Eagles are observed in largest numbers along north-south oriented mountain ranges where they soar on mountain updrafts. The species typically avoids lengthy water-crossings. In North America, migrating Golden Eagles concentrate along the Appalachian Mountains in the East and Rocky Mountains in the West.

Management agency - see Action Agency.

Monitoring - inventories over intervals of time (repeated observations), using comparable methods so that changes can be identified. Monitoring includes analysis of inventory data or measurements to evaluate change within or to defined metrics. Monitoring also includes repeated observations of a known nesting territory.

Occupied Nests - those nests which are used for breeding in the current year by a pair. Presence of raptors (adults, eggs, or young), freshly molted feathers or plucked down, or

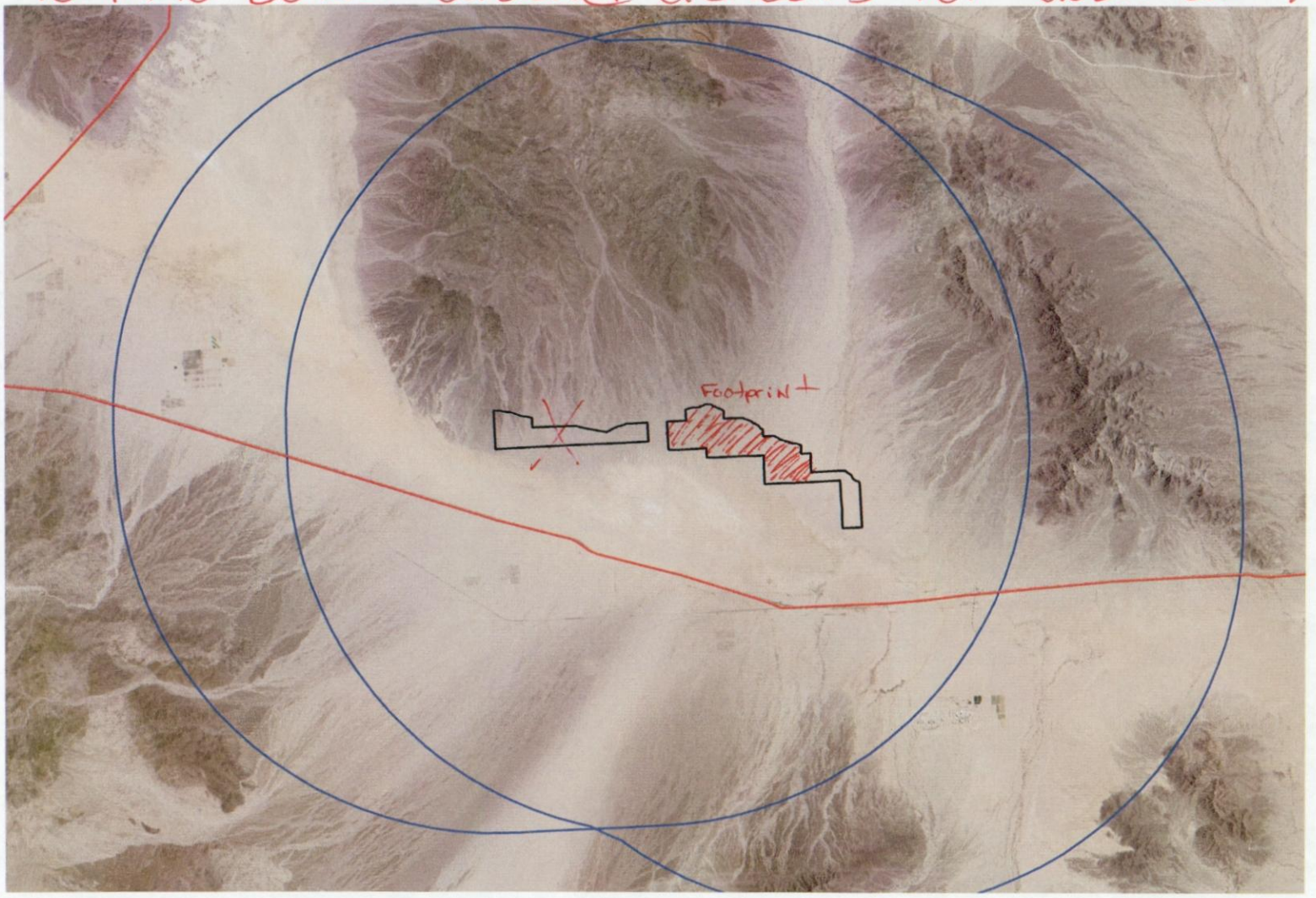
current years' mute remains (whitewash) suggest site occupancy. Additionally, for the purposes of these guidelines, all breeding sites within a breeding territory are deemed occupied while raptors are demonstrating pair-bonding activities and developing an affinity to a given area. If this culminates in an individual nest being selected for use by a breeding pair, then the other nests in the nesting territory will no longer be considered occupied for the current breeding season. A nest site remains occupied throughout the periods of initial courtship and pair-bonding, egg laying, incubation, brooding, fledging, and post-fledging dependency of the young.

Unoccupied Nests - those nests not selected by raptors for use in the current nesting season. Nests would also be considered unoccupied for the non-breeding period of the year. The exact point in time when a nest becomes unoccupied should be determined by a qualified wildlife biologist based upon observations and that the breeding season has advanced such that nesting is not expected. Inactivity at a nest site or territory does not necessarily indicate permanent abandonment.

Productivity — the mean number of individuals fledged per occupied nest annually.

Survey –is used when referring to inventory and monitoring combined.

10 mile buffer around GENESIS For GOEA surveys.



PROOF OF SERVICE

I, Bonnie Heeley, declare that on June 18, 2010 I served and filed copies of the attached **Testimony of Scott Cashen on Behalf of the California Unions for Reliable Energy on Biological Resources for the Genesis Solar Energy Project**. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at www.energy.ca.gov/sitingcases/genesis. The document has been sent to both the other parties in this proceeding as shown on the Proof of Service list and to the Commission's Docket Unit electronically to all email addresses on the Proof of Service list and by depositing in the U.S. Mail at South San Francisco, CA with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list to those addresses NOT marked "email preferred." I also sent a copy via email and an original and one copy via U.S. mail to the California Energy Commission Docket Office.

I declare under penalty of perjury that the foregoing is true and correct. Executed at South San Francisco, CA on June 18, 2010.

_____/s/_____
Bonnie Heeley

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