SODA MOUNTAIN SOLAR

February 23, 2015

California Energy Commission
Dockets Office, MS-4
Docket No. 09-RENEW EO-01
1516 Ninth Street
Sacramento, CA 95814-5512
docket@energy.ca.gov

SUBJECT: Comments on DRECP Draft EIS/EIR

Dear Sir/Madam:

This letter provides the comments of Soda Mountain Solar, LLC (SMS) on the Draft Environmental Impact Statement (EIS), and Environmental Impact Report (EIR) prepared for the Desert Renewable Energy Conservation Plan (DRECP), referenced herein as the DRECP Draft EIS/EIR.

SMS is the applicant for the Soda Mountain Solar project, a 350 megawatt solar electric generating facility proposed on public lands administered by the Bureau of Land Management (BLM) in the Soda Mountain Valley of San Bernardino County, California (SMS Project). The BLM received a right-of-way application for the SMS Project on January, 2008. The BLM case number for the project is CACA 49584.

Project site surveys on the SMS Project site began in 2009 and continued through 2013. BLM and San Bernardino County published the SMS Draft EIS/EIR on November 27, 2013. The SMS project will be exempt from the DRECP if it is approved and SMS accepts a ROW grant before issuance of the DRECP Record of Decision.

1. Proposed DRECP land use designations over the SMS Project site

Of the five action alternatives proposed in the DRECP Draft EIS/EIR, two (Alternatives 1 and Alternative 4) would allow solar development of the entire site, two (the Preferred Alternative and Alternative 3) would prohibit development in the northern third of the SMS Project,[1] and one (Alternative 2) would prohibit development of the SMS Project site altogether. The alternatives prohibiting development of all

[1] Interestingly, both the Preferred Alternative and Alternative 3 would assign a Visual Resource Management (VRM) Class II designation to the remaining 2/3 of the SMS Project, which designation could in turn prohibit development of the remainder of the site in addition to the northern 1/3. As discussed below, a VRM Class II management designation makes little sense given that the Soda Mountain valley includes prior disturbance and has a less stringent Visual Resource Inventory (VRI) Class III designation.

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or a portion of the SMS Project site would do so through operation of an Area of Critical Environmental Concern (ACEC) or National Conservation Land (NCL) designation.

2. Proposed DRECP land use designations limiting development of the SMS Project site are unwarranted

The SMS Project site is not fit for an ACEC or NCL designation. As shown below, a wealth of information about the SMS project site has been developed after multiple years of baseline survey work and, then, NEPA and CEQA review. That work has shown the SMS Project site does not host (and the SMS Project does not impede) the kind of biological, cultural, visual, recreational or scientific resources that require conservation under an ACEC or NCL designation. This is unsurprising. The Soda Mountain Valley is already disturbed by the I-15 freeway, transmission lines, a gas pipeline and a gas station, and is bounded to the southeast by a designated OHV area. It is also a 2005 Energy Policy Act Section 368 transmission corridor. The west side of the I-15 freeway is marked for development of the approved Xpress West high-speed rail project.

As also shown below, but for portions of the site that exceed a two percent slope, the SMS Project would satisfy all Solar Energy Zone (SEZ) screening and qualification criteria. This, indeed, is why BLM's October 2012 Solar Program assigned a "variance lands" designation to the entire SMS Project site. The SMS Project site would also remain open to renewable energy development under the "no buffer" provisions of Senator Diane Feinstein's Desert Protection Act, as introduced to Congress in 2010, 2011 and 2015.

These adopted and proposed designations are founded in fact. They are the product of more than six years of resource assessment and stakeholder-informed policymaking that have since been verified and supported by multiple years of SMS Project baseline surveys and environmental impact review. We ask that the DRECP Final EIS/EIR reflect these facts by ascribing a Development Focus Area (DFA) designation to the SMS Project site across all alternatives.

a. An ACEC designation for all or a portion of the Soda Mountain Valley is unwarranted

The Preferred Alternative would prohibit development of the northern third of the SMS Project site by way of an ACEC designation that appears to be derived from Appendix L of the DRECP DEIR. Appendix L includes maps printed on May 29, 2013 that depict the Soda Mountain Valley as within a "Soda Mountains Expansion" ACEC. As explained below, ascribing ACEC status to a portion or all of the Soda Mountain Valley is unwarranted.

ACEC designations highlight areas where special management attention is needed to protect, and prevent irreparable damage to important historical, cultural, and scenic values, fish, or wildlife resources or other natural systems or processes; or to protect human life and safety from natural hazards. (BLM

Manual 1613 – Areas of Critical Environmental Concern). To qualify for potential ACEC designation, these traits must have "substantial significance and values" with "qualities of more than local significance and special worth, consequence, meaning, distinctiveness, or cause for concern." (43 CFR 1610.7-2). Such traits are not in evidence at the SMS Project site.

i. Historical and cultural values within the Soda Mountain Valley

The Boulder Dam-San Bernardino 115 kV transmission line traversing the valley is listed in the National Register. The line is not unique to the valley and, given its location within a larger 2005 Energy Policy Act Section 368 transmission corridor, does not and should not require significant buffering. Segments of the Arrowhead Trail – an early 20th Century highway – are visible on the SMS Project site, but the segment is non-contributing. Please refer to the SMS Project EIS for further details.

The high energy erosional environment of the Soda Mountain valley limits the preservation of cultural sites. Over 7,000 acres of the Soda Mountain valley have been surveyed by SMS consultants and reported to BLM. This work has not revealed substantial historical or cultural values of more than local significance. As a result of the archaeological surveys, a total of 12 archaeological sites and 77 isolates were recorded. Of these, five archaeological sites and 52 isolates are located within the SMS Project Area of Potential Effect. Three of the five archaeological sites are related to historic-era transportation, while the remaining two archaeological sites are prehistoric sites including a flaked stone scatter and a cleared circle. The prehistoric sites, which the SMS Project avoids, are isolated and simpler than others found in this region of the Mojave Desert and are not of more than local significance. BLM has determined that none of these resources are eligible for listing in the National Register. Please refer to the SMS Project EIS and its cultural studies for further details.

ii. Scenic values within the Soda Mountain Valley

1. Visual Resource Inventory values

BLM has assigned a Class III Visual Resource Inventory (VRI) index for the area, as shown in Figure 3.4-4 of the December 2012 "Description and Comparative Evaluation of Draft DRECP Alternatives". A Class III VRI designation is appropriate for the Soda Mountain Valley. While the Soda Mountain Valley is bounded to the east by the Mojave National Preserve, the Desert Protection Act and the CDCA contain no "buffer" restrictions and, in any event, the Soda Mountain Solar EIS/EIR shows that almost all views of the Soda Mountain Valley from within the Preserve are shielded by the intervening South Soda Mountains. The Soda Mountain Valley's scenic values are lower due to the amount of development that has been undertaken or approved in the valley (Interstate 15 freeway, transmission lines, high speed rail and gas station complex) and its inherently local nature as a valley enclosed on all sides by mountains. The approved Section 368 transmission corridor passing through the Soda Mountain Valley must at a minimum be managed with a Class III Visual Resource Management designation (DRECP, ii.3-364). In short, the Soda Mountain Valley does not host scenic values of more than local significance.

2. Visual Resource Management designations

DRECP Alternatives I and IV, which would allow development of the SMS Project, assign a VRM Class III designation over the entire Soda Mountain Valley, based on a decision to manage the valley at the same level as its VRI value.

The DRECP Preferred Alternative and Alternative III, which prohibit development of the northern third of the SMS Project, would assign a VRM Class II designation over the remaining 2/3 of the SMS Project. We assume this is in error. First, because a VRM Class II designation could effectively prohibit development of the eastern 2/3 of the project, rendering solar development of the Soda Mountain Valley impossible. Second, the visual resource inventoried values of the Soda Mountain Valley are Class III. The valley could not be improved to a Class II management designation unless all existing infrastructure in the valley were removed (I-15, transmission lines, gas station, etc.).

DRECP Alternative II, which would prohibit development of the entire SMS Project site, would assign a VRM Class II designation to the entire valley, which, for the same reasons stated above, appears to be in error.

It should also be observed that the DRECP itself does not contemplate VRM class designations at levels higher than the underlying VRI designation: when discussing potential forms of visual resource mitigation, Chapter II.3 of the DRECP Draft EIS/EIR states that mitigation can include "amending RMP for lands located within VRM Class III or IV to a higher level of protection (VRM Class I or II) for areas that are visually intact with no cultural modifications *and have visual resource inventoried values that are equal to or greater in value …"* (DRECP Draft EIR p. II3-419 (emphasis supplied).). The Soda Mountain Valley is not visually intact with no cultural modifications and does not have VRI values that are equal to or greater than VRM Class II.

We request that the BLM reconsider the VRM Class III and Class II DRECP designations proposed for the Soda Mountain Valley. The decision to retain or even somehow improve upon the Soda Mountain Valley's VRI Class designation appears to have been made without consideration of the management objectives embodied in the existing Multiple Use Class designations of the valley, as implemented in past and approved development nearby. As stated in BLM's national guidance:

> Inventory classes are not intended to automatically become VRM class designations. Management classes are determined through careful analyses of other land uses and demands. The VRM classes are considered a land use plan decision that guides future land management actions and subsequent site-specific implementation decisions. … Class determination is based on a full assessment that evaluates the VRI in concert with needed resource uses and desirable future outcomes. The VRM class designations may be different than the VRI classes assigned in the inventory and should reflect a balance between protection of visual values *while meeting America's energy and other land use, or commodity needs*.

(IM No. 2009-167 (July 7, 2009), page 1 (emphasis supplied).).

Taking this guidance into consideration, as well as (i) the Project site's Multiple Use Class designations (all of which allow utility-scale solar), (ii) the amount of development that has been undertaken and/or approved in the project study area (Interstate 15 freeway, transmission lines, high speed rail, gas station and (iii) the designation of most of the valley as a national utility corridor pursuant to an act of Congress, we are of the firm opinion that a VRM Class IV designation is more consistent with IM No. 2009-167 and the management decisions made to date within the Soda Mountain Valley. This is particularly fitting in the solar context because, as mentioned below, the Project site meets all SEZ screening criteria except one requiring a slope of two degrees or less (portions of the site are sloped up to 4 percent).

iii. Wildlife and other natural system values within the Soda Mountain Valley

Initial iterations of the DRECP depicted the Soda Mountain Valley as lying within a desert tortoise connectivity corridor. The January 2013 comments filed by SMS, attached hereto as Exhibit A and made a part hereof, exhaustively demonstrated why the Soda Mountain Valley is not a desert tortoise connectivity corridor. That conclusion has since been independently verified by the Averill-Murray desert tortoise connectivity study, which is now a DRECP data set, showing that desert tortoise connectivity does not exist within the Soda Mountain Valley but does exist on the other side of the North Soda Mountains. (Averill-Murray, R. et al. 2013 Conserving Population Linkages for the Mojave Desert Tortoise (Gopherus agassizii). Herpetelogical Conservation Biology.). This conclusion has been further corroborated by the detection of only one live desert tortoise on the SMS Project site after protocol surveys conducted in 2009, 2012 and 2013. In short, the Soda Mountain Valley does not contain desert tortoise resources of substantial significance and values that are more than local in their significance. Please refer to the January 2013 SMS DRECP comments in Exhibit A for additional detail and substantiation.

A population of bighorn sheep reside in the South Soda Mountains located to the East of the Soda Mountain Valley. The existing I-15 freeway acts as a major barrier to bighorn movement between the South Soda Mountains and the North Soda Mountains and Avawatz Mountains. Game cameras installed since August 2012 in I-15 underpasses within and near the Soda Mountain Valley have detected no bighorn sheep crossing the Soda Mountain Valley. As evidenced in a July 2013 response letter and the exhaustive bighorn study prepared by consultants on behalf of SMS, attached hereto as Exhibit B and made a part hereof, the Soda Mountain Valley is not primary bighorn habitat and does not support bighorn migration. Moreover, even absent the I-15 freeway, the same study shows that bighorn sheep are most likely to migrate to the north of the SMS Project Site where the mountains on either side of the I-15 freeway are closest. As such, the Soda Mountain Valley does not contain bighorn resources of substantial significance and values that are more than local in their significance. Please refer to the July 2013 response letter and bighorn study in Exhibit B for additional detail and substantiation.

No biological resources of more than local significance exist within the Soda Mountain Solar valley. Please refer to the Soda Mountain Solar Draft EIS for additional details and substantiation regarding species other than desert tortoise and bighorn.

iv. The Soda Mountain Valley lacks ACEC values

In short, keeping the Soda Mountain Valley open to solar energy development will not result in irreparable damage to important historical, cultural, and scenic values, fish, or wildlife resources or other natural systems or processes qualities of more than local significance and special worth, consequence, meaning, distinctiveness, or cause for concern. An ACEC designation for the Soda Mountain Valley is therefore inappropriate. Rather, an ACEC designation through the Soda Mountain Valley appears to be founded on a desire to create the cartographical semblance of connectivity restoration between the Superior-Cronese DWMA and Cronese ACEC to the Shadow Valley DWMA and ACEC. However, environmentally speaking, no such connection exists, whether cultural, visual or ecological. The proposed ACEC designation should instead be dropped.

b. An NCL designation for all or a portion of the Soda Mountain Valley is unwarranted

On March 30, 2009, the President signed into law the Omnibus Public Land Management Act of 2009 (Public Law 111-11, which congressionally established the National Lands Conservation System to "conserve, protect and restore nationally significant landscapes that have outstanding cultural, ecological and scientific values for the benefit of current and future generations."

DRECP Alternative 3 would prohibit development of the northern third of the SMS Project by way if an NLC designation. Alternative 2 would apply an NLC designation prohibit solar development within the Soda Mountain Valley altogether.

For the same reasons stated above with regard to ACEC values, the Soda Mountain Valley does not host nationally significant, outstanding cultural or ecological values. Nor to the knowledge of SMS does it host nationally significant scientific values. None of the values cited in Appendix L of the DRECP Draft EIS/EIR or in the Mojave and Silurian NLC designation discussed in Chapter II of the DRECP Draft EIS/EIR are germane to the Soda Mountain Valley. Rather, ascribing an NLC designation to all or a portion of the Soda Mountain Valley again appears to be founded on an arbitrary desire to "fill the gap" between the Superior-Cronese DWMA and Cronese ACEC to the Shadow Valley DWMA and ACEC, irrespective of the environmental merits for doing so. An NLC designation is therefore inappropriate. Please refer to the attached January 2013 SMS DRECP comments for additional detail and substantiation regarding why the Soda Mountain Valley is unfit for incorporation into the National Lands Conservation System.

3. **A DFA designation for the Soda Mountain Valley is appropriate**

The Soda Mountain Valley should be ascribed a DFA designation across all DRECP alternatives. As shown in Exhibit C, attached hereto and made a part hereof, but for portions of the site that are less than five percent slope but exceed a two percent slope, the SMS Project would satisfy all Solar Energy Zone (SEZ) screening and qualification criteria. This, indeed, is why BLM's October 2012 Solar Program assigned a "variance lands" designation to the SMS Project site. The SMS Project site would also remain open to renewable energy development under the "no buffer" provisions of Senator Diane Feinstein's Desert Protection Act, as introduced to Congress in 2010, 2011 and 2015. The Soda Mountain Valley meets all five DFA guiding principles articulated on page I.3-37 of the DRECP DEIR for the same reasons underlying each of these adopted and proposed designations. Specifically:

a. *Generation should be developed either on already-disturbed land or in areas of lower biological value, and conflict with both biological and non-biological resources should be minimized.*

The SMS Project site is located in an area that contains substantial human disturbance and has lower biological value. Anthropogenic disturbance of the Project site includes the presence of I-15, multiple linear projects, a gas station complex, OHV recreational use, and the former Arrowhead Highway. As explained above and in the SMS Project EIS, the site-specific species data for the SMS Project site demonstrate lower biological value for special status species relative to other utility-scale projects of a similar size, both as habitat and as a connectivity corridor.

b. *Areas identified for generation should have high-quality solar, wind, and/or geothermal renewable energy resources.*

The SMS Project site was selected for its high solar insolation values.

c. *Generation should be sited close to existing transmission and in areas where transmission could be expected as a reasonable extension of the existing transmission system and planned system upgrades, as identified by the Renewable Energy Transmission Initiative, or other transmission plans.*

Development at the project site would allow aggregation of transmission, thereby reducing transmission sprawl, cost, and disturbance. Located within a Section 368 energy corridor and RETI CREZ, the Project site already has been identified as suitable for substantial infrastructure development and is one of the primary transmission and transportation routes into California. Moreover, the BLM has concurred that development of the Project would not conflict with the transmission objectives of the Section 368 corridor. LADWP's system impact study indicates that its existing transmission line through the Project site has sufficient capacity to accommodate 350MW of renewable generation without the need for upgrading. Because of its proximity to existing transmission infrastructure, no generation intertie transmission line construction is necessary.

d. *Generation should, to the maximum extent possible, be aggregated to avoid transmission sprawl, reduce cost, and reduce disturbance across the Plan Area. Again,* *this principle aims to minimize disturbance to biologically, culturally, recreation, and visual valuable areas.*

Siting a large-scale solar facility adjacent to existing transmission lines within the Soda Mountain Valley aggregates disturbance within a closed valley that has already been exposed to substantial disturbance in the form of the I-15 freeway, an adjacent OHV area, transmission lines, pipelines, an approved high-speed rail project, gas station and abandoned highway segments. As evidenced in the ACEC discussion above, the biological, cultural, recreational and visual values of the Soda Mountain Valley are not high.

e. *The Plan should provide sufficient areas for development flexibility to ensure the Plan does not constrain competition within the market or unnecessarily result in distorted or environmentally incompatible incentives when implemented (i.e., where feasible, the Plan should remain market neutral between different technologies or different project configurations).*

Assigning DFA status to the Soda Mountain Valley would provide more area for development flexibility on BLM-administered lands. As proposed, only 20 percent of DFA lands under the DRECP would be BLM-administered lands, an issue which is of great concern to the County of San Bernardino because it has so few private lands to develop for other uses.

4. Conclusion

In assigning land use designations to the Soda Mountain Valley, SMS asks that the DRECP do so on the basis of the underlying environmental merits of the area rather than to simply link disparate segments of the Mojave Desert on a map. As shown above and in the exhibits attached hereto, the environmental qualities of the Soda Mountain Valley warrant a DFA designation across all DRECP alternatives.

Sincerely,

Adriane E. Wodey
Manager
Soda Mountain Solar, LLC

Attachments:

Exhibit A. SMS January 23, 2013 comments on DRECP alternatives
Exhibit B. Bighorn response letter and Bighorn Sheep Survey Results and Analysis
Exhibit C. SMS and SEZ criteria

EXHIBIT A

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January 23, 2013

California Energy Commission
Dockets Office, MS-4
Docket No. 09-RENEW EO-01
1516 Ninth Street
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SUBJECT: Comments on Description and Comparative Evaluation of Draft DRECP Alternatives

Dear Sir/Madam:

Soda Mountain Solar, LLC is providing comments on the "Description and Comparative Evaluation of Draft DRECP Alternatives" (California Energy Commission [CEC] 2012). The document will be referenced in this letter as the Alternatives Analysis. Soda Mountain Solar, LLC is the applicant for the Soda Mountain Solar project. The Soda Mountain Solar project (SMS project) is a 350 megawatt solar electric generating facility located in San Bernardino County. The project has requested a right-of-way (ROW) grant from the U.S. Bureau of Land Management (BLM). The BLM case number for the project is CACA 49584. Soda Mountain Solar, LLC is providing comments on components of the "Description and Comparative Evaluation of Draft DRECP Alternatives" as they pertain to the Soda Mountain Solar Project.

SUMMARY OF COMMENTS

Soda Mountain Solar comments are summarized into key points:

1. The SMS lands and Soda Mountain valley do not meet the criteria for NLCS designation
2. SMS project variance lands are inaccurately screened from Alternative 1
3. Desert tortoise and bighorn sheep model results are inconsistent with habitat and genetic studies

4. The bighorn sheep critical linkage designation for Soda Mountain Valley is inaccurate and unsupported
5. The High Biological Sensitivity designation is inaccurate and inappropriate for Soda Mountain Valley
6. The Soda Mountain Valley should be designated a Development Focus Area
7. Appendix E is overly restrictive and contemplates excessive mitigation requirements
8. Appendix I criteria for pending projects need further refinement
9. Extend the comment period for the Alternatives Analysis materials

SMS LANDS DO NOT MEET CRITERIA FOR NATIONAL LANDSCAPE CONSERVATION SYSTEM (NLCS) DESIGNATION

Purpose of NLCS

The NLCS designation was established to

> *"conserve, protect and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations."*

Examples of lands within the NLCS include:

- Wilderness
- Wilderness Study Areas
- National Monuments
- National Conservation Areas
- Wild and Scenic Rivers
- National Scenic and Historic Trails.

Chapter 3.7 of the Description and Comparative Evaluation of Draft DRECP Alternatives states, "[u]nder the various plan alternatives, the DRECP will consider all lands within the CDCA boundary as identified in FLPMA for possible inclusion in the NLCS." Appendix D identifies the criteria that were applied to designate NLCS in the DRECP and how these lands were specified under each alternative.

Designation of Project Area in DRECP Alternatives

Alternatives 1 through 4 classify lands within the SMS project area and west of I-15 as NLCS. Alternative 5 classifies the entire SMS project area, both west and east of I-15, as NLCS. However, the SMS project area does <u>not</u> contain:

- Wilderness
- Wilderness Study Areas
- National Monuments

- National Conservation Areas
- Wild and Scenic Rivers
- National Scenic and Historic Trails
- Lands with Wilderness Characteristics

Most of the SMS project area is located within a designated utility corridor under Section 368 of the Energy Policy Act of 2005. The portion of the SMS project area northwest of the Interstate-15 Highway (I-15) is bounded by Blue Bell Mine Road, two transmission lines, mining areas, fuel pipelines, and fiber optic lines. The portion of the SMS project area southeast of I-15 is bounded by Rasor Road and a service station property, I-15, and the Rasor Off-Highway Vehicle (OHV) area. This portion of the project area is within close proximity to I-15, a four-lane divided highway and major transportation route between Los Angeles and Las Vegas. Highway I-15 experiences nearly continuous traffic. In short, the SMS project area's existing transportation and utility uses traversing the project area strongly suggest that the project area should not be included in the NLCS. Indeed, to do so would be entirely inconsistent with its current status as a Section 368 corridor under the Energy Policy Act of 2005.

The Soda Mountain Solar Site Does Not Have an Intact Landscape

The northwest portion of the SMS project area is identified as NLCS on Figures 2.3-1 and 2.3-4 of Chapter 2, Description of DRECP Alternatives. These figures present proposed land use categories for Alternative 1. Alternative 1 identifies NLCS lands in "highly scenic and intact landscapes".

The SMS project area includes an existing transmission corridor with multiple transmission lines, utilities, and the I-15 highway, which have altered the scenic landscape. The Visual Resource Inventory (VRI) index for the area is Class III as shown in Figure 3.4-4 of the document. Class III corresponds with moderate viewer sensitivity.

Appendix D states that Alternative 1 "excludes all existing transmission corridors" from areas identified as NLCS. The figure titled "Mojave and Silurian Valley Alt 1" in Appendix D does not include NLCS designated land in the northwest portion of the project area. It appears that Figure 2.3-1 and 2.3-4 incorrectly display SMS ROW lands northwest of I-15, which are within an existing Section 368 transmission corridor, as NLCS lands. This is most likely a GIS mapping error in Figures 2.3-1 and 2.3-4. The NLCS designations for Figures 2.3-1 and 2.3-4 in Chapter 2 should be revised to match the map in Appendix D. This area should not be designated as NLCS under Alternative 1 because it is in a transmission corridor, consistent with Appendix D.

The NLCS Designation is Not Appropriate for Transmission Corridors

The SMS project area northwest of I-15 is classified as NLCS in Alternatives 2 through 4. This designation corresponds with the presence of a Section 368 utility corridor within this area. As provided in Appendix D, NLCS identified in Alternatives 2 through 5 would include existing transmission corridors. The application of the NLCS designation to transmission corridors, particularly Section 368 corridors, is inconsistent with the purpose of the NLCS to

> *"…conserve, protect and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations."*

Transmission corridors are typically located in areas that are near highways and existing development. In the absence of critical habitat, significant cultural sites, or major rivers, transmission corridors would not be expected to have outstanding ecological, cultural, or scientific value. Blanket application of the NLCS designation to transmission corridors is therefore inconsistent with the purpose of the designation.

The NLCS Designation is Not Appropriate for the Entire California Desert

The entire project site is designated as NLCS within Alternative 5. Alternative 5 is "based on the premise that all lands in the California Desert have been determined by Congress to be nationally significant and lands not focused on development or other intensive uses under the BLM's multiple use mandate should be included as national Conservation lands. This alternative would include existing transmission corridors." We are of the opinion that it would be extremely short-sighted - and inconsistent with BLM's multiple use mandate - to designate as national conservation lands all BLM lands other than those deemed ideal for solar and wind development under the DRECP. Doing so loses sight of the fact that the DRECP was originally intended to create a voluntary process for streamlining species permitting for renewable energy development, not to "rezone" away most multiple uses - renewable or otherwise - on BLM-administered lands located within the southern quarter of the state of California. It also runs the risk of creating what is in effect "Wilderness" by an act other than that of Congress.

ERROR IN SCREENING OF VARIANCE LANDS IN ALTERNATIVE 1

SMS project variance lands northwest of I-15 are incorrectly screened out of Alternative 1. Chapter 2 of the Alternatives Analysis defines screening criteria that were applied to variance lands in Alternative 1. The screening criteria and applicability to the SMS project site are provided in Table 1. As can be seen, the project does not trigger any of the variance screening criteria, with the exception of Criterion 13. However, the GIS mapping error in Figures 2.3-1 and 2.3-4 (discussed previously) that designated lands northwest of I-15 as NLCS consequently triggered variance land screening Criterion 13. Because the NLCS lands were incorrectly designated on the SMS project site as a result of a GIS error in Alternative 1, areas northwest of I-15 were inappropriately screened from Alternative 1. The NLCS designation should be removed from these areas and the variance lands northwest of the I-15 should be included in Alternative 1 because the project area does not qualify for screening under any of the 21 variance screening criteria.

Table 1: Variance Land Screening Criteria and Applicability to Project Area

Screening Criteria for Variance Lands	Soda Mountain Contains	
	Yes	No
1. All designated and proposed critical habitat areas for species protected under the ESA of 1973 (as amended).		X
2. All areas where the BLM has made a commitment to state agency partners and other entities to manage sensitive species habitat; for example, the Desert Tortoise Research Natural Area, including the lands acquired by the Desert Tortoise Preserve Committee, Inc.		X
3. All desert tortoise translocation sites identified in applicable land use plans, project-level mitigation plans or Biological Opinions.		X
4. All wildlife migratory and movement corridors identified in applicable land use plans and recently mapped, through efforts such as South Coast Wildlands.		X
5. All Big Game Winter Ranges identified in applicable land use plans, such as mule deer area in the Bishop Resource Management Plan (RMP).		X
6. National Historic and Natural Landmarks identified in applicable land use plans and DRECP.		X
7. Lands within the boundaries of properties listed in the National Register of Historic Places (NRHP).		X
8. Segments of rivers determined to be eligible or suitable for Wild and Scenic River status identified in applicable land use plans, including associated 0.25 mile corridor.		X
9. Lands within a solar, wind or geothermal energy development ROW grant or application area found to be inappropriate for energy development through an environmental review process that occurred prior to finalization of the Draft DRECP EIS.		X
10. All lands within the proposed Mojave Trails National Monument.		X
11. All conservation lands acquired through donations or use of Land and Water Conservation Funds.		X
12. Wild Horse or Burro Herd Management Areas.		X
13. All ACECs, Research Natural Areas (RNA), and NLCS lands/units identified in DRECP Alternative 1.	X**	
14. All areas with BLM inventoried wilderness characteristics.		X
15. Developed recreational facilities, special-use permit recreation sites, all SRMAs, and all Long Term Vehicle Areas (LTVA) identified in Alternative 1.		X
16. Developed recreational facilities, special-use permit recreation sites, all SRMAs, and all Long Term Vehicle Areas (LTVA) identified in Alternative 1.		X
17. Variance land parcels smaller than 280 acres and/or not capable of being combined with other BLM variance parcels or non-BLM lands in Alternative 1		X

Table 1: Variance Land Screening Criteria and Applicability to Project Area

Screening Criteria for Variance Lands	Soda Mountain Contains	
	Yes	No
Development Focus Areas to reach the 280-acre minimum size. (280 acres is the size of two small utility-scale solar projects [20 MW as per CEC] at approximately 7 acres per MW.)		
18. Narrow stringers on cherry stem roads between areas conserved or specially managed.		X
19. Areas within 1 mile of National Scenic and Historic Trail Corridors.		X
20. Designated off-highway vehicle (OHV) open areas.		X
21. All dunes, sand sources, and sand flow corridors.		X
22. All Microphyll woodlands, also known as semi-desert wash woodland/scrub.		X
23. Lands within 0.25 mile of any surface water source or riparian areas (e.g., seeps, springs, lakes, ponds, streams, rivers).		X
Notes: ** The area northwest of I-15 is designated as NLCS in DRECP Alternative 1 as a result of a GIS mapping error in Chapter 2. Alternative 1 presented in Appendix D does not include the NLCS designation northwest of I-15 in the project area.		

Source: CEC 2012 and Panorama Environmental, Inc.

DESERT TORTOISE AND BIGHORN SHEEP MODEL RESULTS ARE INCONSISTENT WITH HABITAT AND GENETIC STUDIES

Appendix C of the Alternatives Analysis provides updated species models and modeling methods. Comments are provided for two species models:

1. Draft species habitat model results for desert tortoise (USFWS least cost corridors) presented in Figure SM-R3B
2. Draft species habitat model results for bighorn sheep (critical linkage)

Analysis of Habitat Suitability and Connectivity in the Soda Mountain Area

SMS submitted an analysis of the habitat suitability and connectivity for desert tortoise and bighorn sheep in the Soda Mountain area (Panorama Environmental 2012; attached hereto as Exhibit 1). The analysis was based on site-specific field surveys of the project area and surroundings that identified no desert tortoise on the project site and limited sign outside project boundaries (URS 2009a). The habitat suitability analysis showed that characterization of the SMS project area based on model results (Nussear et al. 2009) was inconsistent with site-specific surveys of the project area. The model overstated the habitat value for desert tortoise.

The results of subsequent fall desert tortoise surveys (Kiva Biological) 2012), floristic survey (CSESA 2012), and general wildlife survey (CSESA 2012a) of the SMS project area have supported the conclusions of the habitat suitability and connectivity analysis for desert tortoise. No desert tortoise were found on the project site or in the zone of influence surveys. Limited sign was found on the eastern margins of the project area (Kiva Biological 2012).

The fall 2012 surveys found no evidence of bighorn use of the project area and CDFW photographic monitoring of the I-15 underpasses in the area found no evidence of bighorn use of the underpasses (Abella 2012a).

USFWS Desert Tortoise Least Cost Corridors are Inconsistent with Recent Connectivity Studies

Figure SM-R3B, "Draft Species Habitat Model Results for Desert Tortoise (USFWS Least Cost Corridors)"shows the SMS project area as within a least-cost corridor for desert tortoise (Figure 1). This modeling was conducted by USFWS using the habitat suitability results of Nussear et al. (2009). SMS presented data in its DRECP comment letter dated July 23, 2012, that show the habitat suitability presented in Nussear et al. overstates the habitat value for the project area (Panorama 2012; attached hereto as Exhibit 1). This USFWS least-cost corridor (Figure 1) is inconsistent with Penrod et al. (2012), in which species-specific modeling was used to identify movement corridors (Figure 2).

Least Cost Corridors are Inconsistent with USFWS Recovery Plan and Genetic Studies

The least-cost corridor identified in Figure SM-R3B appears to connect suitable habitat areas to USFWS critical habitat areas. In the case of the SMS project area, the USFWS least-cost corridor attempts to connect the Ivanpah critical habitat unit to the Superior-Cronese critical habitat unit. This attempt is ill-founded.

The designation of a least-cost corridor between the Ivanpah critical habitat unit and Superior-Cronese critical habitat unit is inconsistent with the *Revised Recovery Plan for the Mojave Population of the Desert Tortoise* (USFWS 2011), other studies, and the physical environment. The Mojave population of desert tortoise is divided into five recovery units in the Revised Recovery Plan (USFWS 2011). Recovery units were defined on the basis of geographic barriers that coincide with observed variation among tortoise populations (Ibid). The project area is located on the eastern edge of the Western Mojave recovery unit (Figure 1). The Ivanpah critical habitat unit is located in the Eastern Mojave recovery unit. A least-cost corridor in Figure SM-R3B extends through the SMS project area and crosses between these recovery units (Figure 1). This corridor contradicts the Revised Recovery Plan by asserting that there is existing, or possible, connectivity between the West Mojave recovery unit and the Eastern Mojave recovery unit even though their separate designation is premised on the basis of geographic barriers between them.

Figure 1: DRECP Desert Tortoise Least-Cost Corridors With USFWS Recovery Units

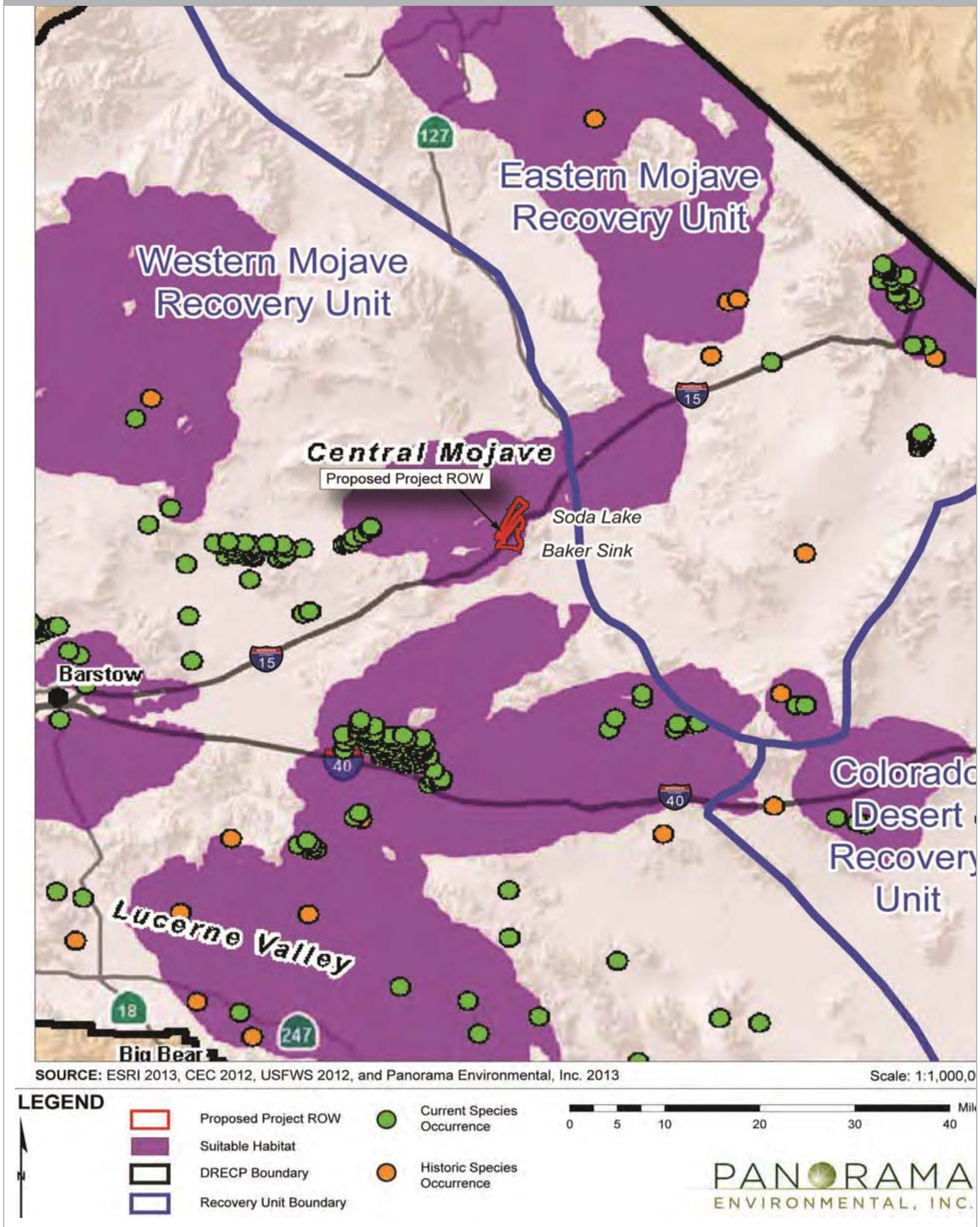
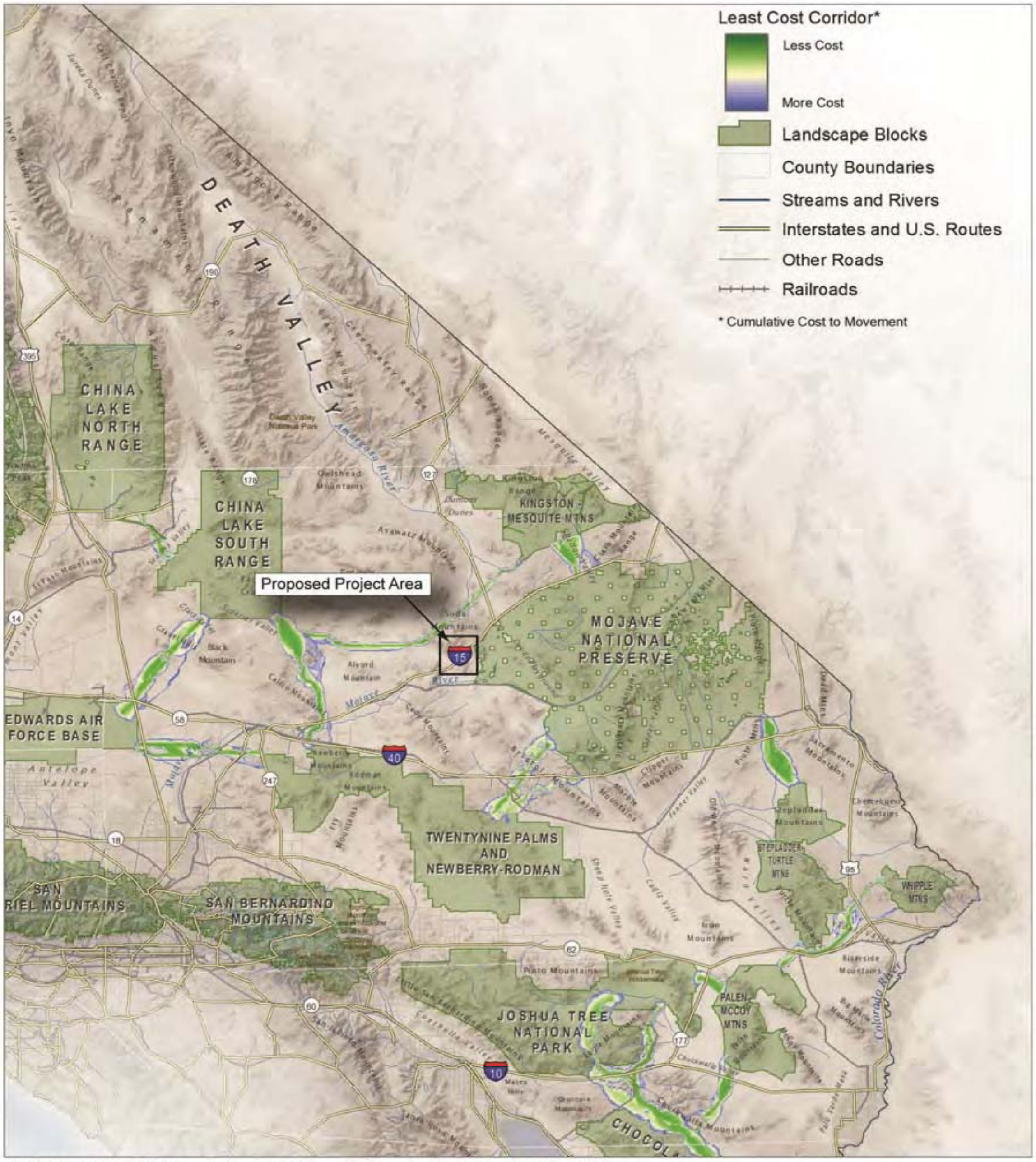


Figure 2: Penrod et al. Desert Tortoise Least-Cost Corridors in SMS Area



SOURCE: ESRI 2012, Penrod, K. et al. 2012, and Panorama Environmental, Inc. 2012

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The objectives identified in the Revised Recovery Plan revolve around the concept of the recovery unit. The recovery objectives include:

- Maintain self-sustaining populations of desert tortoises within each recovery unit into the future
- Maintain well-distributed populations of desert tortoise throughout each recovery unit
- Ensure that habitat within each recovery unit is protected and managed to support long-term viability of desert tortoise populations

Connectivity between recovery units is not necessary to achieve the recovery objectives. It is implicit in the concept of the recovery unit that there are natural barriers to movement between the recovery units that will not be overcome by management actions. The designation of a least-cost corridor linking the Ivanpah/Shadow Valley critical habitat unit to the Superior-Cronese critical habitat unit is inconsistent with the Revised Recovery Plan's definition of recovery units. It is also inconsistent with the Revised Recovery Plan's own assessment of the region surrounding the project area. Specifically, the Recovery Plan states that the population within the Eastern Mojave recovery unit is recognized as relatively isolated from other recovery units on the basis of genetic analysis (USFWS 2011). Baker Sink through Soda Dry Lake is a movement barrier between the Eastern Mojave recovery unit and the West Mojave recovery unit (Ibid). The Baker Sink barrier forms the dividing line between these two recovery units:

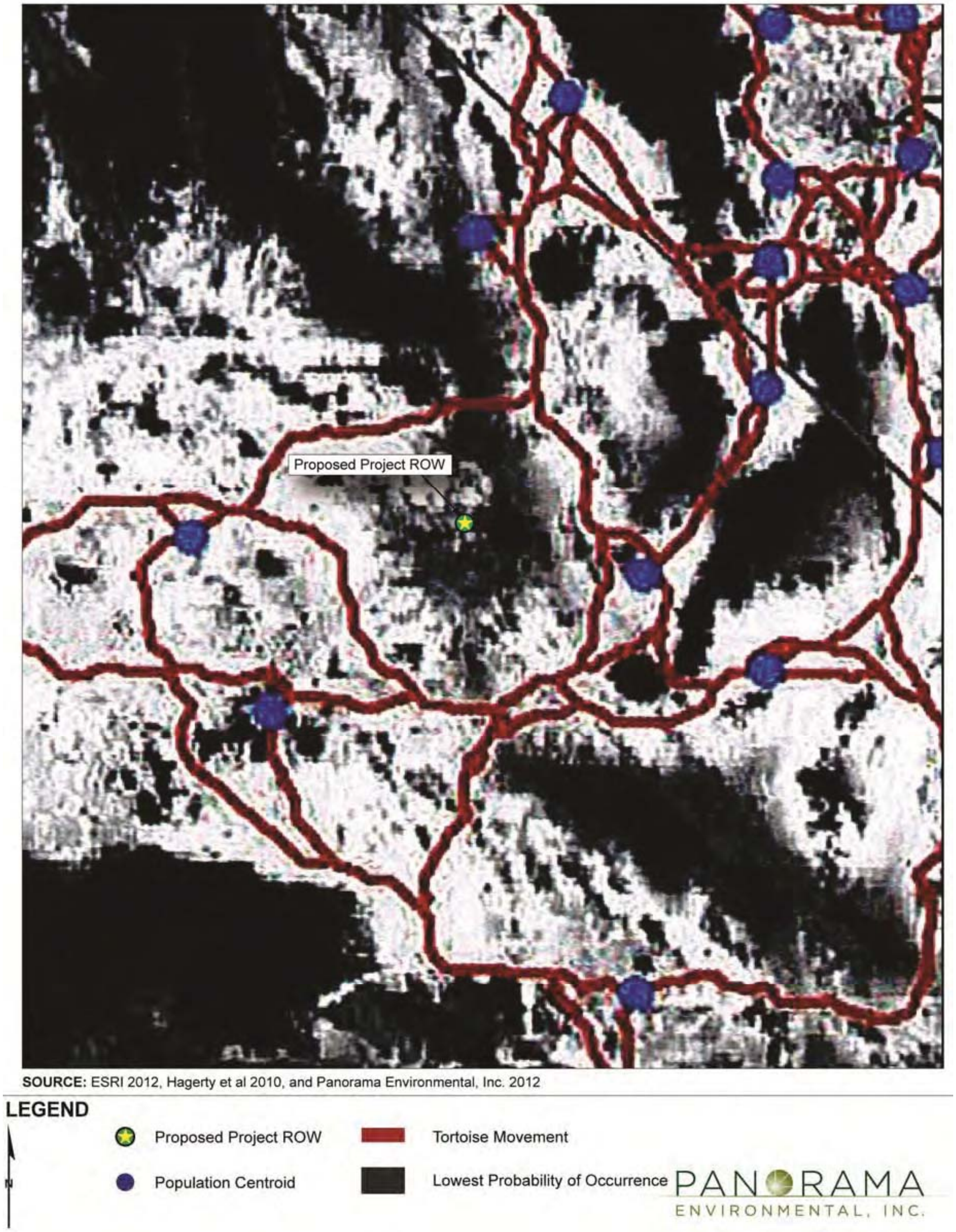
> "*Although gene flow likely occurred intermittently during favorable conditions across this western edge of the recovery unit, this area contains a portion of the Baker Sink, a low-elevation, extremely hot and arid strip that extends from Death Valley to Bristol Dry Lake. This area is generally inhospitable for desert tortoises*." (Ibid)

A study conducted by Hagerty et al. (2010) supported this conclusion from a genetic standpoint by finding that geographic barriers were significantly correlated with genetic differences and that,

> "*The Baker Sink is a low-elevation barrier that begins in Death Valley and separates these topographically different areas*."

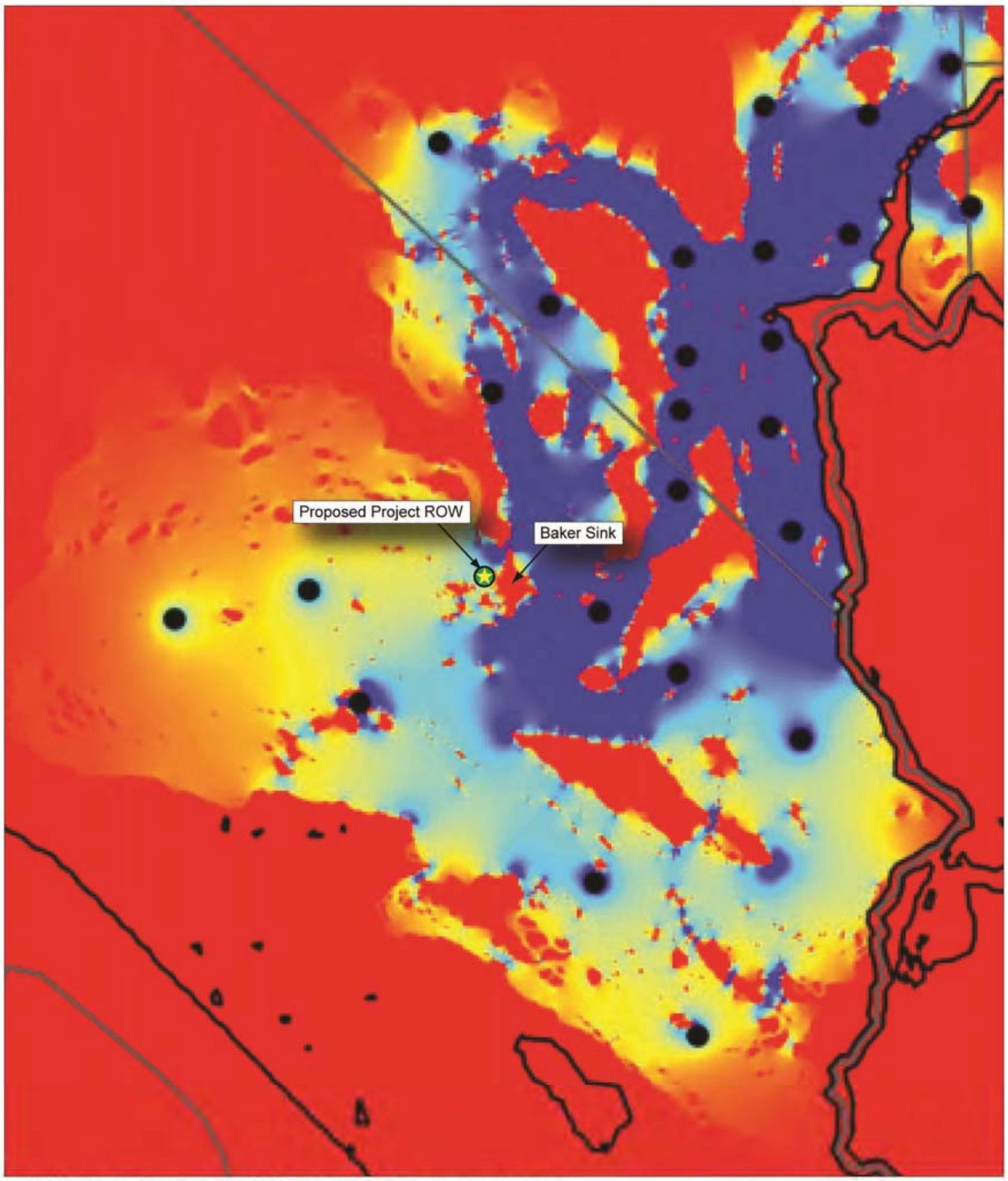
Movement areas from Hagerty et al. are shown in Figure 3. The Baker Sink is shown in Figure 4. In short, substantial evidence –in the form of (i) site-specific survey results and habitat suitability analysis; (ii) USFWS' own Revised Recovery Plan; and (iii) genetic studies strongly indicate that tortoise populations are not crossing the Baker Sink and are not connecting between the West Mojave recovery unit and East Mojave recovery unit.

Figure 3: Hagerty et al. Desert Tortoise Movement Routes



SOURCE: ESRI 2012, Hagerty et al 2010, and Panorama Environmental, Inc. 2012

Figure 4: Baker Sink Barrier to Movement



SOURCE: ESRI 2012, Hagerty et al 2010, and Panorama Environmental, Inc. 2012

LEGEND

Proposed Project ROW

Population Centroid

Low Probability of Tortoise Movement

Tortoise Movement Area

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BIGHORN SHEEP CRITICAL LINKAGE DESIGNATION FOR SODA MOUNTAIN VALLEY IS INACCURATE AND UNSUPPORTED

Figure SM-M1A, "Draft Species Habitat Model Results for Bighorn Sheep (Critical Linkage)" shows the SMS project area within a critical linkage for bighorn sheep (Figure 5 in this letter). The Alternatives Analysis does not include assumptions used in the model development, and does not specify the methods or criteria that were applied to determine the "critical linkages." Section 3.1 of the Alternatives Analysis indicates Mountain and Intermountain Habitat models were developed by CDFW and John Wehausen. Appendix C of the Alternatives Analysis states that a proxy model was used but provides no additional information. The bighorn sheep model assumptions and methodology must be provided so they can be analyzed. Additional time should be allowed to review and comment after the model information is provided to reviewers.

The "critical linkage" figure is inconsistent with field surveys of the SMS project area and investigations that have been undertaken by Soda Mountain Solar, LLC and CDFW regarding bighorn sheep use of the project area.

Bighorn Sheep Surveys

Soda Mountain Solar Surveys

SMS contracted with BioResource Consultants to conduct a helicopter survey of bighorn sheep (see survey results in Figure 6). The survey protocol was determined in consultation with CDFW. The surveys did not include the south Soda Mountains to the east of the project area in order to avoid effects to a known bighorn population during lambing season (see "CDFW 2012 Survey", below). Bighorn sheep were observed during surveys within 10 miles of the project area. Surveyors observed two desert bighorn sheep fleeing down a ravine approximately 8 miles southwest of the project area in the Cave Mountains (BRC 2011). No other individuals or groups were seen in the region during the remainder of the surveys conducted in March and May 2011 (BRC 2011). Five sheep and bedding sites were observed on the slope east of the project site in October 2012 (Kiva Biological 2012).

CDFW 2012 Survey

CDFW conducted a ground count for bighorn sheep on April 30 and May 1, 2012 in the south Soda Mountains, near Zzyzx Spring. Surveyors counted all sheep that could be located on the east side of the range in the vicinity of water. Habitat conditions in the south Soda Mountains are highly suitable for bighorn sheep because of the presence of a year-round water source at Zzyzx and the presence of limestone outcrops for lambing-rearing habitat. A total of 47 sheep in seven groups were identified within the south Soda Mountains during the CDFW 2012 survey (Abella 2012a).

Figure 5: DRECP Bighorn Sheep Critical Linkage and SMS Project Area

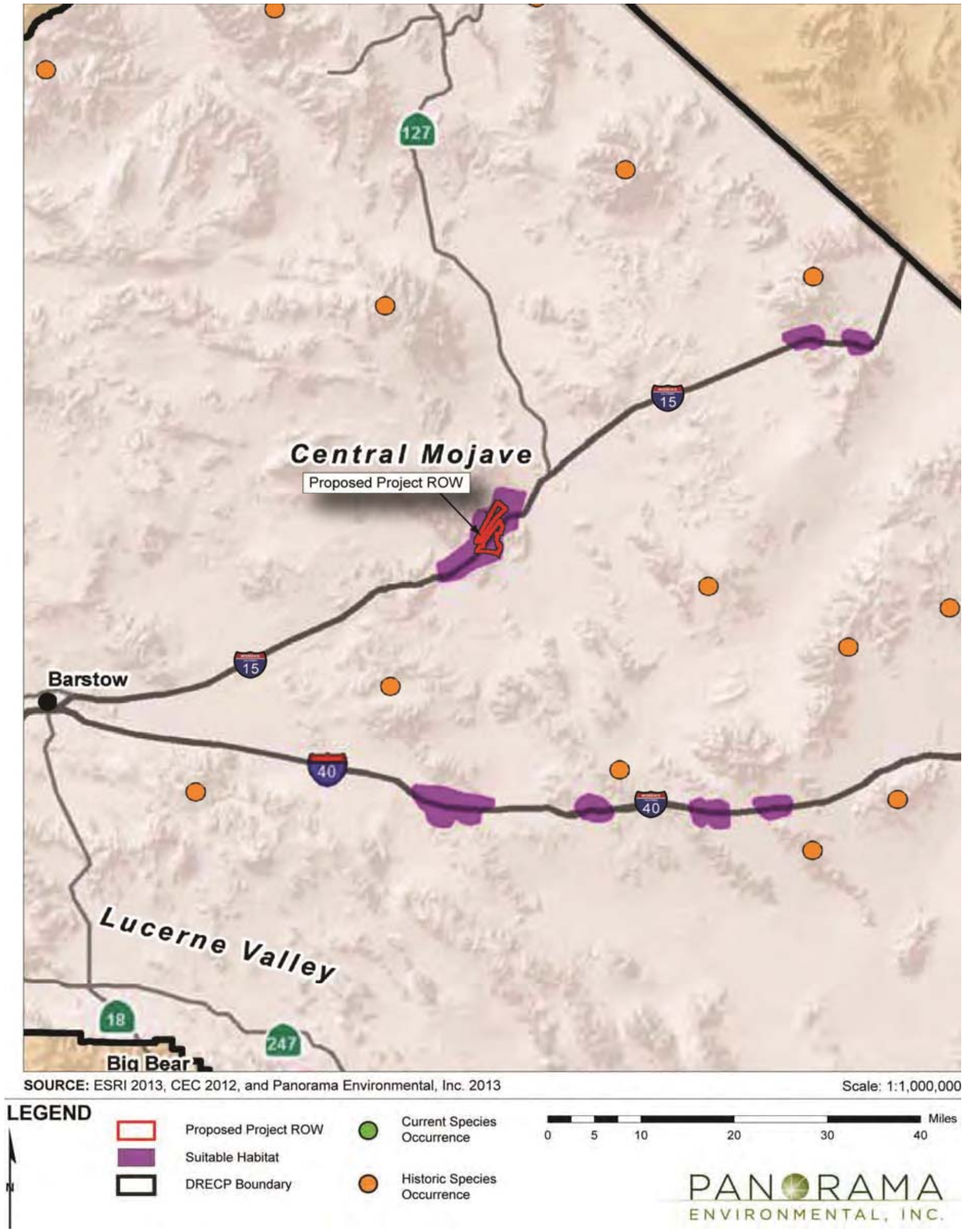


Figure 6: Bighorn Sheep Surveys and Populations in Soda Mountain Region

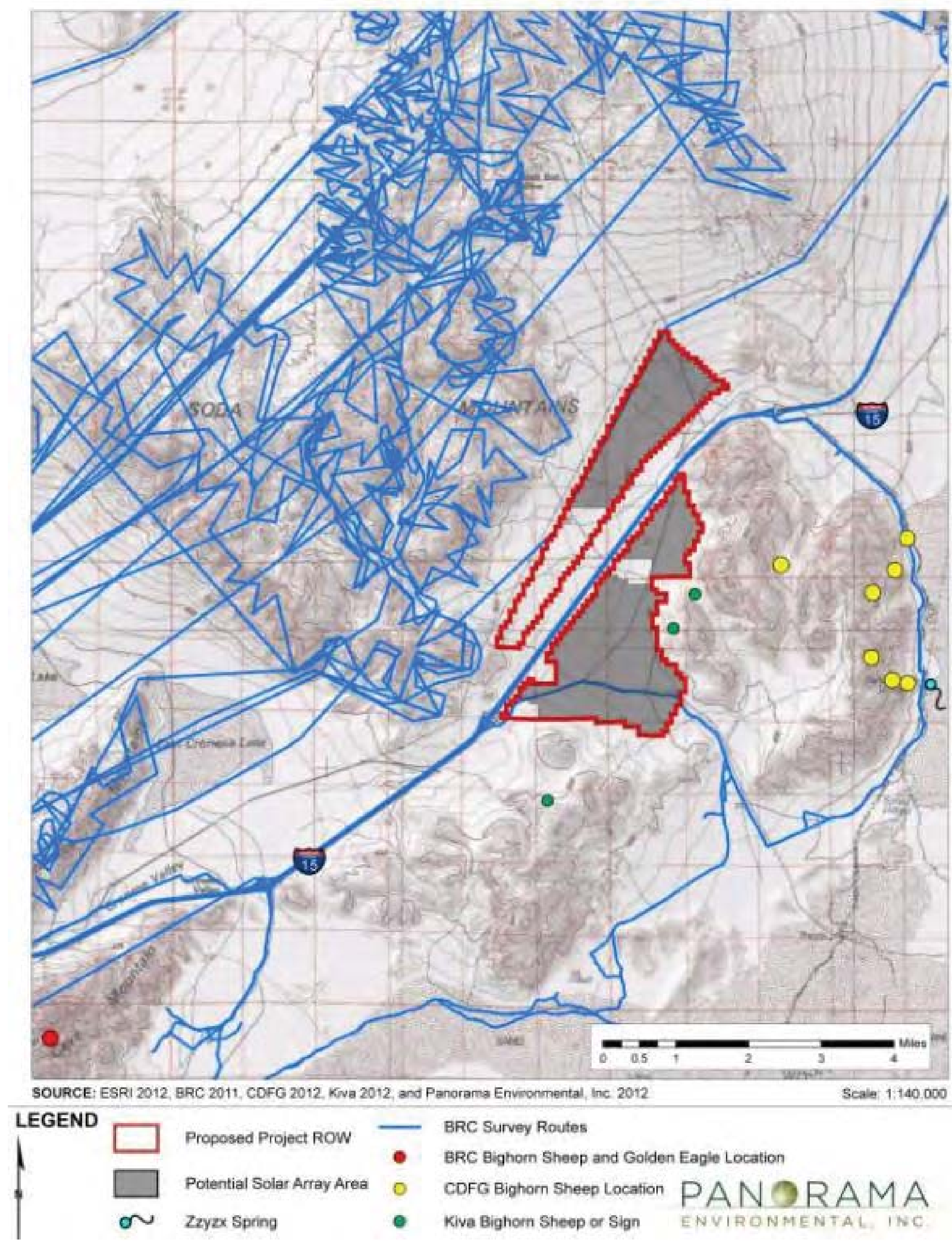


Figure 6 shows the recent locations of bighorn sheep as reported in SMS surveys (BRC 2011; Kiva 2012) and CDFW surveys (Abella 2012a). The 2011 SMS helicopter and ground survey (BRC 2011) identified sheep in the Cave Mountains, 7.75 miles south of the project area and Kiva (2012) identified sheep and sign on the western edges of the south Soda Mountains. The CDFW survey found very little sign of recent use by bighorn above the 1,960 foot elevation where sheep were found (Abella 2012a). It appears that the eastern portion of the south Soda Mountains, where most of the sheep were seen, is occupied primarily by females and associated younger sheep in the spring. Given that few adult males were seen, and that there are likely additional males, this population can be projected to fall into the 51 to 100 population size category (Abella 2012a). Abella (2012a) also indicated that the bighorn sheep seem acclimated to the humans at the Desert Research Center at Soda Springs, which is used as a water source for the sheep.

Modeled Bighorn Sheep Habitat

The results of the DRECP bighorn sheep modeling for intermountain and mountain habitats (Figures 7 and 8) are consistent with recent survey results in the SMS project area. There have been many studies of the project area (vegetation, desert tortoise, cultural resources) and none of the surveys have found sign (scat, bedding, trails) in the SMS project area. The lack of sign is evidence of little or no use of the project area by bighorn sheep, which is consistent with the DRECP model results for bighorn sheep intermountain habitat (Figure 7).

Bighorn sheep and sign were consistently found in the mountains in all recent surveys in the project area, zones of influence, and within a 10-mile radius of the project (BRC 2011; CSESA 2012; Kiva 2012; Abella 2012a). These survey results are consistent with the DRECP modeled bighorn sheep mountain habitat (Figure 8).

Analysis of Connectivity in the Soda Mountains

No Evidence of East-West Connectivity in the Soda Mountain Valley

The SMS project area is not a known connectivity or linkage area for bighorn sheep, or a linkage corridor for bighorn sheep (Penrod et al. 2012). No scat, sign, or trails of bighorn sheep were documented on the SMS project during surveys of the project area in 2009 and 2012 (URS 2009b; CSESA 2012; Kiva Biological 2012). Bighorn sheep were identified in the Soda Mountains to the south and east of the project as shown in Figure 6 (Kiva Biological 2012; Abella 2012a).

Bighorn sheep are known to prefer steep, rocky terrain and to avoid flat areas with no cover. It is logical to assume that sheep would move long distances through mountains, rather than across the Soda Mountain valley, which is bisected by northeast-southwest oriented highway I-15 in the valley. Sheep in the project region are likely moving north-south through the south Soda Mountains and there would be no reason to move east-west, given that there are no water sources in the western Soda Mountains or the west side of the valley.

Figure 7: DRECP Bighorn Sheep Intermountain Habitat and SMS Project

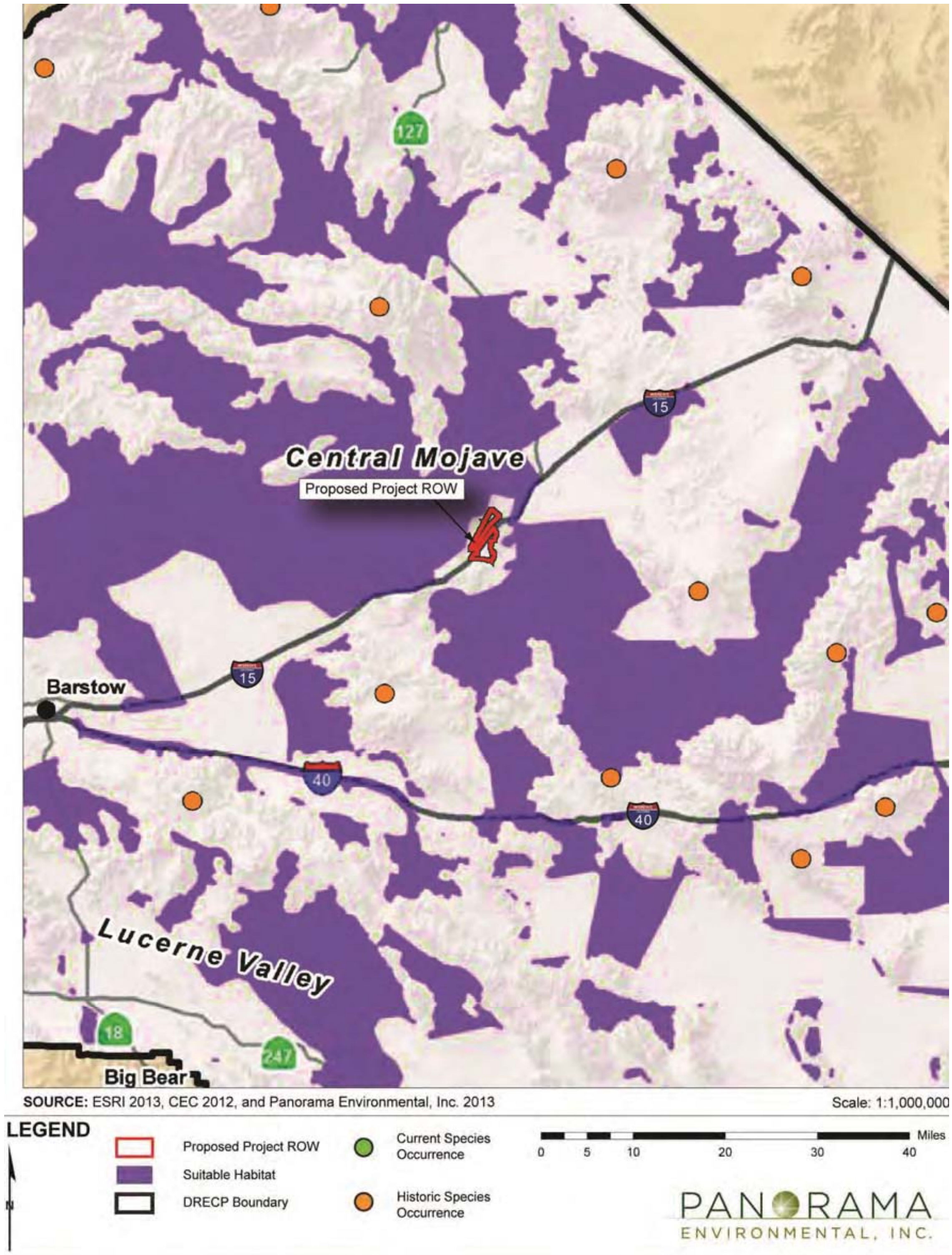
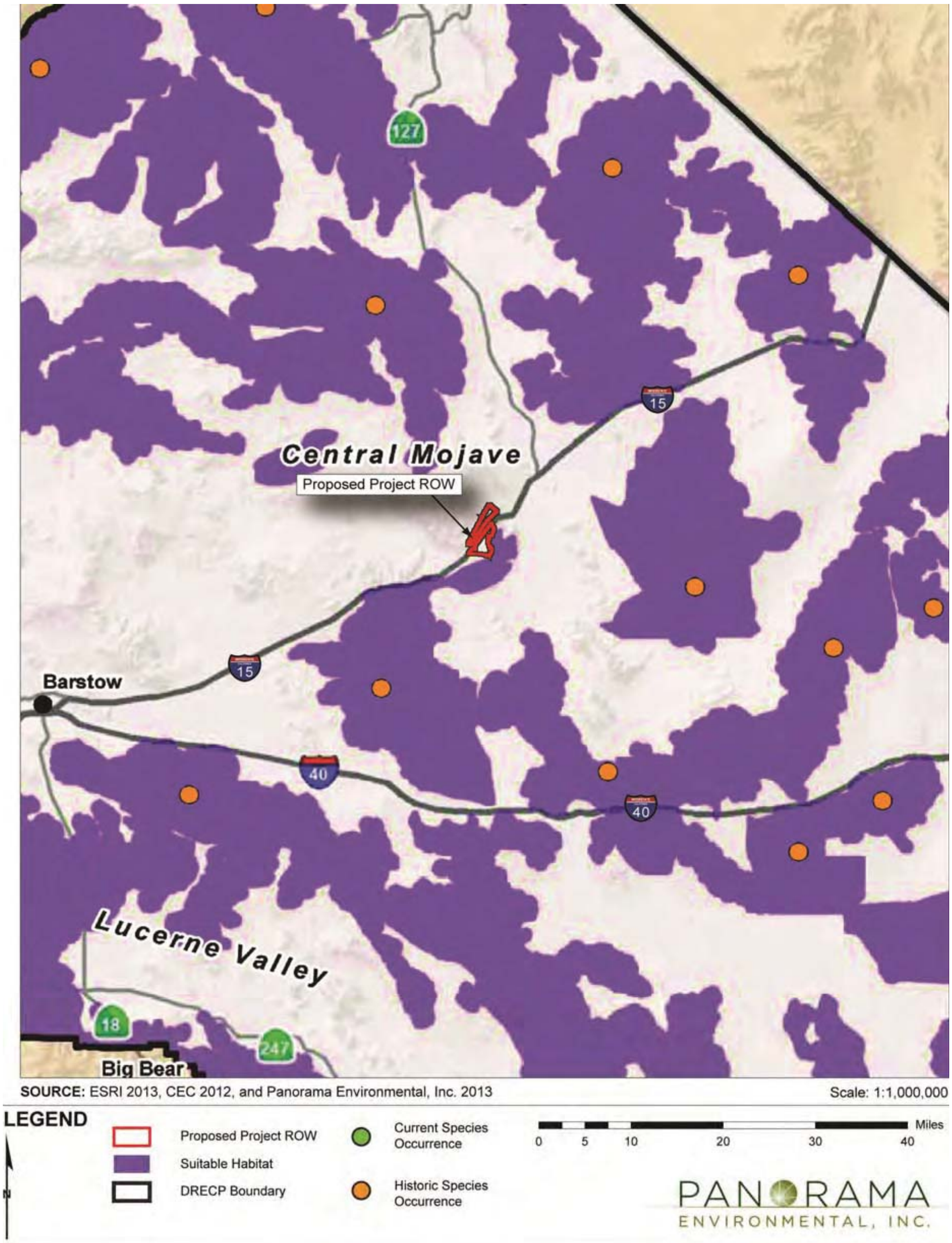


Figure 8: DRECP Bighorn Sheep Mountain Habitat and SMS Project



CDFW installed cameras in two I-15 underpasses near the SMS project area in August 2012. No sheep have been identified using the underpasses (Abella 2012a).

Literature Shows Highways are a Barrier to Bighorn Sheep Movement

Interstate highways are typically barriers to bighorn sheep connectivity (Turner 2010). Frequent traffic can make sheep, particularly ewes, reluctant to cross roads and actual crossing exposes the sheep to mortality (USFWS 2001). Roads have reduced long-term population viability when they bisect a bighorn sheep group's range (USFWS 2001). I-15 and I-40 have segregated desert bighorn sheep into metapopulations (north, central, and south) with no connectivity across the highways between the metapopulations (Wehausen 2006). I-15 acts as a major barrier to connectivity for bighorn sheep. Sheep have been sighted on the north side of I-15 to the north of the SMS project area, suggesting that they may cross the highway using the underpasses or overpasses to the north of the SMS project area in order to access the south Soda Mountains bighorn population.

Bighorn sheep occasionally use underpasses to cross highways. One study in Arizona monitored wildlife use at three highway underpasses for 10 months and recorded 25 times when bighorn sheep crossed under the highway (AZDOT 2008). Most (88 percent) of the crossings occurred at the culvert located in the most rugged terrain at the narrowest highway span (AZDOT 2008). The study concludes that higher intensity of culvert use was most associated with their proximity to traditional trails of bighorn sheep, while other factors, such as proximity to steep terrain, underpass structure, lines of sight, and other animals' presence may also be important influences (AZDOT 2008). Another study suggests that ungulate underpasses must be a minimum of 14 feet high and 26.3 feet wide (Penrod et al. 2008).

Potential Highway Crossings of I-15 in the Soda Mountain Valley

There are four box culverts (#2, 3, 5, 6 on Figure 8) and two bridges (underpasses 1 and 4 on Figure 9 and 10) that bighorn sheep could potentially use to cross under the I-15 highway near the project area. These box culverts and bridges were evaluated for potential bighorn sheep use (Table 2). The four box culverts (underpasses 2, 3, 5, 6) are unlikely to be used by bighorn sheep due to a combination of freeway noise within the overpass/ box culvert, darkness (inability to see predators), and because they are smaller than the minimum width identified for underpass use by bighorn sheep (Burke 2012; Penrod et al. 2008). Based on the criteria identified in the Arizona study discussed above, the bridge at Opah Ditch (underpass 4, Figure 10) is unlikely to be used by bighorn sheep, even though it is of sufficient size, because it is far from steep terrain. The underpass at Zzyzx Road (underpass 1, Figure 9) has a higher likelihood of bighorn sheep use because it is wider and closest to steep terrain. Game cameras installed by CDFW under the underpasses at Opah Ditch and Zzyzx Road in August 2012 have not detected any bighorn sheep use to date (Abella 2012b). There are also no bighorn sheep trails at either underpass. The

Figure 8: Box Culverts 2, 3, 5, and 6

SOURCE: TerraMetrics 2012, GeoEye 2012, USDA Farm Service Agency 2012, DigitalGlobe 2012, Google Earth Pro 2012, and Panorama Environmental, Inc. 2012

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Figure 9: Underpass 1, North of Zzyzx Road

SOURCE: ESRI 2012, TerraMetrics 2012, GeoEye 2012, USDA Farm Service Agency 2012, DigitalGlobe 2012, Google Earth Pro 2012, and Panorama Environmental, Inc. 2012

LEGEND

Proposed Project ROW

Existing Culvert

N

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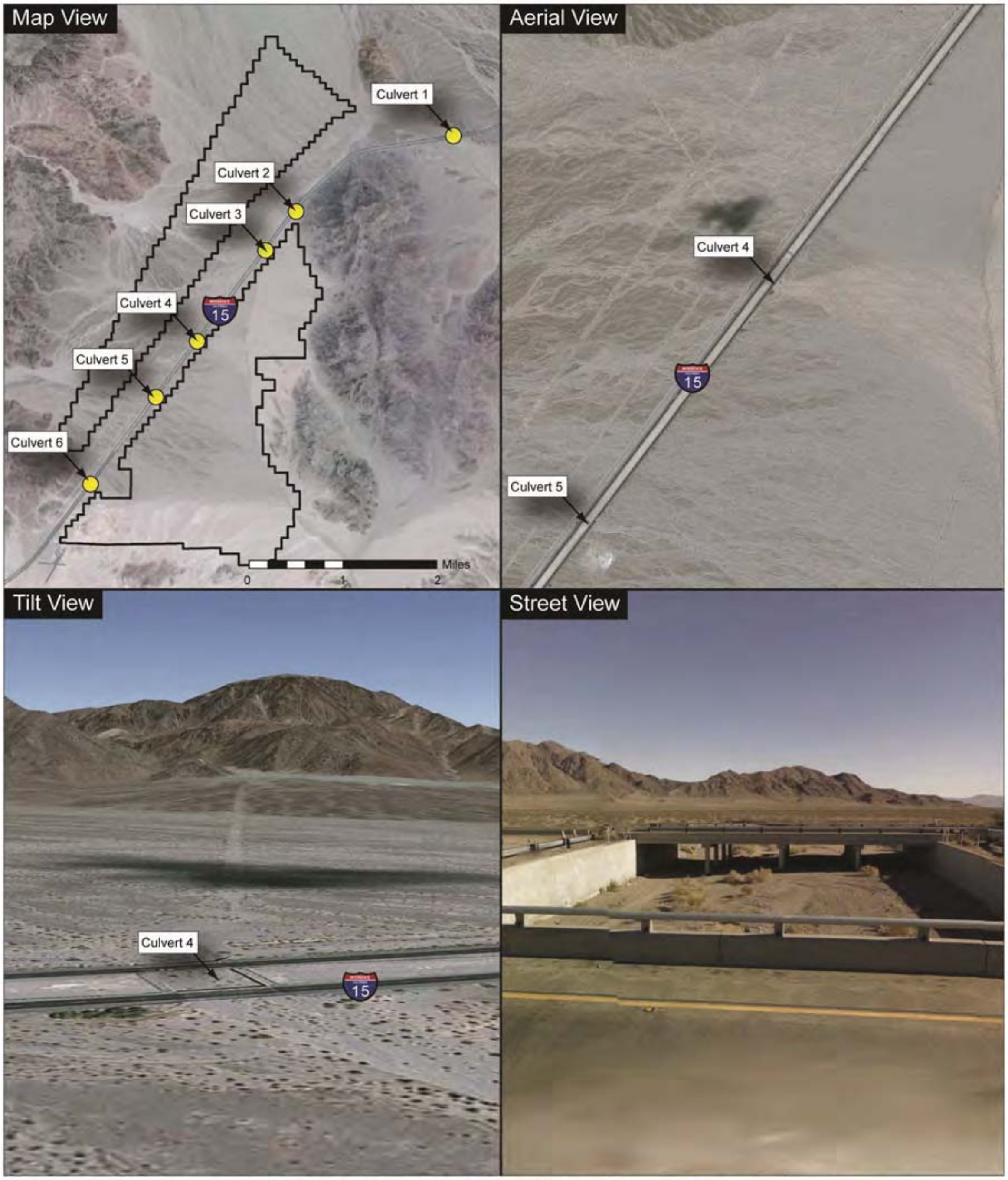
Figure 10: Underpass 4, Opah Ditch



SOURCE: ESRI 2012, TerraMetrics 2012, GeoEye 2012, USDA Farm Service Agency 2012, DigitalGlobe 2012, Google Earth Pro 2012, and Panorama Environmental, Inc. 2012

LEGEND

Proposed Project ROW

Existing Culvert

N

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Table 2: Likelihood of Bighorn Sheep Use of Box Culverts/Bridges for Undercrossing

Underpass	Dimensions (width by length in feet)	Distance to Nearest Mountainous Terrain (miles)	Proximity to Nearest Known Bighorn Sheep Occurrence	Probability of Use
1 (Zyzzx Road bridge)	100 by 15	0.15 north	2.2	**Moderate.** Of adequate size, close to steep terrain, near known location, no bighorn sheep trail, approximately 2.5 miles from mapped occurrence
2 (box culvert)	25 by 15	0.16 east	1.6	**Low.** Under minimum width of 26.3 feet (Penrod et al. 2008)
3 (box culvert)	25 by 15	0.49 east	1.3	**Low.** Under minimum width of 26.3 feet (Penrod et al. 2008), far from steep terrain
4 (Opah Ditch bridge)	80 by 15	1.14 east	1.3	**Low.** Of adequate size, far from steep terrain, no bighorn sheep trail
5 (box culvert)	25 by 15	1.5 east	1.7	**Low.** Under minimum width of 26.3 feet (Penrod et al. 2008), far from steep terrain
6 (box culvert)	25 by 15	0.12 west	2.7	**Low.** Under minimum width of 26.3 feet (Penrod et al. 2008), far from known occurrences

absence of any bighorn sheep tracks or trails near these underpasses in combination with the absence of observed use indicates that any potential bighorn sheep use of these underpasses is infrequent.

Bighorn sheep could also use the I-15 overpasses that cross over I-15 at Zzyzx Road and Rasor Road. Both of these existing overpasses are located within mountainous terrain and near locations where bighorn sheep have previously been sighted. However, there are no bighorn sheep tracks or trails near these overpasses or reports of sightings of sheep using the overpasses, indicating that use of the bridges to cross over I-15 is infrequent.

The DRECP Critical Linkage Map (Figure 5) is Unsubstantiated and Should be Deleted because I-15 is a Substantial Barrier

The DRECP-modeled mountain and intermountain habitat depicted in Figures 7 and 8 reflects current and potential habitat use in the project vicinity fairly well. It is unclear why a separate delineation of "critical linkages" in Figure 5 is needed or what supports the delineation. The intermountain habitat results more accurately identify locations where bighorn sheep could connect between core mountain habitat areas. We suggest removing the critical linkage map because it is unsubstantiated and does not reflect the results of the more precise modeled mountain and intermountain habitat. If the critical linkage map is not removed, at a minimum it would need to be updated to reflect the reality that I-15 is not permeable except for at specific overpasses and underpasses where conditions are suitable for bighorn sheep crossing, which is essentially the conclusion drawn in Figure 6 of this comment. I-15 experiences near-continuous traffic in the SMS project area. Bighorn sheep would be struck by vehicles if they were to attempt to cross the highway at locations other than the specified overpasses or underpasses. Figure 5 fails to take this into account and ignores the viability of movement through the underpass at Zzyzx Road.

INACCURATE AND INAPPROPRIATE HIGH BIOLOGICAL SENSITIVITY DESIGNATION OF SODA MOUNTAIN VALLEY

The project area is designated as "high biological sensitivity" in the DRECP reserve design. This designation is inappropriate given the biological resource on the site identified in site-specific surveys. This inappropriate designation was discussed at length in previous comments submitted by Soda Mountain Solar, LLC (attached hereto as Exhibit1). Since that comment letter was submitted, supplemental surveys were performed for desert tortoise, burrowing owl, kit fox, bighorn sheep, bats and rare plants in the fall of 2012. The results of these additional surveys are provided in Table 3. These additional surveys support the conclusion that the project area does not meet the criteria for "high biological sensitivity".

Table 3: Surveys and Results

Survey	Survey Timing	Results
Desert tortoise	Fall 2012	Protocol survey of eastern extremes of project area. No live tortoise observed. Sign along toe of hill slope and on eastern margin of project area
Floristic survey for rare plants	Fall 2012	No special-status plants
Bighorn sheep	Fall 2012	No bighorn sheep or trails on site. Bighorn and sign observed in mountainous area east and south of the project.
Bats	August 2012	No special-status bats observed on site. Townsend's big-eared bat observed at Blue Bell mine; Pallid bat observed at Otto Mine.
Burrowing owl	Fall 2012	Active burrows and sign of recent use
Kit fox and American badger	Fall 2012	Kit fox and dens observed. American badger sign.

Appendix H of the Alternatives Analysis (CEC 2012) identifies the methods that were used to formulate the reserve design. The "high biological sensitivity" designation appears to reflect the assumption that the SMS project area is within a desert tortoise least-cost corridor. As stated above in "USFWS Desert Tortoise Least Cost Corridors" (i) site-specific survey results and habitat suitability analysis; (ii) USFWS' own Revised Recovery Plan; and (iii) genetic studies strongly indicate that tortoise populations are not crossing the Baker Sink and are not connecting between the West Mojave recovery unit and East Mojave recovery unit.

The substantial data that has been collected on the SMS project area does not support a conclusion of "high biological sensitivity." This designation should be revised in the Draft EIS/EIR to reflect the resources that are on the site.

THE SODA MOUNTAIN VALLEY SHOULD BE DESIGNATED A DEVELOPMENT FOCUS AREA

The SMS project site warrants a DFA designation within the DRECP, across all alternatives. The 4,400-acre project site is currently not located within a DFA in any of the five draft DRECP alternatives.

DFA Designation Criteria

The Alternatives Analysis states that suitable locations for DFAs were identified:

> "[u]s[ing] resource distribution data in combination with agency and stakeholder input to identify and characterize areas suitable for renewable energy development based on the principles laid out above, and accounting for the conservation goals identified during the reserve design process." (CEC 2012, page 1.2-22).

There are three guiding principles identified in the Alternatives Analysis. In general, they include:

1. Develop generation "either on already disturbed land or in areas of lower biological value."
2. Aggregate transmission to the extent feasible to avoid transmission cost, sprawl, and disturbance. This principle reduces disturbance to biologically sensitive areas.
3. Allow sufficient flexibility in the Plan so as to not limit competition or "unnecessarily result in distorted or environmentally incompatible incentives when implemented, i.e., where feasible, the Plan should remain market neutral between different technologies or different project configurations." (CEC 2012, page 1.2-21.)

Reserve Design Designation

The project area is designated as "high biological sensitivity in the DRECP reserve design, which supports its exclusion as a DFA; however, this designation is inappropriate, as demonstrated above. Site-specific survey data do not support a conclusion of "high biological sensitivity" due to the low level of biological resources identified in site-specific surveys, as discussed under "Inaccurate and Inappropriate High Biological Sensitivity of Soda Mountain Valley." Therefore, designation of the project area as a DFA would not conflict with conservation goals.

Guiding Principles

The project area would be consistent with all three guiding principles outlined in the Alternative Analysis, warranting its designation as a DFA.

The project site is located in an area that contains substantial human disturbance and has lower biological value. Anthropogenic disturbance of the Project site is abundant, including the presence of I-15, multiple linear projects, OHV recreational use, and the former Arrowhead Highway. The site-specific species data for the project site demonstrate limited biological value for special status species, both as habitat and as a connectivity corridor.

Development at the project site would allow aggregation of transmission, thereby reducing transmission sprawl, cost, and disturbance. Located within a Section 368 energy corridor and RETI CREZ, the Project site already has been identified as suitable for substantial infrastructure development and is one of the primary transmission and transportation routes into California. Moreover, the BLM has concurred that development of the Project would not conflict with the transmission objectives of the Section 368 corridor (BLM 2009). LADWP's system impact study indicates that its existing transmission line through the Project site has sufficient capacity to accommodate 350MW of renewable generation without the need for upgrading. Because of its proximity to existing roads and transmission infrastructure, no generation intertie transmission line construction is necessary and access road development would be limited to internal access.

Alternatives

Designation of the project area as a DFA under each alternative would not conflict with selected themes of each alternative (excluding the No Action Alternative) as described in *Primary Features of DRECP Alternatives* and briefly summarized in Table 4, below.

Table 4: Alternatives Characteristics

Alternative	Geographic Distribution of Development	Resource Conflicts	High and Moderate Biological Sensitivity Lands in DFAs	Project Site Conflicts
1	Low-conflict disturbed lands	Lowest	70,559 (6 percent of DFAs)	Project site has low biological value and contains existing infrastructure and other signs of human disturbance; therefore, it would be an appropriate DFA under Alternative 1.
2	Distributed across plan area	Moderate	477,051 (26 percent of DFAs)	Project site has low biological value and contains existing infrastructure and other signs of human disturbance; therefore, it would be an appropriate DFA under Alternative 2 because it would not add to amount of resource conflict.

Table 4: Alternatives Characteristics

Alternative	Geographic Distribution of Development	Resource Conflicts	High and Moderate Biological Sensitivity Lands in DFAs	Project Site Conflicts
3	Focused on western portion of plan area	High in West Mojave; moderate elsewhere	507,827 (26 percent of DFAs)	The project site has low biological value and thus would not create more resource conflicts; however, the project site is not located in the West Mojave area near other DFAs in this Alternative. Past reports have noted that Alternative 3 has least impact on tribal lands (e.g., Overview and Discussion of DRECP Alternatives, DRECP Stakeholders Meeting, July 2012 [REAT Agency Team 2012]). The DRECP does not identify culturally sensitive areas in the project area or its vicinity. Thus, designation of the project site as a DFA under Alternative 3 would not increase impacts to tribal concerns.
4	Distributed across plan area	Moderate	191,427 (13 percent of DFAs)	Project site has low biological value and contains existing infrastructure and other signs of human disturbance; therefore, it would be an appropriate DFA under Alternative 4 because it would not add to amount of resource conflict.
5	Distributed across plan area	Moderate to high	690,013 (30 percent of DFAs)	Project site has low biological value and contains existing infrastructure and other signs of human disturbance; therefore, it would be an appropriate DFA under Alternative 5 because it would not add to amount of resource conflict.
6	Distributed across plan area	Moderate to high	371,926 (22 percent of DFAs)	Project site has low biological value and contains existing infrastructure and other signs of human disturbance; therefore, it would be an appropriate DFA under Alternative 5 because it would not add to amount of resource conflict.

Source: CEC 2012.

The Project site's designation as a DFA would comport with the three guidelines described above, and its low biological value means that it is not vital for conservation. We request that the preparers of the DRECP and its associated NEPA and CEQA reviews draw from the wealth of existing project-specific data to substantiate a DFA designation for the project site across all alternatives.

APPENDIX E

The myriad of allowable uses and use restrictions of Appendix E of the Alternatives Analysis (CEC 2012) are extraordinarily sweeping in their effect. While they ostensibly provide some flexibility for development, the use restrictions and mitigation requirements are so stringent that they either directly or effectively prohibit development altogether. They are also confusing and potentially inconsistent. Take, for example, the general desert tortoise management provisions within BLM lands, which categorically prohibit utility-scale energy development within BLM conservation lands (Appendix E, page 56), and which appear to conflict with some Alternatives that allow development within reserve lands as follows (Appendix E, pages E-60 and E-61):

Alternative	Live Tortoise Limit	Mitigation Ratio
1, 2, 4, 6	No more than 5 per non-linear project within reserve system	5:1
3, 5	No utility scale energy development allowed within BLM reserve system; more than 2 for non linear projects within reserve system	10:1

In addition, while the provisions in the table above appear to allow development on their face, they will prohibit it in practice. Very few, if any, project survey results will remain below the live tortoise limit of alternatives 1, 2, 4 and 6, and, even if they do, a mitigation ratio of 5:1 will make the project cost prohibitive. It is highly unlikely that any non-linear project survey results outside the BLM reserve system will remain below a two tortoise limit (which essentially requires no live tortoise identification on-site under USFWS guidance, and, to our knowledge, has only occurred on two solar projects on BLM-administered lands to date) and, even if they did, a mitigation ratio of 10:1 for the entire project is impossible to justify under a project feasibility analysis.

Moreover, if a project's survey results indicated two or fewer live tortoises, why should the project be subject to a 10:1 mitigation ratio when its extraordinarily low survey results suggest that habitat quality on the site is poor? If the REAT agencies desire to impose new, higher mitigation ratios within DRECP reserve lands, shouldn't a project's mitigation burden still be directly correlated to its survey results (as it usually is under project-specific incidental take authorizations), rather than inversely, as here?

The second question above is important because it raises the issue of proportionality. Under state law, mitigation for a project must be "roughly proportional" to its impacts, just as dedications of land under federal law must be "roughly proportional". *Napa Citizens for Honest Gov't v Napa County Bd. of Supervisors*, 91 Cal.App.4th 342, 364 (2001); E*nvironmental Council of Sacramento v City of Sacramento*, 142 Cal.App.4th 1018, 1040 (2006) ; 14 Cal Code Regs §15126.4(a)(4)(B); *Dolan v City of Tigard,* 512 US 374 (1994). The same question also invites scrutiny under the arbitrary and capricious standard of judicial review of the Administrative Procedure Act. *Marsh v.Oregon Natural Res. Council*, 490 U.S. 360 (1989).

The negative manner in which the DRECP reserve design and many of the restrictions of Appendix E have been defined similarly invite scrutiny. Although the DRECP reserve design distinguishes between high and moderate biological sensitivity lands, it is, at its heart, simply defined negatively as all undeveloped, unprotected lands that are not within a Development Focus Area (DFA), irrespective of the fundamental biological values of the lands themselves, the only distinction being moderate and high sensitivity.

The preliminary desert bighorn sheep habitat map (Map 1) on page E-84 of Appendix E is another example; the map categorically defines bighorn inter mountain (i.e., linkage) habitat as all lands lying between core mountain habitat segments that aren't already legislatively and legally protected, without any reference to the fundamental biological values of the lands in question or an assessment of their suitability as bighorn linkage habitat.

Limitations within linkage and wildlife corridors appear to be similarly arbitrary and divorced by design from on-the-ground conditions. For example, to manage for bighorn by asserting that "No new development is allowed within the specific interstate crossings identified in Wehausen (2012)" (Appendix E, page E-81) leaves no room for an on-the-ground assessment of the validity of each programmatically imposed interstate crossing designation. Nor does it leave room for projects that may actually be able to improve pre-project interstate crossing rates through project-specific mitigation. Rather than an outright prohibition, the measure should require any new development within specific interstate crossings to improve pre-project interstate crossing rates. Similarly inflexible percentage-based limitations on cumulative ground disturbance within linkage and wildlife corridors also appear in Appendix E (e.g., pages E-58, E-81), without any substantiation as to why a particular percentage has been applied.

Appendix E is so far reaching and complex that an exhaustive assessment of its contents could not be completed within the short comment period for review of the Alternatives Analysis. It is our hope, however, that the examples above demonstrate basic principles that should be carried forward through the entirety of Appendix E.

APPENDIX I PENDING PROJECTS

Appendix I of the Alternatives Analysis (CEC 2012) identifies DRECP criteria for the processing of existing BLM right-of-way applications. We recommend the following changes to make the criteria more balanced.

1. Projects on BLM land that receive a ROD prior to issuance of the DRECP ROD.

This criterion will incentivize the misuse of project-specific land use plan amendment protests. Protestors will try to delay protest resolution beyond the date of the DRECP ROD. We recommend adding a clause that also includes the RODs of projects that were subject to the protest resolution process at the time of issuance of the DRECP ROD.

2. Projects proposed on BLM lands that do not receive a ROD prior to issuance of the DRECP ROD.

Criterion 1) under this category exempts from the land use allocation decisions of the DRECP any project applications filed before June 30, 2009 within a BLM Solar Energy Zone. However, the "pending projects" exemption of the PEIS also applies to applications filed *outside* Solar Energy Zones before October 27, 2011.

The pending projects exemption of the Solar PEIS is the fulcrum upon which many compromises were made by the environmental community on one side and the solar industry on the other. It would be unfortunate if the DRECP were to upset such a hard-won (and well-supported) collaborative balance, especially given that it is embodied in a comprehensive, multi-state land use plan amendment that is less than four months old.

Criterion 1 therefore should include all pending projects under the Solar PEIS. Short of that, Criterion 1 should apply to "pending projects" within variance areas identified by the Solar PEIS as well as Solar Energy Zones, but not exclusion areas. Or, at the very least, Criterion 1 should apply to all applications filed before June 30, 2009 if they are located in Solar PEIS variance areas or Solar Energy Zones. Although still a much reduced form of the pending project exemption of the Solar PEIS, the latter would more fittingly comprehend only those applications filed within variance areas or Solar Energy Zones before BLM began to formally designate areas best suited for solar energy development and before the DRECP planning agreement had been developed.

3. Add a new, third criterion for projects proposed on BLM lands that do not receive a ROD until 60 days or more after issuance of the DRECP ROD.

As evidenced by our comments above (as well as by our July and August 2012 comments on the DRECP) the landscape-scale modeling assumptions of the DRECP will not always correspond with ground-truthed, site-specific data. The DRECP therefore should be flexible in instances where the DRECP's landscape-scale land use allocations are at odds with site-specific data. To that end, we recommend adding a third criterion for projects that do not receive a ROD until 60 days or more after the issuance of the DRECP ROD, as follows:

> 3) A project with a published Draft EIS or EA later than 60 days after the release of the DEIS for the DRECP (expected late summer 2013) provided the project-level NEPA document (FEIS for projects with a DEIS published before the release of the DEIS for the DRECP) includes:
>
> a) Analysis using the best available information at the time of publication, including data developed in support of DRECP conservation and recreation strategies,
>
> b) Analysis describing the relationship between the project and the DRECP conservation and recreation strategies, and
>
> c) Analysis conclusively demonstrating that the landscape-scale land use allocation decisions of the DRECP are unsupported by the best available site-specific information for the project.

Because it would be resource-based rather than strictly temporal, our recommended exemption would not be as categorical as the other exemptions; it would apply only to the extent of the resource discrepancies identified in factor c) proposed above.

REQUEST FOR EXTENSION OF TIME FOR REVIEW AND COMMENT

Soda Mountain Solar, LLC requests an extension of time to review and comment on the extensive materials posted for the Alternatives Analysis. The comment period should be extended by 60 days to allow for a review period commensurate with the amount of time commonly allowed for public review of a Draft EIS of the same size as the Alternatives Analysis.

CONCLUSION

To conclude, the unprecedented size of the DRECP of course requires generalized, over-inclusive measures to a certain degree in order for its implementation to be feasible. But it need not be so monolithic in its application as proposed in the Alternatives Analysis, particularly when the vast amount of land slated for inclusion within the DRECP reserve system is roughly eight times larger than the amount of land slated for development. This discrepancy leaves ample room for significantly more flexibility than currently proposed.

Soda Mountain Solar, LLC appreciates the opportunity to review and comment on these documents in advance of the Draft EIS/EIR. Thank you for reviewing our comments. We request that these comments be incorporated into the Draft EIS/EIR for the DRECP.

Sincerely,

for

Adriane E. Wodey
Manager
Soda Mountain Solar, LLC.

Exhibit 1: SMS Comments on July 25, 2012, Stakeholder Meeting Materials
SMS Comments on Baseline Biology Report July 24, 2012

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Attachment 1

SMS Comments on July 25, 2012, Stakeholder Meeting Materials

SMS Comments on Baseline Biology Report

August 9, 2012

California Energy Commission
Dockets Office, MS-4
Docket No. 09-RENEW EO-01
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: Comments on DRECP July 25 and 26, 2012 Stakeholder Meeting Materials
Docket Number 09-RENEW EO-01

Dear Sir/Madam:

Soda Mountain Solar, LLC, a subsidiary of Bechtel Development Company, Inc., is submitting comments in response to materials and information presented at the Desert Renewable Energy Conservation Plan (DRECP) Stakeholder Committee Meeting on July 25 and 26, 2012. The Soda Mountain Solar project (Project) is a proposed 350 megawatt photovoltaic solar generating facility located on BLM-administered lands in San Bernardino County, California (Figure 1). The BLM right-of-way Serial Number for the Project is CACA-49584. These comments specifically address inappropriate proposed designations for the Project site in the DRECP, namely:

- A high biological sensitivity designation (Project site biological reports do not support a moderate biological sensitivity designation);
- A high conflict Development Focus Area (DFA) designation (unsupported by Project site biological reports and land use planning status); and
- Lack of DFA designation for the Project site across draft DRECP alternatives (DFA designation warranted across all alternatives due to prior disturbance, Section 368 status, and demonstrated lack of biological and land use planning conflicts).

As mentioned below, our opinion on these matters is backed by three years of Project site-specific data presently on file with the BLM, as well as by a rigorous, peer reviewed analysis of the modeling assumptions of the DRECP previously filed under this docket.

Finally, we also recommend carrying forward into the DRECP the "pending projects" concept embodied in the Solar Energy Development Programmatic Environmental Impact Statement (PEIS) insofar as the DRECP concerns BLM-administered lands.

INAPPROPRIATE CLASSIFICATION OF THE SODA MOUNTAIN PROJECT WITHIN THE BIOLOGICAL RESERVE DESIGN

Reserve Design and Categories

A biological reserve design was prepared for the DRECP to guide the California Environmental Quality Act/National Environmental Policy Act (CEQA/NEPA) alternative development process. Among other categories, the biological reserve design identifies areas of high and moderate biological sensitivity. Areas of high and moderate biological sensitivity are proposed for conservation as a part of the DRECP.

The plan-wide biological reserve design for the DRECP was developed using Marxan (Ball et al. 2009) and expert-based analysis. Marxan is a computer-based planning tool to aid in reserve design[1]. Marxan requires data on species habitat and quality to optimize the reserve design. The plan-wide biological reserve design includes eight categories. The reserve categories were defined in the presentation for the April 25 and 26, 2012, DRECP stakeholder meeting and are presented in Table 1, below (DRECP 2012a).

Marxan does not consider data uncertainty or accuracy, therefore the quality of the reserve design is dependent on the quality of the input data. According to the DRECP, the plan-wide biological reserve design was refined through expert-based analysis, post-Marxan, through consideration of:

- Species habitat distribution and occurrences;
- Natural communities;
- Large habitat blocks;
- Habitat linkages;
- Physiographic and environmental characteristics; and
- Ecological processes (DRECP 2012a).

At the July 25th stakeholder meeting, the BLM stated that the reserve design was based in large part on the "naturalness" of the landscape. The use of models based on habitat naturalness was used in lieu of species specific modeling and connectivity analysis, or detailed, site-specific data because the DRECP area is very large and it would be infeasible to assess each of the covered species in the entire Plan Area at a site-specific level.

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[1] The Marxan objective function seeks to optimize the reserve design through econometrics by applying costs for preservation within reserve areas and penalties to areas of high conservation value that are not preserved (Ball et al. 2000). The optimal design has the lowest reserve cost with lowest penalties.

Table 1: Reserve Categories and Descriptions

Reserve Category	Description
Legislatively and Legally Protected Areas	Existing protected lands; emphasis on existing protection and management of biological resource values. No renewable energy development covered by DRECP.
High Biological Sensitivity	Based on Marxan Scenario 5 additional conservation area zone (blue areas), desert tortoise (conservation areas and least cost corridors), Mohave ground squirrel conservation areas and range, flat-tailed horned lizard management areas, major rivers, desert linkage network, and expert input. Higher biological sensitivity signifies areas where biological resources are more sensitive to perturbation or where biological resources are concentrated or where highly sensitive biological resources occur. In general, fewer uses or less intensive uses are compatible with these areas.
Moderate Biological Sensitivity	Based on Marxan Scenario 5 conservation area zone (green areas) and other biological resource information, including species occurrence and model data, natural community data, landscape-level information, and expert input. In general, moderate biological sensitivity signifies areas where biological resources are moderately sensitive to perturbation or where biological resources are less concentrated or where moderately sensitive biological resources occur. In general, more uses or more intensive uses are compatible with these areas.
Military and Military Expansion Mitigation Lands	No renewable energy development or conservation covered by DRECP currently displayed or considered (subject to change pending DOD input).
Open OHV Lands	Biological conservation is area dependent.
Tribal Lands	No renewable energy development or conservation covered by DRECP currently displayed or considered (subject to change pending tribal input).
Impervious and Urban Built-up Land	Utility-scale renewable energy development and conservation unlikely.
Undesignated	Conservation unlikely.

Source: DRECP 2012a; DRECP 2012b

Why the Designation of the Soda Mountain Solar Project Site is Inappropriate

Although the DRECP is a landscape-scale endeavor, more detailed regional and local species specific analyses should replace large scale modeling based on habitat naturalness.[2] In this instance, the Project site is designated as "Plan-wide Conservation Area – High Biological Sensitivity – Public" within the plan-wide biological reserve (Figure 1). The output of the Marxan analysis presented in the meeting materials showed a moderate biological sensitivity for the Project site (DRECP 2012a). The elevation to high biological sensitivity was therefore an output of the expert-based analysis. The high biological sensitivity designation indicates that the area contains biological resources that are sensitive to perturbation, high concentrations of biological resources, or highly sensitive biological resources. However, as explained below, neither a High Biological Sensitivity nor a Moderate Biological Sensitivity designation is consistent with the multiple Project-specific, habitat and focused species field surveys that have been on file with the BLM under right-of-way application CACA-49584 since 2009.[3]

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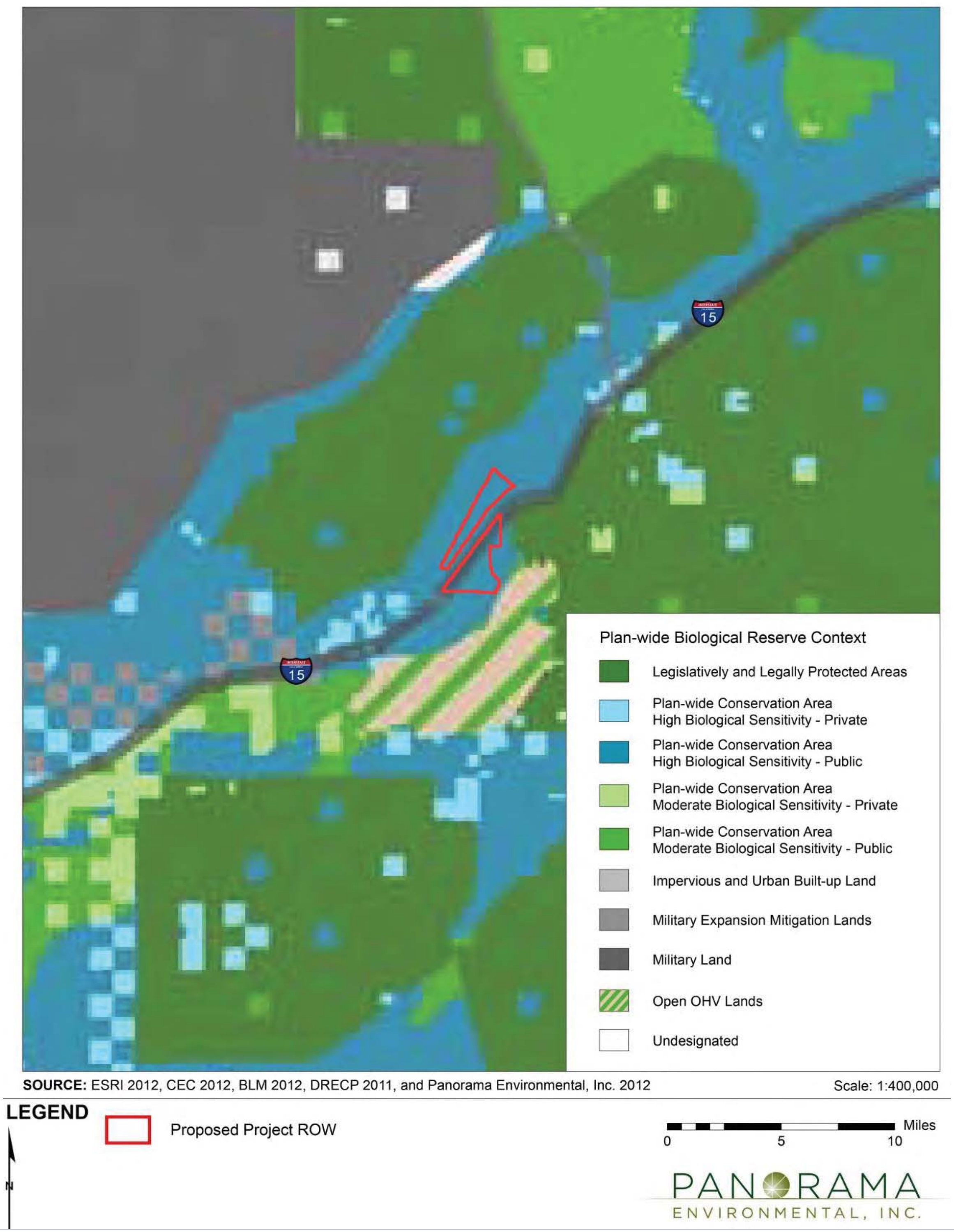
[2] This approach is recommended in *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (Spencer et al. 2010), which specifically states:

> "*Essential Connectivity Areas are placeholder polygons that can inform land-planning efforts, but that should eventually be replaced by more detailed Linkage Designs, developed at finer resolution based on the needs of particular species and ecological processes. It is important to recognize that even areas outside of Natural Landscape Blocks and Essential Connectivity Areas support important ecological values that should not be "written off" as lacking conservation value. Furthermore, because the Essential Habitat Connectivity Map was created at the statewide scale, based on available statewide data layers, and ignored Natural Landscape Blocks smaller than 2,000 acres; it has errors of omission that should be addressed at regional and local scales*".

[3] SMS has completed detailed environmental studies within the proposed Project site as part of the right-of-way application process, including: desert tortoise survey; golden eagle and bighorn sheep survey; special-status plant survey; Mojave fringe-toed lizard survey; avian surveys; habitat assessment; water resource investigation and delineation; hydrologic and groundwater evaluation; geologic characterization; and a percolation and scour analysis. The results of each of these surveys are on file with the BLM under right-of-way application CACA-49584.

Figure 1: Soda Mountain Solar Reserve Classification



SOURCE: ESRI 2012, CEC 2012, BLM 2012, DRECP 2011, and Panorama Environmental, Inc. 2012

Scale: 1:400,000

PANORAMA ENVIRONMENTAL, INC.

Marxan Reserve Design for Soda Mountain Solar Project Site

The reserve design that resulted from Marxan Scenario 5 displayed the Project site as a green area of moderate biological sensitivity and therefore an area considered for conservation according to the DRECP. As stated by the BLM during the stakeholder meeting on July 25, 2012, this sensitivity was based largely upon land cover naturalness; species-specific biological goals and objectives were not developed or considered. Naturalness is an inaccurate proxy for species habitat and use. Species niche habitat and connectivity reflect landscape population dynamics that are independent of the naturalness of the habitat, for example. Areas of high "naturalness" may be unsuitable for species use for a variety of reasons: areas with few impervious surfaces may be unsuitable for niche habitat preferences, other factors may have contributed to habitat degradation (e.g., predators, invasive species), or an area may be outside of a species range due to natural or man-made landscape barriers (e.g., mountains, unvegetated playas, highways). Likewise, highly-disturbed habitats may be suitable to species use or contain important corridors, such as riparian areas for connecting wildlife populations. The reserve design does not provide targeted protection of the species that the DRECP is tasked with conserving because detailed, "ground-truthed" species and linkage analysis was not used in the design. Because the reserve design is based on naturalness of habitat, the reserve design reflects very large areas of moderate and high biological sensitivity due to the relatively few developed areas (impervious areas which would not be "natural") located within the DRECP Area. These areas may not be key habitat or linkage areas for species covered under the DRECP. Therefore, in the absence of detailed species analysis, the Marxan reserve design is unlikely to identify targeted areas for protection because it did not consider the species and uses that need to be protected.

Soda Mountain Solar Compared to Expert-Based Analysis Criteria

The DRECP used expert-based analysis to improve the reserve design output of Marxan, and, in this instance, to elevate the Project site's designation from "Moderate Biological Sensitivity" to "High Biological Sensitivity". Table 2, below, reevaluates the biological sensitivity of the Project site by comparing the expert-based criteria to Project-specific intensive habitat and species field survey results on file with BLM under CACA-49584. The analysis in Table 2 indicates that the Project site does not meet any of the criteria for high biological sensitivity.

Table 2: Soda Mountain Solar Biological Sensitivity Analysis

Expert Evaluation Criteria	Soda Mountain Solar Project Site
Species habitat distribution and occurrences: concentrations, major populations, essential locations	The Project site does not have high concentrations or major populations of species. The Project site is characterized by sparse vegetation and low abundance and diversity of wildlife (URS 2009a). None of the DRECP-covered species are known to occur or were observed within the Project site during focused species surveys for desert tortoise, Mojave fringe-toed lizard, golden eagle, and bighorn sheep (URS 2009b; RMT 2010; RMT 2011).
Natural communities: representation and capture of rare and sensitive types	There are no rare or sensitive natural communities within the Soda Mountain Solar Project site. The Project site is completely dominated by Mojave creosote bush scrub, which is common throughout the desert (URS 2009a).
Large habitat blocks/core areas	The Project site lies within a relatively small valley that is separated geographically from larger landscape blocks or units. The Project site was not identified as a natural landscape block or core area within the Desert Connectivity Project (Penrod et al. 2012)
Habitat linkages and corridors	No habitat linkages were identified within the Project site by the Desert Connectivity Project (Penrod et al. 2012). An essential connectivity area was identified within the Project site (REF); however, the essential connectivity areas should be succeeded by the linkages identified in the Desert Connectivity Project (Spencer et al. 2010; Heim and Hietter 2012); *see* fn 2, above.
Physiographic and environmental representativeness: elevation gradients, slope, aspect, temperature, rainfall, including climate change	The Soda Mountain Solar Project site is contained within a valley where slopes range from 2-4%. The Project site is very uniform in elevation, gradient, rainfall, and temperature due to the overall small size of the Project site (4,400 acres) and the uniformity of site conditions. The habitat within the Project site is also uniform, exhibiting low vegetation and species diversity. The Project site does not include unique or distinct physiographic elements.
Ecological processes: landscapes supporting aeolian processes, alluvial and fluvial processes, geomorphological processes	There are no intermittent or perennial streams within the proposed Project site. There are numerous small ephemeral drainages within the Project site that are geomorphically stable and have not changed course over the last 50 years based upon analysis of historical aerial imagery. The ephemeral drainages and general area contain course grain sediments including gravels, cobbles, and sands. These course grain sediments are not subject to aeolian processes. While there are alluvial fans within the Project site, the alluvial processes are not an important source of sediment for downstream habitat. The Project site is geomorphically stable with coarse grain sediment, and would not be a significant source of sand or other materials for downstream areas (Wilson 2011).

Soda Mountain Solar Project Site Conditions Compared to Moderate Biological Sensitivity Description

The results of the Marxan reserve design indicated that the Project site should be designated as moderate biological sensitivity. The Project site does not meet the definition for moderate biological sensitivity as defined by the DRECP. The definition for moderate biological sensitivity includes areas that contain:

1) Biological resources that are moderately sensitive to perturbation;
2) Biological resources are less concentrated; or
3) Moderately sensitive biological resources.

1. Sensitivity of Biological Resources to Perturbation

The Project vicinity has been highly disturbed by past land use actions. The Project site is adjacent to and divided by the four- lane, divided Interstate-15 (I-15) highway. Other land uses directly adjacent to the Project site include:

- Rasor Road off-highway vehicle area
- Two transmission lines
- Power distribution line
- Telephone line
- Cellular tower
- Two fuel pipelines
- Underground fiber optic cable

Biological resources that are sensitive to perturbation would not be expected in the Project site due to the existing intensive land uses, particularly I-15 which exhibits nearly constant traffic as the primary thoroughfare between Las Vegas, Nevada and Los Angeles, California. Biological resources that would use the Project site would be limited to those that are habituated to human disturbance. The level of existing disturbance and on-going intensive uses of the Project site would not be suitable for biological resources that are moderately sensitive to perturbation.

2. Concentration of Biological Resources

Biological field studies were conducted for the Project site in 2009 and 2011. These studies included:

- Special status plants survey
- Focused desert tortoise survey
- Mojave fringe-toed lizard survey
- Golden eagle and bighorn sheep surveys
- Avian point count surveys
- Water resource investigation

Species diversity and abundance within the Project site is low and typical of areas containing sparse and uniform vegetation (URS 2009a). Neither vegetation nor wildlife occur within the Project site in high concentrations. The Project site does not support high concentrations of sensitive or other biological resources. The focused surveys for desert tortoise, Mojave fringe-toed lizard, golden eagle, and bighorn sheep did not identify presence of these species within the Project site (URS 2009b; RMT 2010; RMT 2011). Avian point count surveys were conducted in the fall and spring of 2009. A total of 629 birds were identified in the spring consisting of 22 common species. 210 birds were identified in the fall consisting of 23 common species. The most abundant species accounting for the majority of the birds observed in the Project site was the horned lark which is abundant through the Mojave Desert (URS 2010). There was no presence or concentration of DRECP covered species during Project site surveys.

3. Sensitive Biological Resources

The *DRECP Baseline Biology Report* (CEC 2012) identified modeled suitable habitat for both desert tortoise and bighorn sheep within the Project site. Suitable habitat was not identified for any other species covered under the DRECP. The suitable habitat models for desert tortoise and bighorn sheep used in the *DRECP Baseline Biology Report* inaccurately characterize and overestimate the habitat suitability within the Project site.

Protocol-level desert tortoise surveys were conducted for the Project site. No tortoise, burrows, or sign were identified within the study area during 100% coverage surveys conducted on 10-meter transects throughout the entire Study Area (URS 2009 and RMT 2010). No desert tortoise or sign were identified in any of the studies conducted in the study area (biology, geology, and cultural resources). The field surveys also indicate that conditions are not likely to support populations of desert tortoise because:

- The elevation of the area (less than 1,600 feet) is low for desert tortoise
- Vegetation is sparse with low diversity
- Soils are very rocky
- Habitat is fragmented by Interstate-15 (I-15)
- Disturbance from off-highway vehicle use and construction of two transmission lines, a cellular tower, a distribution line, a fiber optic cable, and two fuel pipelines

These conditions, combined with the field survey results for desert tortoise, indicate that few, if any, desert tortoise would be expected in the Project site (Heim and Hietter 2012).

Surveys for bighorn sheep were conducted in Project site and in the Soda Mountains in 2011 (RMT) and 2012 (Abella). No bighorn sheep were identified within the Project site and suitable habitat was not identified within the Project site during a habitat evaluation (URS 2009a). Bighorn sheep experts determined that the Project site does not provide habitat for bighorn sheep because:

- The Project site is flat and does not contain mountains (Kerr 2010)
- The Project site does not provide any water sources
- Bighorn sheep prefer to stay in mountainous areas which provide views of the surrounding areas and vantage points (Turner 2010)

These habitat conditions indicate that bighorn sheep would not occupy the Project site or stay in the Project site for long if they were to travel through the Project site (Heim and Hietter 2012).

The Project site does not contain sensitive biological resources including desert tortoise or bighorn sheep.

Appropriate Designation for Soda Mountain Solar Project Site

The Project site exhibits low biological sensitivity and should not be designated as a moderate biological sensitivity area. The Project site is highly affected by the presence of I-15 and the existing intensive land uses within the area. Wildlife use of the Project site is limited by the Soda Mountains to the north and south, the Baker sink to the east, and I-15 dividing the Project site. These barriers to wildlife movement and the increased incidence of mortality associated with the highway limit the potential for future wildlife use of the Project site. The Project site does not meet any of the criteria for biological sensitivity and should be categorized as unclassified land (i.e., "conservation unlikely"), particularly when its low biological sensitivity is considered in the context of current disturbance and the site's designation as a Section 368 transmission corridor and a (biologically ground-truthed) Renewable Energy Transmission Initiative (RETI) Competitive Renewable Energy Zone (CREZ). The reserve design should be modified to designate the Project site as unclassified land.

INAPPROPRIATE DESIGNATION OF SODA MOUNTAIN SOLAR PROJECT SITE AS A HIGH CONFLICT DEVELOPMENT FOCUS AREA

The Project site falls within the "Dinosaur" polygon that was designated as a "high conflict" Development Focus Area (DFA) on the basis of potential biological and public land use planning conflicts. The conflicts identified for the Dinosaur polygon do not apply to the Project site.

The following potential biological conflicts were identified(Figure 2):

- Bighorn sheep (29,326 acres of inter-mountain habitat; 7,390 acres of mountain habitat)
- Desert tortoise (17,583 acres of modeled habitat)
- Mojave fringe-toed lizard (29,821 acres of modeled habitat)
- Habitat linkages (16,117 acres of desert linkages)
- Total number of modeled DRECP Species: 10

The Project site, consisting of approximately 4,400 acres, is included in a larger potentially high conflict area. The majority of the Dinosaur polygon is located north of the Soda Mountains in an area that is geographically separate from and includes different habitat elements than the Project site. The conflicts identified for the Dinosaur polygon do not apply to the Project site. The Project site does not contain Mojave fringe-toed lizard modeled habitat, and, as shown in Figure 3, is not located within any habitat linkages (CEC 2012 and Penrod et al. 2012), or habitat identified by intensive surveys (URS 2009). The modeled results for designating desert tortoise and bighorn sheep habitat inaccurately characterize and overstate the habitat suitability of the Project site because focused surveys for desert tortoise and bighorn sheep are in direct conflict with the model results. The surveys found no desert tortoise on the Project site and a lack of suitable habitat for bighorn sheep. As explained above, the models of desert tortoise and bighorn sheep habitat suitability overstate the habitat quality of the Project site.

The model for desert tortoise habitat suitability identified moderately suitable habitat for desert tortoise (0.6 to 0.8) within the Project site, while focused surveys using USFWS protocols did not find any tortoise or sign within the Project site. Similarly, suitable habitat for bighorn sheep was predicted within the southern portion of the Project site, which is flat and does not contain areas that meet bighorn sheep habitat criteria and bighorn sheep have not been identified in the Project site. The difference between model output and field surveys can be explained through 1) errors in the model input, 2) human impacts to the habitat, and 3) expected errors in modeling. Errors in the data used to model suitable habitat include GIS data showing 0% presence of rocks in the Project site when field geology studies identified abundant rocks and cobbles, and the model resolution at $1km^2$ would miss details that could impact the habitat suitability. Human impacts to the Project site are abundant, including the presence of I-15, multiple linear projects, and OHV recreational use. None of these previous land use impacts were considered in the modeling and no field ground-truthing was conducted to verify the results. Finally, the models would be expected to be inaccurate in some locations such as a relatively small area like the Project site. The multi-state model of tortoise habitat suitability was conducted over 6 states including a very large variety of habitat circumstances allowing for a high degree of variability in tortoise predicted suitable habitat. The model of bighorn sheep habitat was only conducted over the DRECP Plan Area, but included a limited number of presence data points (32 points total) from which to model suitable habitat. The limited amount of data used in the model would be expected to result in less accurate results (Heim and Hietter 2012).[1]

The high-conflict designation of the Dinosaur polygon is also founded on assumptions regarding potential conflicts with public land use designations, specifically, its adjacency to:

- BLM Wilderness,

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[1] Due to the limited number of presence data points a relatively low threshold of 0.236 was used to classify suitable habitat for bighorn sheep.

- BLM Proposed Wilderness; and
- Proposed Feinstein Bill.

These potential conflicts identified for the Dinosaur polygon do not apply to the Project site. The Project site is not adjacent to BLM Wilderness. The Project site is adjacent to the Soda Mountain Wilderness Study Area (WSA), but the BLM determined the Soda Mountain WSA to be unsuitable for wilderness designation in 1990, stating:

> Known and potential mineral values, the need to keep the land available for full development of a designated utility corridor, and opportunities for motorized recreation, when coupled with the lack of outstanding or unique natural features in the WSA, are of greater importance than the area's value as wilderness. Designation of the area as wilderness would not contribute any additional unique or distinct features to the National Wilderness Preservation System (BLM 1990).

While Senator Feinstein's Desert Protection Act of 2011 does propose designation of a portion of the Soda Mountain WSA as wilderness, the following express provisions of Section 1502 of the bill resolve any potential conflicts posed by renewable energy development of the Project site:

- The bill does not create a protective perimeter or buffer zone around the wilderness areas it creates (Section 1502(a)(1)).
- The bill does not require additional regulation of activities on land outside the boundary of the wilderness areas it creates (Section 1502(a)(3)).
- Perception of noise from or views of activities outside the wilderness areas created by the bill cannot be grounds for prohibiting or restricting such uses (Section 1502(a)(2)(A)).
- The impacts of a renewable energy project on a wilderness area created by the bill must be assessed based on the status of the proposed wilderness lands before their designation as wilderness if the renewable energy project initiates NEPA review prior to December 31, 2013 (Section 1502(a)(2)(B)).

The Project will initiate NEPA review prior to December 31, 2013.

In short, the High Conflict Area map needs to be revised to exclude the Project site because the potential biological and public land use conflicts ascribed to the Dinosaur polygon do not apply to the Project site.

Figure 2: Soda Mountain Solar "High Conflict Areas"

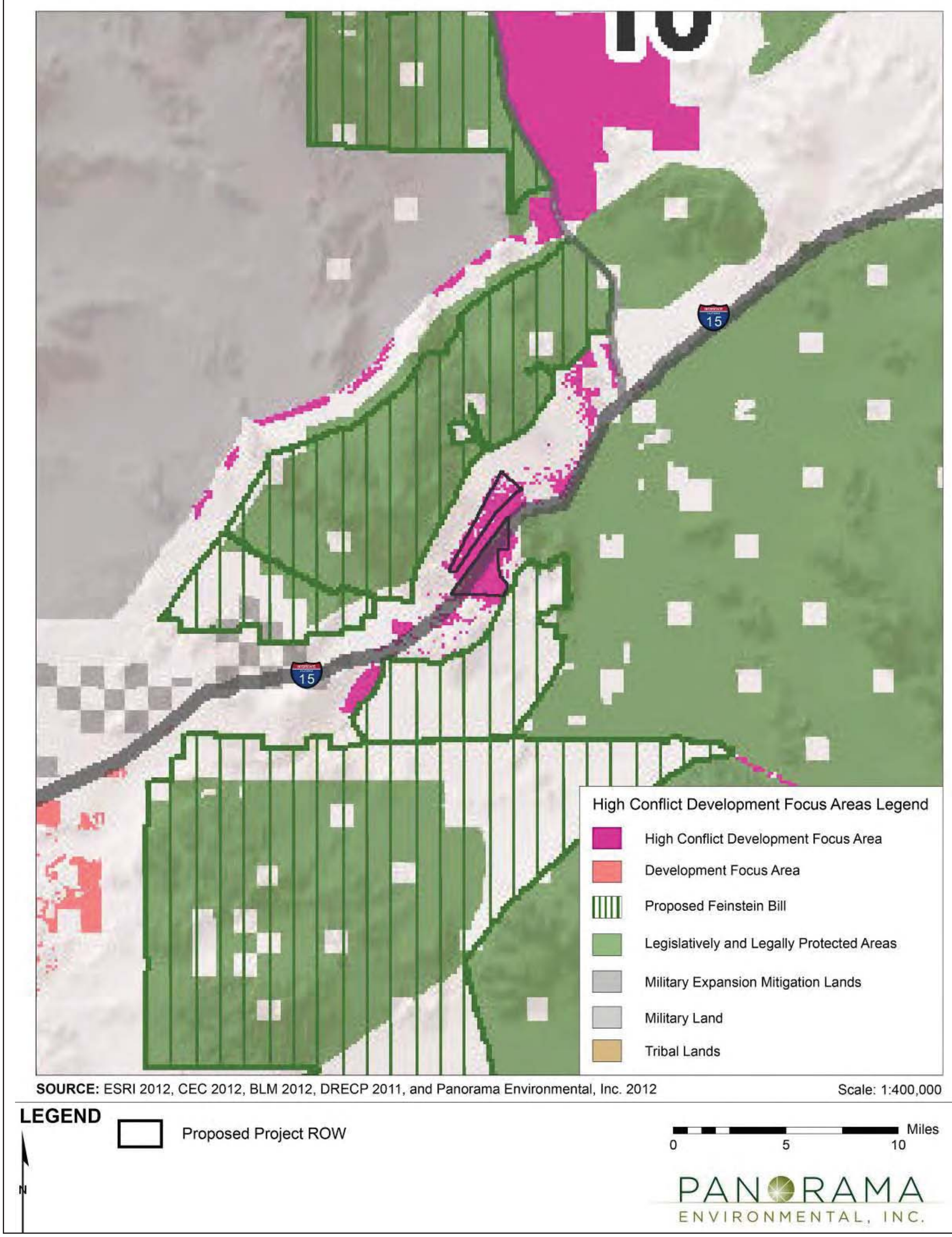

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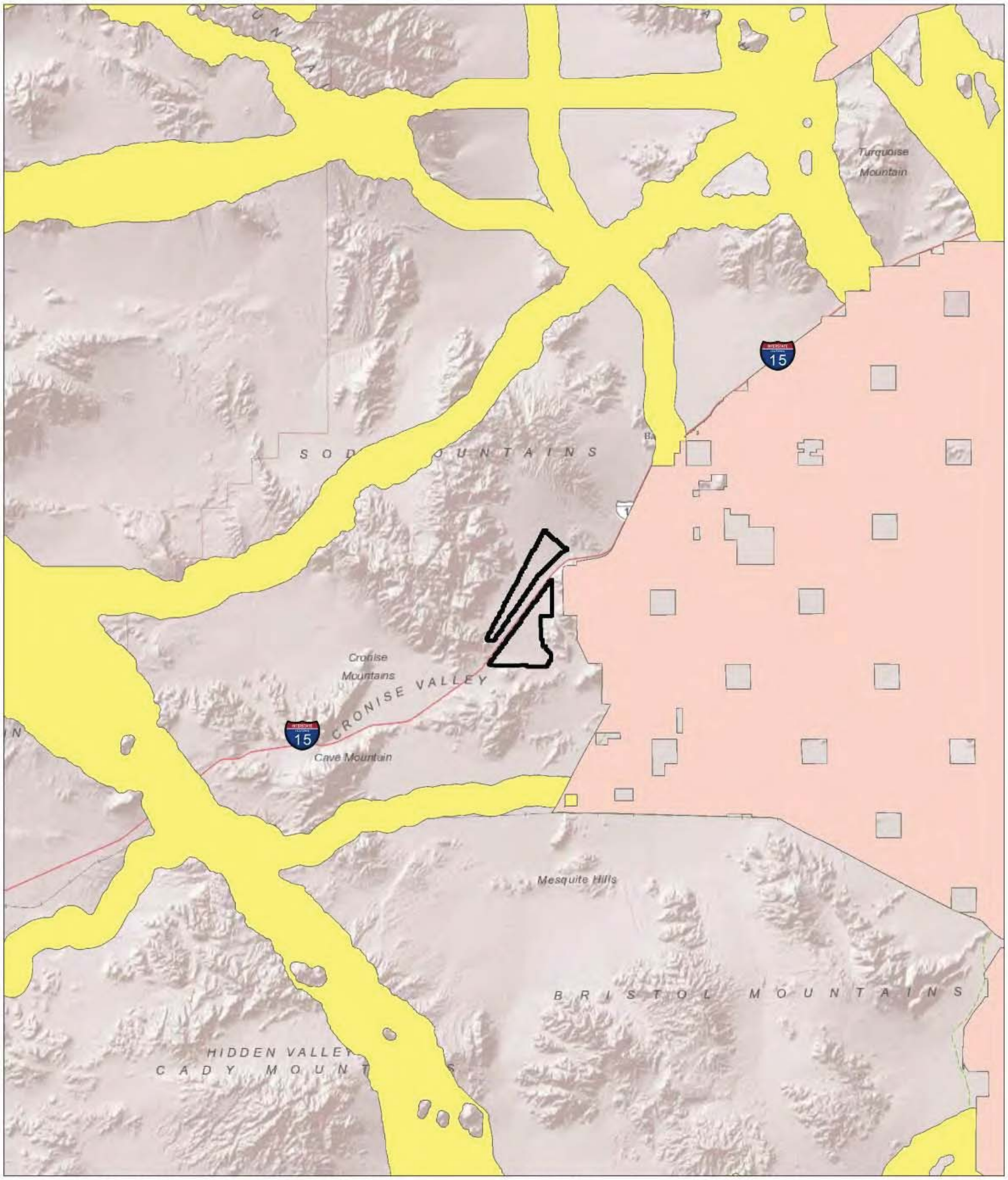
Figure 3: Soda Mountain Solar Connectivity Areas (Penrod et al. 2012)



SOURCE: ESRI 2012, Penrod, K. et al. 2012, and Panorama Environmental, Inc. 2012

Scale: 1:400,000

LEGEND

Proposed Project ROW

Landscape Blocks

Least Cost Unions

0 5 10 Miles

N

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DFA STATUS OF THE PROJECT SITE ACROSS DRAFT DRECP ALTERNATIVES

The 4,400-acre Project site is not located within a DFA in any of the five draft DRECP alternatives, although it is depicted as a "variance" area in Alterative 1. The Project site warrants a DFA designation within the DRECP, across all alternatives. The site-specific species data for the Project site demonstrate limited biological value for special status species, both as habitat and as a connectivity corridor. Anthropogenic disturbance of the Project site is abundant, including the presence of I-15, multiple linear projects, OHV recreational use, and the former Arrowhead Highway. Located within a Section 368 energy corridor and RETI CREZ, the Project site already has been identified as suitable for substantial infrastructure development and is one of the primary transmission and transportation routes into California. Moreover, the BLM has concurred that development of the Project would not conflict with the transmission objectives of the Section 368 corridor (BLM 2009). LADWP's system impact study indicates that its existing transmission line through the Project site has sufficient capacity to accommodate 350 MW of renewable generation without the need for upgrading. Because of its proximity to existing roads and transmission infrastructure, no generation intertie transmission line construction is necessary and access road development would be limited to internal access. As explained above, Senator Feinstein's proposed Desert Protection Act of 2011 expressly avoids impeding renewable development of the Project site, and such development would not conflict with BLM's recommendation against designating the adjacent Soda Mountain WSA as wilderness. Finally, the National Park Service has confirmed its willingness to work with Soda Mountain Solar, LLC to address concerns regarding potential impacts to the interior of the Mojave National Preserve. All of the above information is on record with the BLM under ROW CACA-49584.

The Project site exhibits fewer siting constraints than most sites previously approved or currently under consideration by the BLM for solar development in California. We request that the preparers of the DRECP and its associated NEPA and CEQA reviews draw from the wealth of existing Project-specific data to substantiate a DFA designation for the Project site across all alternatives, rather than rely solely – and, in this particular instance, potentially arbitrarily - on the development assumptions proposed by the Center for Energy Efficiency and Renewable Technologies.

PENDING PROJECTS ON BLM-ADMINISTERED LANDS

After much negotiation, leaders of the renewable energy industry and the environmental community have jointly supported BLM's proposed decision to exempt from the PEIS all BLM solar energy right-of-way applications filed within Solar Energy Zones prior to June 30, 2009 and, within "variance" areas, prior to October 28, 2011 (Abengoa Solar, et al. 2012). Assuming the pending projects exemption is carried forward through the Record of Decision for the PEIS, we respectfully urge the BLM to continue to honor the concept if and when it amends its land use plans to factor in the DRECP once it is adopted. We also strongly recommend that the

DRECP design incorporate BLM's pending projects exemption into its conservation assumptions by (i) expressly stating that the DRECP's conservation assumptions do not apply to BLM-approved projects or PEIS "pending project" sites unless the approved project is cancelled or the pending project application is withdrawn or rejected; and (ii) overlaying BLM-approved projects and PEIS "pending project" boundaries on relevant DRECP maps with a legend item summarizing the concept. Please note that both CEQA and NEPA will require the cumulative analyses of the DRECP's EIR/EIS to account for the pending projects exemption.

The pending projects exemption is the fulcrum upon which many compromises were made by the environmental community on one side and the solar industry on the other. It would be poor policy if the DRECP were to upset such a hard-won (and well-supported) collaborative balance.

RECOMMENDATIONS

The following modifications to the DRECP reserve design, high conflict areas, and draft alternatives are recommended for the Soda Mountain Solar Project site:

1. The categorization for the Soda Mountain Solar Project site should be changed; from "High Biological Sensitivity – Public" to "Unclassified Land";
2. The high conflict DFA designation should be removed from the Project site;
3. The Project site should be identified as a DFA across all development alternatives; and
4. The PEIS "pending projects" exemption should be incorporated into the DRECP design.

Soda Mountain Solar, LLC, appreciates the opportunity to comment on the meeting materials. These comments seek to improve the reserve design process and to encourage the adoption of a plan that reflects the overall purpose of the DRECP: protection of covered species and streamlining of permitting for renewable energy projects.

Sincerely,

Adriane Wodey
Soda Mountain Solar, LLC

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Soda Mountain Solar, LLC
5275 Westview Drive
Frederick, MD 21703

July 24, 2012

California Energy Commission
Dockets Office, MS-4
Docket No. 09-RENEW EO-01
1516 Ninth Street
Sacramento, CA 95814-5512
docket@energy.ca.gov

RE: Comments on DRECP Baseline Biology Report

Dear Sir/Madam:

Soda Mountain Solar, LLC (SMS) is the developer of the Soda Mountain Solar Project (the Project). The Project is a proposed 350 megawatt photovoltaic solar electric power generating facility located approximately six miles southwest of Baker, California, along Interstate 15, in San Bernardino County. The Project would be located within a 4,400 acre right-of-way on federal land administered by the U.S. Bureau of Land Management. The Soda Mountain Project area is shown in Figure 1 at the end of this letter.

SMS has reviewed the *Draft Desert Renewable Energy Conservation Plan (DRECP) Baseline Biology Report* (CEC 2012) and compared its habitat suitability results for desert tortoise and bighorn sheep with results of field studies conducted within the Soda Mountain Solar project area.[1] Our review also identified weaknesses in the methods used in the *Draft DRECP Baseline Biology Report*. The full analysis, including evaluation of the underlying models applied in the *Draft DRECP Baseline Biology Report*, is provided in the enclosed document, "Analysis of Habitat Suitability and Connectivity in the Soda Mountain Area, San Bernardino County, California" (Heim and Hietter 2012). The findings and recommendations of this analysis as they specifically apply to the *Draft DRECP Baseline Biology Report* and the Soda Mountain Solar Project site are

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[1] As part of the right-of-way application process, SMS has completed detailed environmental studies within the proposed Project area, including: desert tortoise survey; golden eagle and bighorn sheep survey; special-status plant survey; Mojave fringe-toed lizard survey; avian surveys; habitat assessment; water resource investigation and delineation; hydrologic and groundwater evaluation; geologic characterization; and a percolation and scour analysis. The results of each of these surveys are on file with the BLM.

provided below. Our letter concludes with several recommendations for the revision of the *Draft DRECP Baseline Biology Report* as it applies to the Soda Mountain Solar Project site.

Recommendations

The *Draft DRECP Baseline Biology Report* should be revised as described below.

1) **Section 3: Figure 3-4.** The Soda Mountain Solar Project area should not be designated as a connectivity corridor in the Baseline Biology Report because the species-specific analysis conducted by the California Desert Connectivity Project did not identify any linkages within the Soda Mountain Solar area.

The polygons of essential connectivity areas from the California Essential Connectivity Project should be removed and replaced with the more detailed linkage network developed by the California Desert Connectivity Project, where the two efforts overlap. This replacement is recommended in *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (Spencer et al. 2010):

> *"Essential Connectivity Areas are placeholder polygons that can inform land-planning efforts, but that should eventually be replaced by more detailed Linkage Designs, developed at finer resolution based on the needs of particular species and ecological processes. It is important to recognize that even areas outside of Natural Landscape Blocks and Essential Connectivity Areas support important ecological values that should not be "written off" as lacking conservation value. Furthermore, because the Essential Habitat Connectivity Map was created at the statewide scale, based on available statewide data layers, and ignored Natural Landscape Blocks smaller than 2,000 acres, it has errors of omission that should be addressed at regional and local scales".*

The inclusion of Essential Connectivity Areas where detailed regional scale analyses are available is inconsistent with the methods and recommendations of the California Essential Connectivity Project. Figure 3-4 of the Baseline Biology Report should be revised by removing the Essential Connectivity Areas from the map where finer resolution linkages, such as the California Desert Connectivity Project, are available. The Soda Mountain Solar proposed project area should not be designated as a connectivity corridor in the Baseline Biology Report. The species-specific analysis conducted by the California Desert Connectivity Project did not identify any linkages within the Soda Mountain Solar area.

2) **Appendix B - PRELIMINARY DRAFT March 2012, DRECP Species Statistical Model: Desert Bighorn Sheep.** The Preliminary Draft statistical model for desert bighorn sheep should be revised to include additional data. The model was constructed using 32 presence data points, none of which are located within the Soda Mountains. There is a population of bighorn sheep that was surveyed in the south Soda Mountains by California Department of Fish and Game (CDFG 2012). These data should be incorporated into the model to assist in model refinement. There are seven locations where bighorn sheep were identified in the CDFG surveys. In addition, the model should be refined through ground-truthing. Low-lying areas and areas next

to highways, such as those in the southern portion of the Soda Mountain Solar Project area, should not be included in the model because they do not meet known conditions for suitable habitat, as confirmed by bighorn sheep survey work performed for the Soda Mountain Solar Project. Further documentation of methods should also be provided. The method should state which specific data sources listed in Appendix C were used in the final model, and the resolution of the model.

3) **Appendix B – PRELIMINARY DRAFT March 2012, DRECP Species Model: Desert Tortoise.** The Preliminary Draft species model for desert tortoise identifies suitable habitat throughout the entire valley between the Soda Mountains. This identification of suitable habitat is inconsistent with the method used for the species model (e.g., OHV areas and areas of disturbance were to be removed from suitable habitat areas) and it is inconsistent with field studies of habitat suitability. The OHV area to the south and east of the Project area is identified as suitable habitat for desert tortoise. Similarly, the I-15 highway and corridor, which are highly disturbed, are identified as suitable habitat. The enclosed study provides an evaluation of habitat suitability for desert tortoise within the Project area. The habitat is not likely to sustain a population of desert tortoise due to the limited area between the mountains, high level of human disturbance (I-15 highway and OHV area), low elevation, abundance of rocks and cobbles, and sparse vegetation cover with low vegetative diversity. The model should be updated to reflect a lower quality of habitat within the Project area.

4) The DRECP should be revised to include the Soda Mountain Study Area as a solar development area in draft integrated alternatives 2, 3, and 5. Alternative 2, "Geographically Balanced/Transmission Aligned Alternative," state that development should be aligned with the existing and planned transmission network. The C is located in a BLM utility corridor that currently includes two transmission lines and a distribution line.

Alternative 3, "West Mojave and Tribal Sensitivity Emphasis," is designed to emphasize development in the West Mojave and to exclude projects in areas considered by multiple tribes to have high sensitivity. The Soda Mountain Study Area is located in the West Mojave area and no tribal conflicts have been identified after initial consultation by BLM.

Alternative 5, "Increase Geographic and Technology Flexibility," seems to be the alternative with the highest allowed resource conflicts and the greatest flexibility. The Soda Mountain Study Area has limited resource conflicts and is consistent with Alternative 5.

Conclusion

Based on the enclosed "Analysis of Habitat Suitability and Connectivity in the Soda Mountain Area, San Bernardino County, California", we recommend revising the *DRECP Baseline Biology Report* as it applies to the Soda Mountain Solar Project site as follows:

- Remove the connectivity corridor designation from Figure 3-4 at the Soda Mountain project area;

- Remove the suitable habitat designation in the Soda Mountain project area from the DRECP Statistical Model for Desert Bighorn Sheep; and
- Remove the suitable habitat designation in the Soda Mountain Solar Project area from the DRECP Species Model for Desert Tortoise.

A process should also be designed for updating the Baseline Biology Report to incorporate detailed species-specific survey data as it becomes available. The *Baseline Biology Report* relies heavily on the use of models to develop information. Models are representations of reality based upon assumptions. Models are limited in their ability to characterize real world conditions and should be updated by field data like those generated for the Soda Mountain Solar Project. The enclosed analysis is essentially a case study demonstrating this point.

The Soda Mountain Study Area has been shown to be an area with limited resource conflicts. It should therefore be included in the DRECP as a solar development area in draft integrated alternatives 2, 3, and 5.

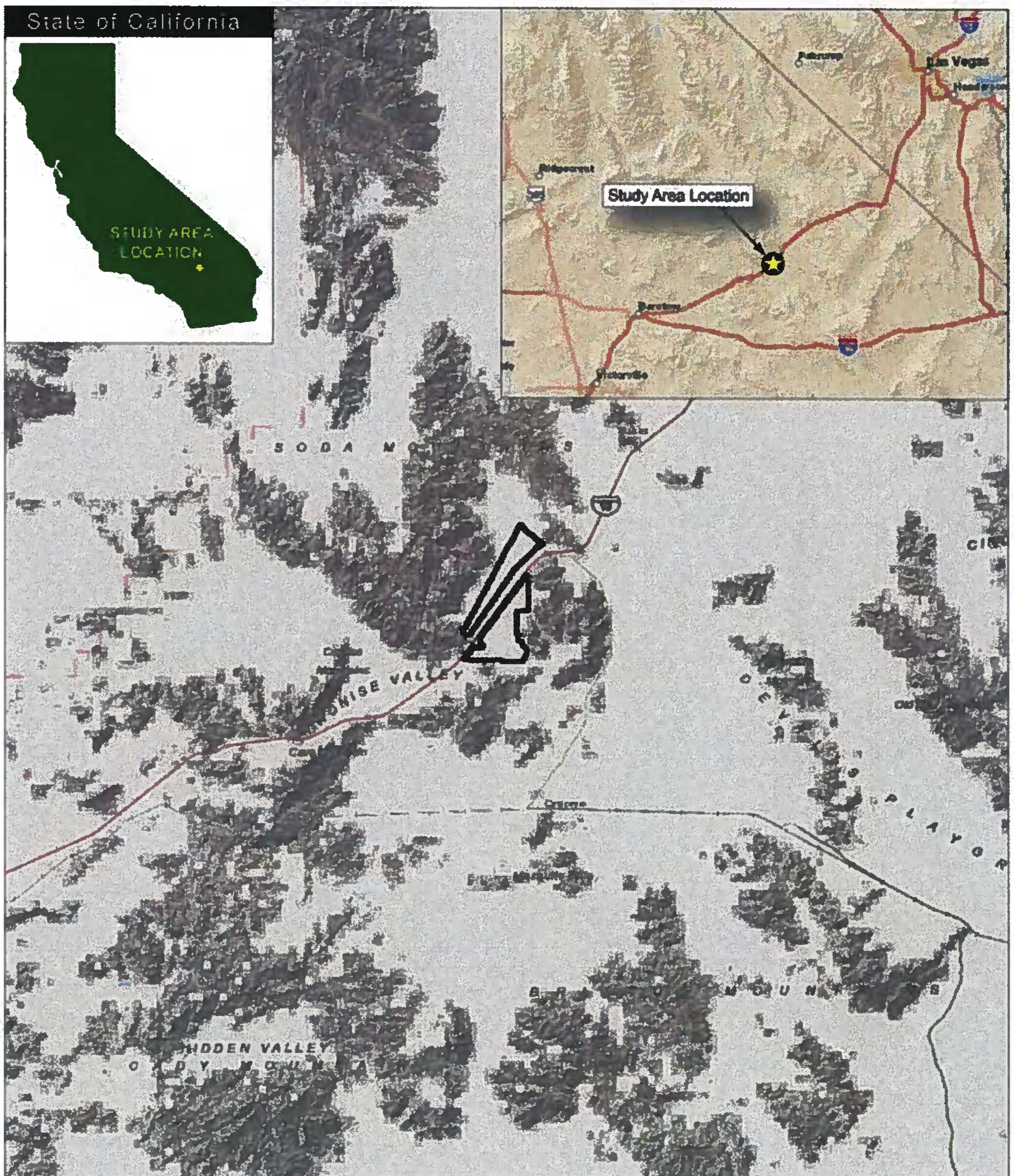
Please review the enclosed study upon which we base our recommendations. We believe it will help to improve the accuracy of the DRECP particularly as it applies to the Soda Mountain Solar Project site. We appreciate the opportunity to review and provide comments.

Sincerely,

Adriane E. Wodey
Manager
Soda Mountain Solar, LLC

Enclosure: "Analysis of Habitat Suitability and Connectivity in the Soda Mountain Area, San Bernardino County, California"

Figure 1



SOURCE: ESRI 2012 and Panorama Environmental, Inc. 2012

Scale: 1:400,000

LEGEND

Study Area

0 5 10 Miles

PANORAMA ENVIRONMENTAL, INC.

Analysis of Habitat Suitability and Connectivity in the Soda Mountain Area, San Bernardino County, California

Susanne Heim and Laurie Hietter

July 2012

PANORAMA ENVIRONMENTAL, INC.

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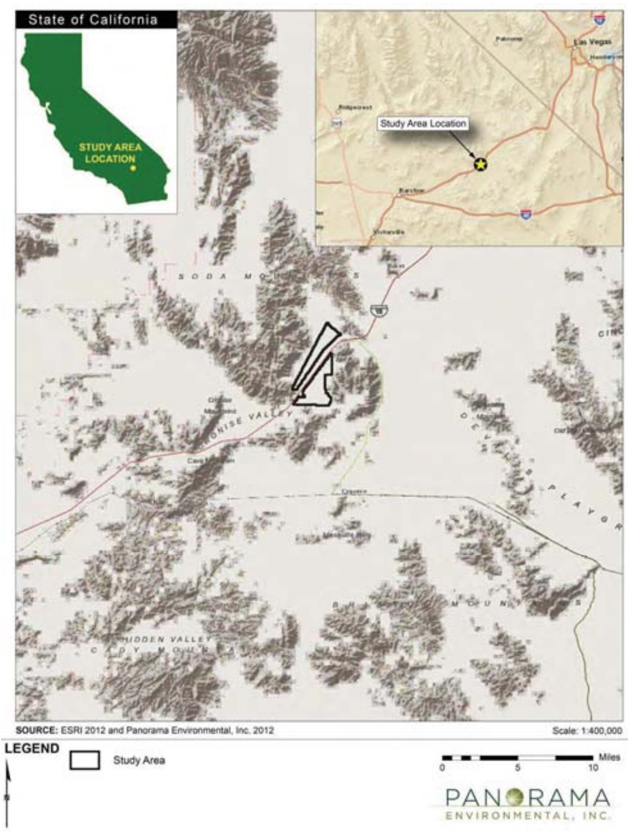
EXECUTIVE SUMMARY

This study was commissioned by Soda Mountain Solar, LLC to assess habitat suitability and connectivity for desert tortoise (*Gopherus agassizii*) and desert bighorn sheep (*Ovis canadensis nelsoni*) in the valley between the north and south Soda Mountains, San Bernardino County, California, which is referred to as the Soda Mountain Study Area. This study provides an analysis of the accuracy of habitat suitability and connectivity model predictions for an approximately 7,000 acre area within the Mojave Desert. Habitat suitability and connectivity models are being used by regulatory agencies to define areas for habitat conservation and development. The accuracy and limitations of model predictions are important considerations for decision-makers when relying on habitat suitability and connectivity models for land use decisions.



Five studies of desert tortoise and bighorn sheep habitat and connectivity were reviewed. The results of these studies were compared with the results of field surveys performed in the Soda Mountain Study area, which is in the valley located between the north and south Soda Mountains. The comparison provides insight into the accuracy of models to correctly predict habitat and species occurrence. The comparison revealed that habitat suitability models have inherent weaknesses and should not substitute for field studies, particularly where detailed field survey data are available.

STUDIES REVIEWED

Habitat and Connectivity Models

Several studies have been conducted that used models to identify suitable habitat for desert tortoise and bighorn sheep, and to identify potential wildlife connectivity corridors. Studies reviewed in this paper include:

1. *Modeling Habitat of the Desert Tortoise (Gopherus agassizii) in the Mojave and Colorado Deserts, California, Nevada, Utah, and Arizona* (Nussear et al. 2009)

2. "Making Molehills Out of Mountains: Landscape Genetics of the Mojave Desert Tortoise" (Hagerty et al. 2010)
3. *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (Spencer et al. 2010)
4. *A Linkage Network for the California Deserts* (Penrod et al. 2012)
5. *Draft Desert Renewable Energy Conservation Plan (DRECP) Baseline Biology Report* (California Energy Commission [CEC] 2012)

Field Studies

Field studies were performed in the Soda Mountain Study Area between 2009 and 2012. Field studies that were compared with the habitat model predictions include:

- Desert tortoise survey, 100% coverage (2009)
- Bighorn sheep surveys, aerial and ground-based (2011 and 2012)
- Special-status plant surveys (2009)
- Avian point count surveys (2009)
- Water resource investigation (2009)
- Geology studies (2010)

DESERT TORTOISE HABITAT

Desert tortoise habitat suitability models predict moderately suitable habitat (0.6 to 0.8 predicted probability) for desert tortoise within the Study Area (Nussear et al 2009) and the area is defined as suitable habitat (CEC 2012). The model results differ from the field survey results, which identified no tortoise, burrows, or sign within the study area during 100% coverage surveys conducted on 10-meter transects throughout the entire Study Area. No desert tortoise or sign were identified in any of the studies conducted in the study area (biology, geology, and cultural resources). The field surveys also indicate that conditions are not likely to support populations of desert tortoise because:

- The elevation of the area (less than 1,600 feet) is low for desert tortoise
- Vegetation is sparse with low diversity
- Soils are very rocky
- Habitat is fragmented by Interstate-15 (I-15)
- Disturbance from off-highway vehicle use and construction of two transmission lines, a distribution line, a fiber optic cable, and two fuel pipelines)

These conditions, combined with the field survey results for desert tortoise, indicate that few, if any, desert tortoise would be expected in the Study Area.

DESERT TORTOISE CONNECTIVITY

The Study Area is not identified within a modeled desert tortoise connectivity corridor (CEC 2012), and the Baker sink, located east of the Study Area, is identified as a barrier to tortoise movement (Hagerty et al 2010). The modeled lack of desert tortoise connectivity within the area is consistent with the presence of 1) mountains surrounding the Study Area, 2) the Baker sink to the east of the Study Area, and 3) highway I-15 bisecting the Study Area. These landscape features individually and cumulatively inhibit tortoise movement through the Study Area.

BIGHORN SHEEP HABITAT

The model of suitable habitat for bighorn sheep identified suitable habitat within the southern portion of the Study Area (CEC 2012). The model results differ from field survey and habitat assessment results, which indicate the area is not suitable habitat for bighorn sheep. The flat and open terrain, absence of a water source, and presence of I-15 all indicate that if bighorn sheep were to use the habitat, the use would be temporary and they would not be expected to stay in the valley for long. The adjacent south Soda Mountains are considered suitable habitat and the herds have been identified as using the east slope of the mountains, which is closer to the water source at Zzyzx Spring,

BIGHORN SHEEP CONNECTIVITY

The model of bighorn sheep connectivity does not identify linkage areas within the Study Area (Penrod et al. 2012). This conclusion is consistent with the field results, which identified a population of bighorn sheep in the south Soda Mountains, but no bighorn sheep to the north. Prior to I-15, the area may have been used for connectivity between the north and south Soda Mountains; however, the presence of I-15 reduces the potential for connectivity in the area. Individual bighorn sheep may cross through the Study Area and attempt to cross I-15, but populations of bighorn sheep would not be expected to use the area as a connectivity corridor.

CONCLUSION

Models of habitat suitability and connectivity have limitations that can result in inaccurate predictions of species habitat and connectivity. The primary limitations of these models include:

1) Errors in the model input that would cause errors in the model predictions,
2) Human disturbance, which has fragmented the habitat or reduced the value of habitat for species, is not considered, and
3) Model errors due to application to a small area.

These limitations should be considered when using the models to make conservation or land use decisions. Where field data are available, the data should be incorporated into the decision-making process.

ABSTRACT

Species habitat and connectivity models are frequently used to support land management decisions. While modeling provides an important tool for decision makers, there are limitations of habitat suitability and connectivity models that land use managers and decision makers should be aware of. Models of desert tortoise (*Gopherus agassizii*) and bighorn sheep (*Ovis canadensis nelsoni*) habitat suitability and connectivity are evaluated in this case study. The model predictions are compared to field study results of desert tortoise and bighorn sheep presence and use within an approximately 2,800-hectare (7,000-acre) area of the Mojave Desert along the Interstate-15 corridor between the North and South Soda Mountains. The comparison of model predictions to field conditions is used to evaluate the strength of each model. This analysis identifies limitations that are common to habitat and species distribution models. Model results can be inaccurate and should only be used in the absence of, rather than as a substitute for, field survey results.

PEER REVIEW

We would like to thank the following experts for their contributions and review of this paper:

Richard Tracy, Ph.D.
University of Nevada, Reno

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1 INTRODUCTION

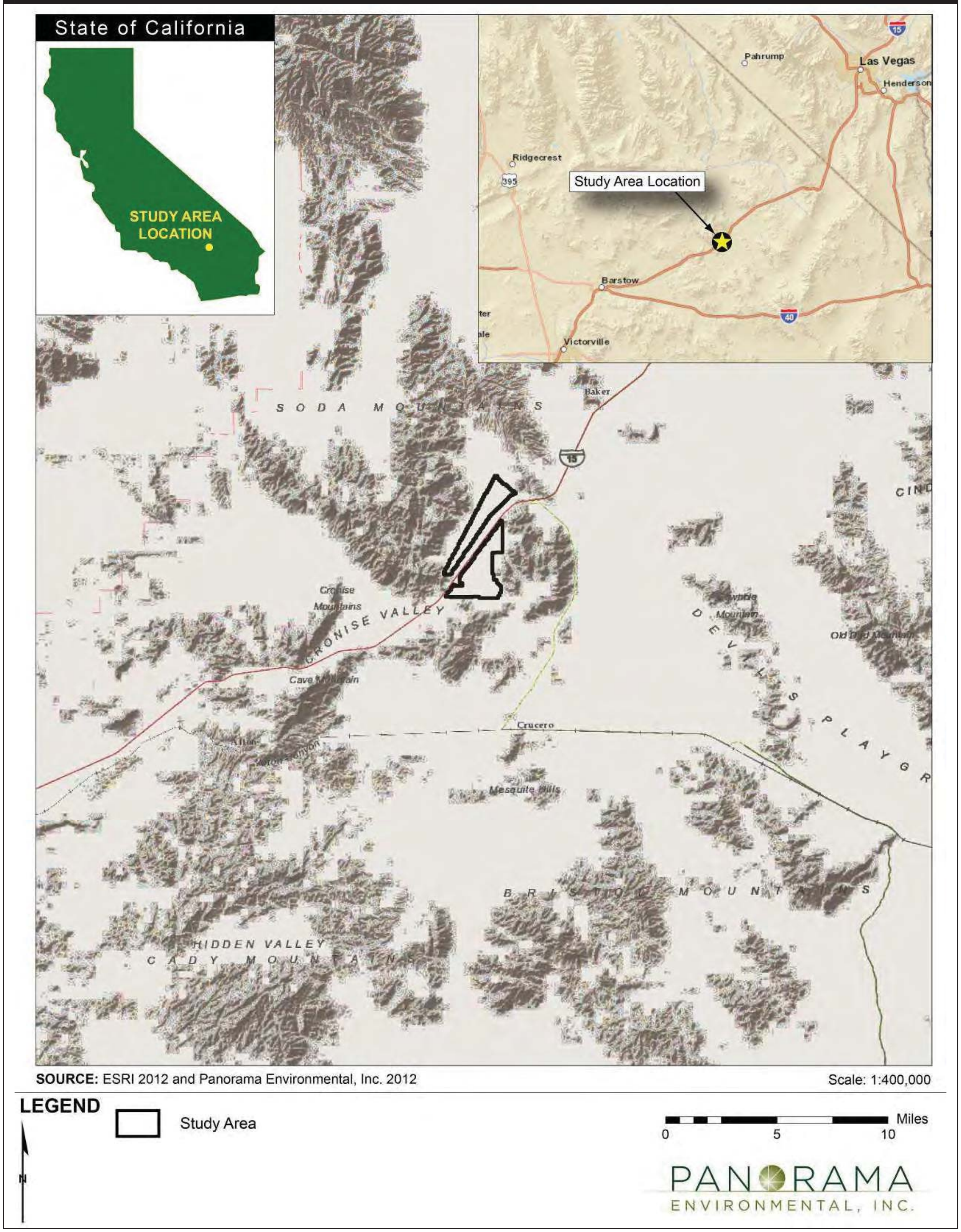
Recent studies of habitat suitability and linkage corridors in the Mojave Desert have used habitat modeling to predict suitability of species habitat and connectivity over multi-state, state, and regional geographic areas. The model results are being used to guide land use decisions related to development and conservation. This case study presents an analysis of the effectiveness of habitat models developed to predict habitat suitability at large geographic scales for use in estimating suitable habitat at a much smaller scale (4,000 hectares or less).

The primary method for determining habitat suitability and connectivity over large geographic areas is through the use of stochastic models. A stochastic modeling approach applies computer processing power to large data sets to estimate a probability distribution. This probability distribution is used to determine habitat suitability for areas within the model. Models of habitat for the desert tortoise (*Gopherus agassizii)*, bighorn sheep (*Ovis canadensis nelsoni*), and wildlife connectivity are reviewed in this case study. Field studies are reviewed to analyze model accuracy for a 2,800-hectare (7,000 acre) area.

1.1 STUDY AREA

The focus area for this study is an approximately 2,800-hectare (7,000-acre) area located along the Interstate 15 (I-15) corridor between the north and south Soda Mountains, referred to here as the Soda Mountain Study Area, San Bernardino, California (Figure 1).The Soda Mountain Study Area lies south and west of the town of Baker, California within an intermontane desert valley composed of alluvial fan deposits and surrounded by the Soda Mountains. Most of the Soda Mountains are northwest of the Study Area and reach an elevation of approximately 1,100 meters. Lower mountains to the south and east of the Study Area form a discontinuous border reaching elevations of approximately 730 meters. Elevations in the Study Area range from approximately 470 meters in the north to 380 meters in the southeast. The Baker sink, a relic of one of the drainages feeding the Pleistocene Lake Manley in Death Valley, is located east of the Study Area and the south Soda Mountains. Average annual precipitation in the Study Area is approximately 4.1 inches (Prism Climate Group 2012).

Figure 1: Soda Mountain Study Area



2 BACKGROUND

2.1 HABITAT

2.1.1 Desert Tortoise

Mojave desert tortoises are known to occur from below sea level to an elevation of 2,225 meters (U.S. Fish and Wildlife Service [USFWS] 2011). Desert tortoises occur most commonly on gently sloping terrain (bajadas) consisting of sand- and gravel-rich soils where there is sparse cover of low-growing shrubs. Soils normally must be friable enough for digging burrows, yet firm enough so that burrows do not collapse (USFWS 2011). Tortoises generally cannot construct burrows in rocky soils or shallow bedrock (USFWS 2011). Typical habitat for the desert tortoise in the Mojave Desert has been characterized as creosote bush scrub between 600 meters and 1,800 meters, where precipitation ranges from 2 to 8 inches, and vegetation diversity and production is high (Nussear et al. 2009). Desert tortoises are known to occupy large home ranges.

Threats to desert tortoise populations identified in the Desert Tortoise Recovery Plan (USFWS 1994) are numerous and include:

6. Human contact and mortality, including vehicle collisions and collection of tortoises
7. Predation, primarily from raven, but also from feral dogs, coyotes, mountain lions and kit fox
8. Disease
9. Habitat destruction, degradation, and fragmentation resulting from grazing, land development, off-highway vehicles (OHVs), wildfire, and road construction

2.1.2 Bighorn Sheep

Bighorn sheep populations are found in steep, rocky, mountainous areas, commonly on slopes of 10 percent or greater (URS 2009a). Sixty-nine discrete population groups have been documented within the Mojave Desert (Bare et al. 2009). Steep, rugged terrain is the primary habitat used by bighorn sheep, particularly females and lambs, because it affords good protection from predators. Alluvial fans and washes on gently sloping terrains are also used to obtain forage and water. The availability of water is an important habitat element for bighorn sheep, particularly between May and October, when reproduction occurs (California Energy Commission [CEC] 2012).

2.1.3 Habitat Connectivity

The pace of development in the western deserts has increased with the institution of renewable portfolio standards in California, Nevada, and Arizona and federal goals for renewable energy development (CDFG et al. 2010). Wildlife corridors are increasingly impacted by land development and linear transportation features, such as highways, which can bisect and abate migration routes resulting in segregation and isolation of wildlife populations. Engineered features, such as under-highway culverts, can provide the means to cross roads safely and allow populations to connect across highways. Habitat connectivity studies are needed to identify and preserve key habitat corridors that support movement of wildlife populations and gene flow. Maintaining key corridors for wildlife dispersal is also important under changing climate conditions where wildlife populations may need to move to new habitat areas as optimal habitat is sought.

2.2 MODELS OF HABITAT SUITABILITY AND CONNECTIVITY

Several recent studies of habitat suitability and wildlife connectivity involving the California deserts have been performed to support protection of rare or threatened species, identify key areas of the desert that include the highest value habitat, and identify areas that are used by species for movement and migration. The studies analyzed in this paper are:

1. *Modeling Habitat of the Desert Tortoise (Gopherus agassizii) in the Mojave and Colorado Deserts, California, Nevada, Utah, and Arizona* (Nussear et al. 2009)
2. "Making Molehills Out of Mountains: Landscape Genetics of the Mojave Desert Tortoise" (Hagerty et al. 2010)
3. *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (Spencer et al. 2010)
4. *A Linkage Network for the California Deserts* (Penrod et al. 2012)
5. *Draft Desert Renewable Energy Conservation Plan (DRECP) Baseline Biology Report* (CEC 2012)

The regional, state, and multi-state geographic scale of these studies required the use of stochastic models with large data sets to determine the potential for suitable habitat and wildlife connectivity. The purpose, methods, limitations, and results of each study are summarized.

2.2.1 Model Methods and Limitations

1. *Modeling Habitat of the Desert Tortoise (Gopherus agassizii) in the Mojave and Colorado Deserts, California, Nevada, Utah, and Arizona* (Nussear et al. 2009)

Purpose

The US Geological Survey (USGS) modeled desert tortoise habitat to evaluate the effectiveness of management efforts for the desert tortoise outlined in the 1994 USFWS Recovery Plan (Nussear et al. 2009). The USGS model was intended for use in conservation program design and to evaluate changes in species distributions. The USGS model was developed to support preparation of the Revised Recovery Plan published by USFWS in 2011.

Approach and Methods

Desert tortoise habitat suitability was modeled using the Maximum Entropy Model (Maxent) (Phillips et al. 2006). The area modeled included the desert region of California, Nevada, Utah and Arizona. Maxent allows for modeling of species distribution using presence-only data. The Maxent model is appropriate for species where there is limited absence data, or where absence is difficult to verify due to the habits of the species. The model uses presence data to define an expected probability of suitable habitat on the basis of past observances of presence of the species.

Habitat suitability was modeled using 16 data layers in a geographic information system (GIS). The model used continuous independent variables. The GIS data were obtained from various data sources and included:

1. Mean dry season precipitation for 30-year normal period
2. Dry season precipitation, spatially distributed coefficient of variation (CV)
3. Mean wet season precipitation for 30-year normal period
4. Wet season precipitation, spatially distributed coefficient of variation (CV)
5. Elevation
10. Slope
11. Northness (aspect)
12. Eastness (aspect)
13. Average surface roughness
14. Percent smooth
15. Percent rough
16. Average soil bulk density
17. Depth to bedrock
18. Average percentage of rocks >254 millimeters B-axis diameter
19. Perennial plant cover
20. Annual plant cover

A total of 15,311 presence data points representing desert tortoise presence or occurrence were aggregated from desert tortoise surveys performed from 1970 through 2008. Presence was determined from evidence of live tortoises, carcasses, burrows, scat, or other sign. Absence data were randomly selected from model grid cells where there were no desert tortoise observances during desert tortoise surveys.

The model was developed at a resolution of 1 square kilometer (km^2) (i.e., grid size). The model was tested using area under the curve (AUC)[1] to estimate model sensitivity and specificity. Due

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[1] Area under the curve (AUC) is used to test model performance by plotting sensitivity (true positive rate) on the y-axis, and specificity (false positive rate) on the x-axis (Nussear et al. 2009). The AUC characterizes the performance of the model, and is summarized by a single number ranging from 0 to 1, where 1 indicates perfect model performance, 0.5 indicates the equivalent of a random guess, and less than 0.5 indicates performance worse than random (Nussear et al. 2009). In general, AUC scores between 0.7 and 0.8 are considered fair to good, and scores above 0.9 are considered excellent (Swets 1988).

to the lack of absence data, AUC tested the model performance against pseudo-absence data rather than true absence data (Phillips et al. 2006). Pearson's correlation coefficient was calculated as the correlation between the predicted model values and 1) test presence data points where tortoises were observed, and 2) the random background points where no tortoises were observed. Pearson's correlation coefficient was used as a more direct measure of how the model predictions vary from observations. Several variables were not predictive of suitable habitat including eastness, northness, wet season precipitation CV, dry season precipitation CV, percent roughness, and slope. These variables were eliminated from the final model.

The model output of habitat potential was binned into categories ranging from 0 to 1 at increments of 0.1, where 0 represents areas where the habitat potential approaches 0 percent habitable, and 1 represents areas where the habitat potential approaches 100 percent habitable. The categories were mapped for each 1-km^2 grid cell to represent percent potential habitat.

Limitations
Limitations of the method used to predict habitat suitability include:

1. Presence-only-based modeling is commonly subject to sampling bias and spatial autocorrelation (Phillips et al. 2006).
2. Errors may be present in the data used for the model. No data were collected for this study, so it is dependent on the accuracy of the various data sources (Nussear et al. 2009).
3. There may be variables that are important to tortoise habitat suitability that were not accounted for in the model (e.g., soil type, vegetation diversity) (Phillips et al. 2006).
4. The model output was not corrected to remove areas where desert tortoises have historically not been found to inhabit, areas that are not inhabited due to biotic interactions, or areas of anthropogenic effects such as habitat destruction, fragmentation, or natural disturbances (Nussear et al. 2009; Phillips et al. 2006).
5. The approach predicts suitability statistically rather than mechanistically as in Kearney and Porter (2009). Species presence and absence in sampling data are assumed to reveal habitat suitability, but may actually reflect stochastic population dispersion (Tracy 2012).

2. "Making Molehills Out of Mountains: Landscape Genetics of the Mojave Desert Tortoise" (Hagerty et al. 2010)

Purpose
Hagerty et al. (2010) evaluated the impacts of habitat fragmentation on desert tortoise genetic diversity. Genetic testing was used to identify landscape features that could facilitate or impede tortoise movement. This study identifies barriers and limitations to tortoise movement to provide a better understanding of how landscape features can impact desert tortoise genetic diversity. Maintaining genetic diversity is particularly important for rare species whose

continued existence can be threatened by disease. An improved understanding of landscape genetics is needed to identify methods to maintain or tortoise genetic diversity and support species recovery efforts.

Approach and Methods

Habitat connectivity for desert tortoise was modeled and used in combination with genetic data to determine the factors that influence tortoise gene flow. DNA was extracted from blood collected from 744 desert tortoises in 25 different geographic areas within California, Nevada, Utah and Arizona deserts. Genetic distance measures or the genetic divergence within the desert tortoise population were calculated for the 25 sampling locations. Euclidian distances (geographic distances) were also calculated as a straight-line measure between the center points of the 25 areas using GIS tools.

A habitat suitability model was developed using Maxent. The model was similar to the model developed by Nussear et al. (2009) and used the same tortoise presence data and 12 of the 16 data layers in its construction. Three separate models were constructed using the outputs of a habitat suitability model:

1. Least-cost path
2. Isolation by resistance
3. Isolation by barriers

Two models of landscape friction, least-cost path and isolation by resistance, were developed using a resistance surface[2] where cells of lower potential habitat would reduce the ability for desert tortoise to traverse the landscape. The least-cost path was identified between the center point of each of the 25 geographic areas, where the shortest distance with least cost for movement (determined by the resistance surface) was defined. In the isolation by resistance model, a resistance distance was estimated similar to least-cost pathway, except the resistance distance decreases proportionally with the increase in available pathways between locations. The resistance distance also assumes a random walk between locations where the habitat suitability in each adjacent cell is used to determine friction resisting movement. The third model, an isolation by barriers model, was created by identifying barriers to movement across the landscape. Areas with a predicted probability of potential habitat less than 0.125 were coded as “no data” and defined as complete barriers to movement. Within the isolation by barriers model, tortoise were allowed to move across all non-barrier cells without friction.

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[2] A resistance surface is developed in GIS using a habitat suitability model. The probability of suitable habitat is subtracted from 1 for each cell in the model. The resulting values are the resistance surface representing the “cost” of movement from one habitat cell in the model to an adjacent cell.

Limitations
Due to the long generational time (25 years) of desert tortoise, the results of the study based upon genetic information cannot reflect current habitat connectivity or barriers. It normally would take several tortoise generations before the effects of roads or other human made barriers would be reflected in population genetics (Hagerty et al. 2010).

Landscape friction was not significantly correlated with genetic diversity. The variables used in the landscape friction model describe desert tortoise habitat in the present and may not capture the appropriate temporal scale to explain the genetic population structure. The resistance surfaces developed from the habitat suitability model may only reflect habitat use and not the resistance to dispersal (Hagerty et al. 2010).

3. *California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California* (Spencer et al. 2010)

Purpose
The *California Essential Habitat Connectivity Project* was prepared for the California Department of Transportation (Caltrans) and California Department of Fish and Game (CDFG). The purpose of the study was to increase efficiency and decrease costs of transportation and land use planning, and to reduce wildlife-vehicle collisions. The report was prepared to define a functional and connected network of wildlands. High quality habitat areas and the connections between these areas were defined to maintain wildlife diversity, which is threatened by human development and climate change.

Approach and Methods
The California Essential Habitat Connectivity Project identified habitat connectivity corridors throughout California. The process for defining wildlife connectivity corridors involved:

1. Delineating Natural Landscape Blocks (areas with high habitat value)
2. Identifying which Natural Landscape Blocks to connect
3. Defining Essential Connectivity Areas

Natural Landscape Blocks were delineated based on a rating of the naturalness of the landscape, called an ecological condition index. Within the Mojave Desert, landscape blocks were limited to those areas larger than 4,000 hectares (10,000 acres) with an ecological condition index greater than 95 and with high biological value. High biological value was defined as areas with GAP Conservation Status 1 or 2 and areas with 1) critical habitat for threatened or endangered species, 2) wetlands or vernal pools, 3) CDFG mapped hotspots using a rarity-weighted richness index, or 4) BLM Areas of Critical Environmental Concern. Lines were drawn between the center point of a landscape block and the center point of the closest and second closest landscape blocks.

Least-cost corridor models were used to define essential connectivity areas between Natural Landscape Blocks along each of the lines. The least-cost corridor model used a resistance surface based on the ecological condition index (0 percent to 100 percent) representing the resistance of the landscape to ecological flow. Using the resistance layer, the cost to move from one landscape block to another was calculated by subtracting the resistance value from 1. The cost of movement from one landscape block to the adjacent block was summed along the entire distance. The area with the 5 percent lowest cost of movement from one landscape block to the next was designated as an Essential Connectivity Area.

Limitations

1. Natural Landscape Blocks excluded Department of Defense lands and multiple-use lands administered by BLM because they did not meet the criteria of being highly conserved and being mapped as having high biological value. Department of Defense lands include areas of high ecological value (Spencer et al. 2010).
2. Spencer et al. modeled connectivity areas on the basis of naturalness of habitat. Species-specific modeling was not used to identify connectivity corridors. The lack of species-specific modeling produces a result that is of limited use to understanding how wildlife would use these corridors as different species have different habitat requirements that affect their movement across the landscape (Tracy 2012). To overcome this limitation, , "Essential Connectivity Areas are placeholder polygons that can inform land-planning efforts, but that should eventually be replaced by more detailed Linkage Designs, developed at finer resolution based on the needs of particular species and ecological processes."(Spencer et al. 2010) Results of finer-scale regional analyses for connectivity should replace the Essential Connectivity Map for those areas in the statewide report.

4. *A Linkage Network for the California Deserts* (Penrod et al. 2012)

Purpose

The California Desert Connectivity Project was designed to identify areas of ecological connectivity that are essential for conserving biological diversity within the Mojave and Sonoran Deserts in California. Key areas of connectivity are identified to maintain genetic diversity. The key areas of connectivity collectively form a linkage design within the California Deserts. The linkage designs were developed to inform land management, land acquisition, restoration, and stewardship decisions in ecological connectivity zones.

Approach and Methods

Habitat connectivity was evaluated for 44 species that were identified as important to the Mojave and Sonoran Desert habitat. Landscape blocks were defined in this study as those areas that are highly protected, including wildlife management areas and Department of Defense lands. The landscape blocks were connected through 22 separate corridors where connectivity analysis was conducted.

Habitat suitability was modeled for the focal species using expert-assigned scores from 0 to 10 for habitat suitability for each factor (see list below). Weights were assigned for the factor to express relative influence of each factor, such that the weights for all factors summed to 100 percent. Each 30-square-meter (m^2) grid cell was scored across the modeled area. Data used in the expert-based models included scores for:

- Land cover
- Elevation
- Aspect (i.e., facing direction)
- Slope
- Distance to streams
- Road density

Corridor modeling was performed to evaluate habitat connectivity for both desert tortoise and bighorn sheep. A corridor was then defined using a least-cost corridor model and selecting those areas with the 5 percent least cost of movement[3].

Additional wildlife corridors were also defined using least-cost corridor modeling. Land facets[4] were used to define pathways for wildlife to move from high elevation to low elevation under changing climatic conditions. Field surveys were conducted to:

1. Ground-truth data (i.e., field data were collected to verify model data)
2. Document habitat barriers (e.g., roads, railroads, and canals)
3. Document potential crossing structures along those barriers
4. Identify locations where restoration and management would enhance connectivity

The land facet corridors and species-specific corridors were combined and used as a preliminary linkage design. The preliminary linkage design was refined through field investigation and removal of redundant connections between landscape blocks. The resulting linkage design incorporated the analyses of fieldwork, species-based modeling, and land facet corridors.

Limitations

1. The expert-based models used habitat scores and weights selected by experts. This approach is subject to expert bias and differences in expert opinions (Rochet and Rice 2004; Greenland and O'Rourke 2001).
2. An expert-assigned score of 0 for any criterion would reduce the habitat score to 0 regardless of the relative weight of that criterion (Penrod et al. 2012).

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[3] Least-cost corridor modeling involves calculating the "cost" of movement from one cell in a model to the next cell using a resistance surface. The cost of movement is aggregated over the distance between the start and end point.

[4] Land facets are enduring landscape features or units with uniform topographic and soil attributes that are "areas of biological activity" (Penrod et al. 2012).

5. *Draft DRECP Baseline Biology Report* (CEC 2012)

Purpose

The Desert Renewable Energy Conservation Plan (DRECP) is being developed to protect and conserve California's deserts while allowing for renewable energy development in areas that have a low level of environmental conflict. The DRECP Baseline Biology Report provides a summary of environmental and biological conditions within the DRECP Plan Area[5] (Figure 2). The biological baseline data will serve as the basis for conservation planning under the DRECP.

Approach and Methods

Desert Tortoise. The *Draft Desert Renewable Energy Conservation Plan Baseline Biology Report* (CEC 2012) identifies suitable desert tortoise habitat through a GIS model that is built on the results of the model developed by Nussear et al. (2009). The DRECP Plan Area covers areas within southern California deserts. The output of the desert tortoise habitat model developed by Nussear et al. (2009), was used as a base layer in GIS. Potential suitable habitat was first defined in this model as those areas with a predicted probability of desert tortoise habitat suitability of 0.6 or greater. Suitable habitat was then limited to all areas with a probability of suitable habitat between 0.6 and 1.0 that could be reached from any 1.0-rated area, with no intervening unconnected habitat areas.

The model was adjusted for anthropogenic disturbance using the National Landcover Dataset impervious surfaces layer and The Nature Conservancy's (TNC) "highly converted areas" data (TNC 2009; TNC 2010). Areas with high anthropogenic disturbance were converted to zero habitat potential. Additionally, military bases and OHV areas were manually removed from the suitable habitat model layer because they would not be considered for development or reserve areas.

Bighorn Sheep. Suitable habitat for bighorn sheep was modeled at a 1-km^2 resolution using the Maxent model (Phillips et al. 2006). Twenty-four occurrence data points obtained over the DRECP Plan Area were used to calibrate the model and eight occurrence points were used to test the model. Suitable habitat was defined as areas with a modeled probability of 0.236[6] or higher. The threshold for suitable habitat was determined using Jenks Natural Breaks[7] to classify the model output. AUC was used to determine model predictive capability.

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[5] The DRECP Plan Area covers the Mojave and Colorado Desert Ecoregions within California.

[6] The threshold for suitable habitat is much lower for bighorn sheep than for desert tortoise. This could be attributed to the small number of data points used to construct the model for bighorn sheep.

[7] The Jenks method maximizes between class variability and minimizes within class variability to find the strongest natural breakpoint in the histogram of cell probability values. This approach is used to separate

Habitat Connectivity. Habitat connectivity in the DRECP baseline biology study was defined using the GIS outputs of previous habitat connectivity mapping projects, which included:

- *A Linkage Network for the California Deserts* (Penrod et al. 2012)
- *The California Essential Connectivity Project* (Spencer et al. 2010)
- *The South-Coast Missing Linkages Project* (Beier et al. 2006; South Coast Wildlands 2008)
- *A Linkage Design for the Joshua Tree-Twentynine Palms Connectivity* (Penrod et al. 2008)

Limitations

Desert Tortoise. Because the methods used in this study relied on the results of a previous desert tortoise habitat suitability model (Nussear et al. 2009), several limitations of that study would apply:

1. Presence-only-based modeling is commonly subject to sampling bias and spatial autocorrelation (Phillips et al. 2006).
2. Errors may be present in the data used for the model. No data were collected for this study, so it is dependent on the accuracy of other studies (Nussear et al. 2009).
3. There may be variables that are important to tortoise habitat suitability that were not accounted for in the model (e.g., soil type, vegetation diversity, desert pavement) (Phillips et al. 2006).
4. An Off-Highway Vehicle (OHV) area located directly south and east of the Soda Mountain Study Area was included as suitable habitat, which conflicts with the methods described for this study (i.e., OHV areas are not to be included in the model).

Bighorn Sheep. The following aspects are limitations of the model for bighorn sheep:

1. The model may be subject to sample bias and spatial autocorrelation (Phillips et al. 2006).
2. Model accuracy depends on the accuracy of the data used to construct the model (Phillips et al. 2006).
3. The home range of Desert bighorn sheep can be very large, and observations of presence is generally temporally fleeting, and may not adequately represent habitat that can, or will be used by sheep (Tracy 2012).
4. The model was not corrected for human disturbance or other factors that may preclude species presence (Phillips et al. 2006).

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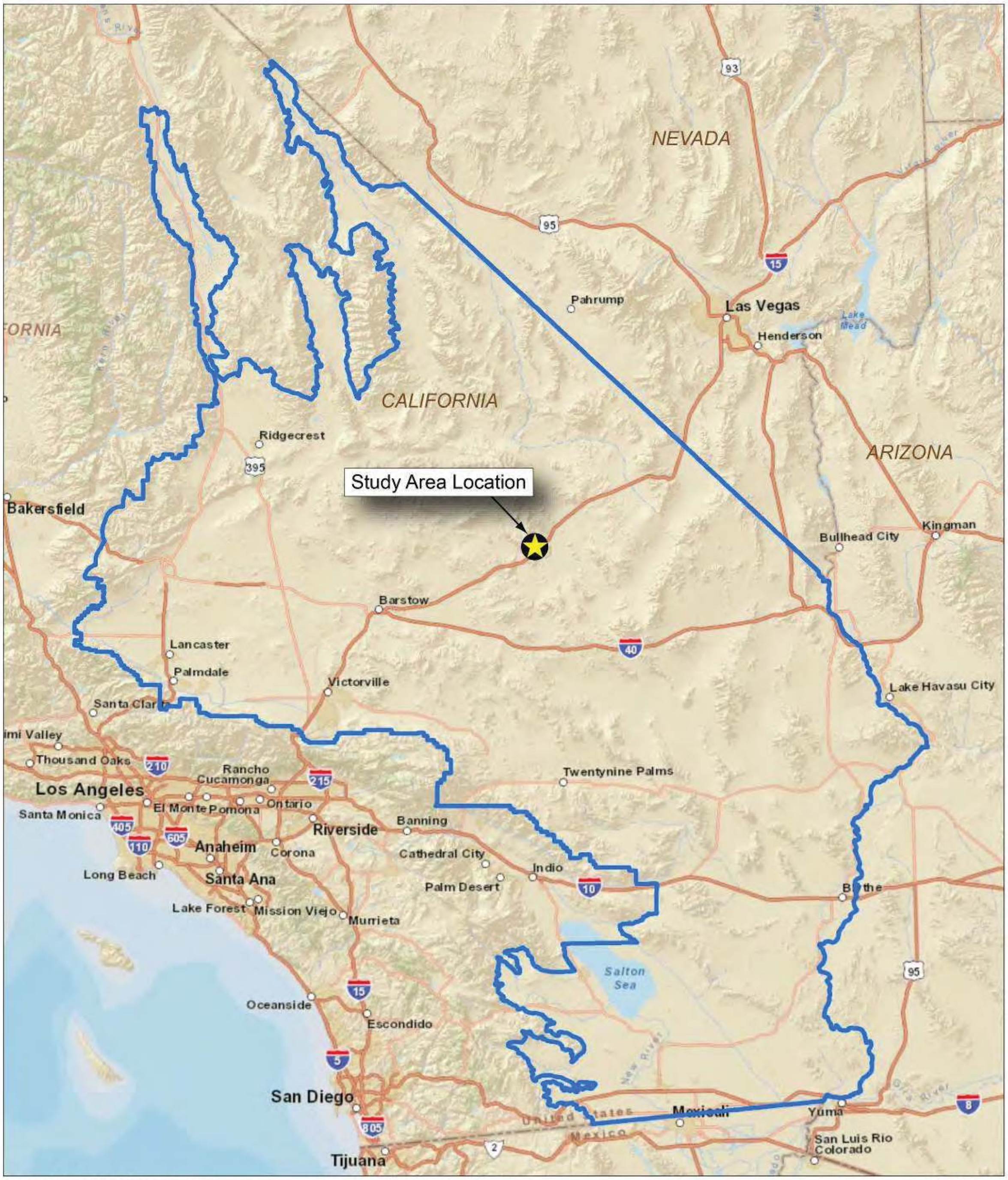
areas of higher probability of occurrence (habitat) from areas of lower probability of occurrence (non-habitat) (CEC 2012).

Figure 2: DRECP Plan Area



SOURCE: ESRI 2012 and Panorama Environmental, Inc. 2012

Scale: 1:3,000,000

LEGEND

Study Area Location

DRECP Boundary

0 25 50 75 100 Miles

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Connectivity. The *DRECP Baseline Biology Report* used the base maps from *A Linkage Network for the California Deserts* (Penrod et. al 2012) and *The California Essential Connectivity Project* (Spencer et al. 2010); therefore, the limitations of those efforts, presented previously, apply to the *DRECP Baseline Biology Report* as well. This study did not critically evaluate or prioritize the mapping efforts where there was overlap. The base map for the *California Essential Connectivity Project* includes essential connectivity areas in the Mojave Desert (Figure 3.8, Spencer et al. 2010). Where the linkage map from *A Linkage Network for the California Deserts* (Penrod et al. 2012) overlaps with the base map for the *California Essential Connectivity Project* (Spencer et al. 2010), the finer scale linkage map developed by Penrod et al. (2012) should replace the connectivity base mapping layer developed by Spencer et al. (2010).In the *DRECP Baseline Biology Report*, there was no replacement of mapped connectivity areas with the finer-scale species-specific regional linkage maps where the finer-scale maps overlapped with the generalized connectivity map. The *DRECP Baseline Biology Report* violates and is inconsistent with the method proposed by Spencer et al. 2010, which included replacement of the general connectivity maps with the finer-scale regional maps developed using species specific analysis.

2.2.2 Modelled Results for Soda Mountain Study Area

The general results for habitat suitability and wildlife connectivity modeling are presented in Table 1. Specific results within the Soda Mountain Study Area are also provided in Table 1.

2.3 SODA MOUNTAIN STUDY AREA FIELD STUDIES

Field studies were conducted to evaluate habitat for desert tortoise and bighorn sheep within the Soda Mountain Study Area. These studies include:

- Surveys for desert tortoise
- Aerial and ground surveys for bighorn sheep
- Field surveys of vegetation and wildlife
- Water resources studies
- Geology studies

Table 1: Modelled Results for the Study Area

Study	Results/Output	Results for Soda Mountain Study Area
Desert Tortoise		
1 Nussear et al. 2009	The model output was used to produce a map of predicted habitat suitability for the Mojave, Colorado, and Sonoran Deserts. The model result was significant and the AUC test score was	Areas within the Soda Mountain Study Area have a predicted habitat potential between 0.6 and 0.8, indicating the presence of adequate, predicted suitable habitat for desert tortoise, and thus, a

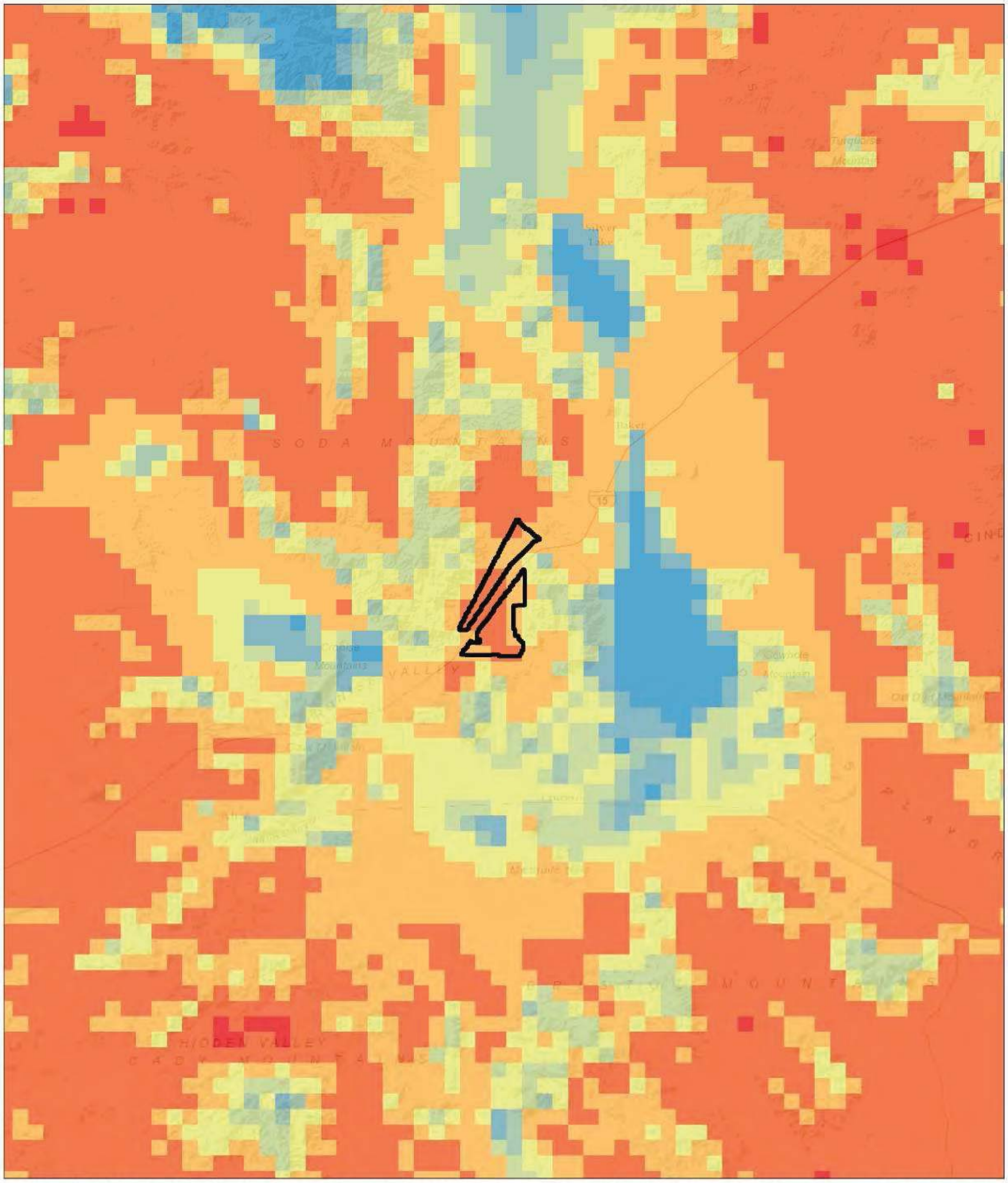
Table 1: Modelled Results for the Study Area

Study	Results/Output	Results for Soda Mountain Study Area
	0.93, indicating a good fit between model data and observations. The mean model score for cells where tortoise were observed was 0.84. Ninety-five percent of cells with documented tortoise presence had a model score of 0.70 or higher.	high likelihood of tortoise presence (Figure 3).
5 CEC 2012	The output of this study is a GIS layer depicting suitable habitat for desert tortoise.	The entire Soda Mountain Study Area is identified as suitable habitat for desert tortoise (Figure 4).
Bighorn Sheep		
5 CEC 2012	A map depicting suitable habitat was constructed using the model output. The model had an AUC value of 0.962 for the calibration data and 0.889 for the test data, demonstrating good predictive capability.	The Maxent model identified suitable habitat for bighorn sheep within the southern portion of the Soda Mountain Study Area. Suitable habitat was also identified within the Soda Mountains north and south of the Study Area (Figure 5).
Habitat Connectivity		
2 Hagerty et al. 2010	Geographic distance and dispersal barriers using the isolation by barriers model were identified as dominant factors and were significantly correlated with genetic structure. Landscape friction was not significantly correlated with gene flow. To construct the model and test hypotheses, GIS models of tortoise barriers, resistance, and least-cost corridors were developed. This study supports the conclusion that habitat within the Mojave population of the desert tortoise is well connected.	Barriers to tortoise movement were identified to the south, east and north of the Soda Mountain Study Area. These barriers included the Baker sink to the south and east, and the mountains to the north. No specific barriers to dispersal were identified within the Study Area (Figure 6).
3 Spencer et al. 2010	An Essential Connectivity Map was developed for California. The map includes 850 Natural Landscape Blocks. Areas that connected two or more	The Soda Mountain Study Area is located within an Essential Connectivity Area (Figure 7).

Table 1: Modelled Results for the Study Area

Study	Results/Output	Results for Soda Mountain Study Area
	Natural Landscape Blocks were identified as Essential Connectivity Areas. These maps should be replaced with the results of finer scale regional studies (Spencer et al. 2010).	
4 Penrod et al. 2012	This study resulted in maps showing linkage corridors for 44 focal species and for wildlife connectivity in a union of linkages. Linkages were defined for desert tortoise and bighorn sheep.	The Soda Mountain Study Area does not fall within a least-cost corridor delineated for desert tortoise (Figure 8) or bighorn sheep (Figure 9), or a least-cost union.
5 (CEC 2012)	The result of the DRECP effort is a map of habitat connectivity generated using layers from each of the connectivity projects (including Study 3 and 4).	The Soda Mountain Study Area is identified within the Essential Connectivity Area mapped by the California Essential Connectivity Project (Study 3). It is not identified as a connectivity area within any of the other habitat connectivity mapping efforts.

Figure 3: Desert Tortoise Habitat Suitability (Nussear et al. 2009)



SOURCE: ESRI 2012, USGS Western Ecological Research Center 2009, and Panorama Environmental, Inc. 2012

Scale: 1:400,000

LEGEND

Study Area

0 - 0.1	0.5 - 0.6
0.1 - 0.2	0.6 - 0.7
0.2 - 0.3	0.7 - 0.8
0.3 - 0.4	0.8 - 0.9
0.4 - 0.5	0.9 - 1

0 5 10 Miles

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Figure 4: Desert Tortoise Suitable Habitat (CEC 2012)

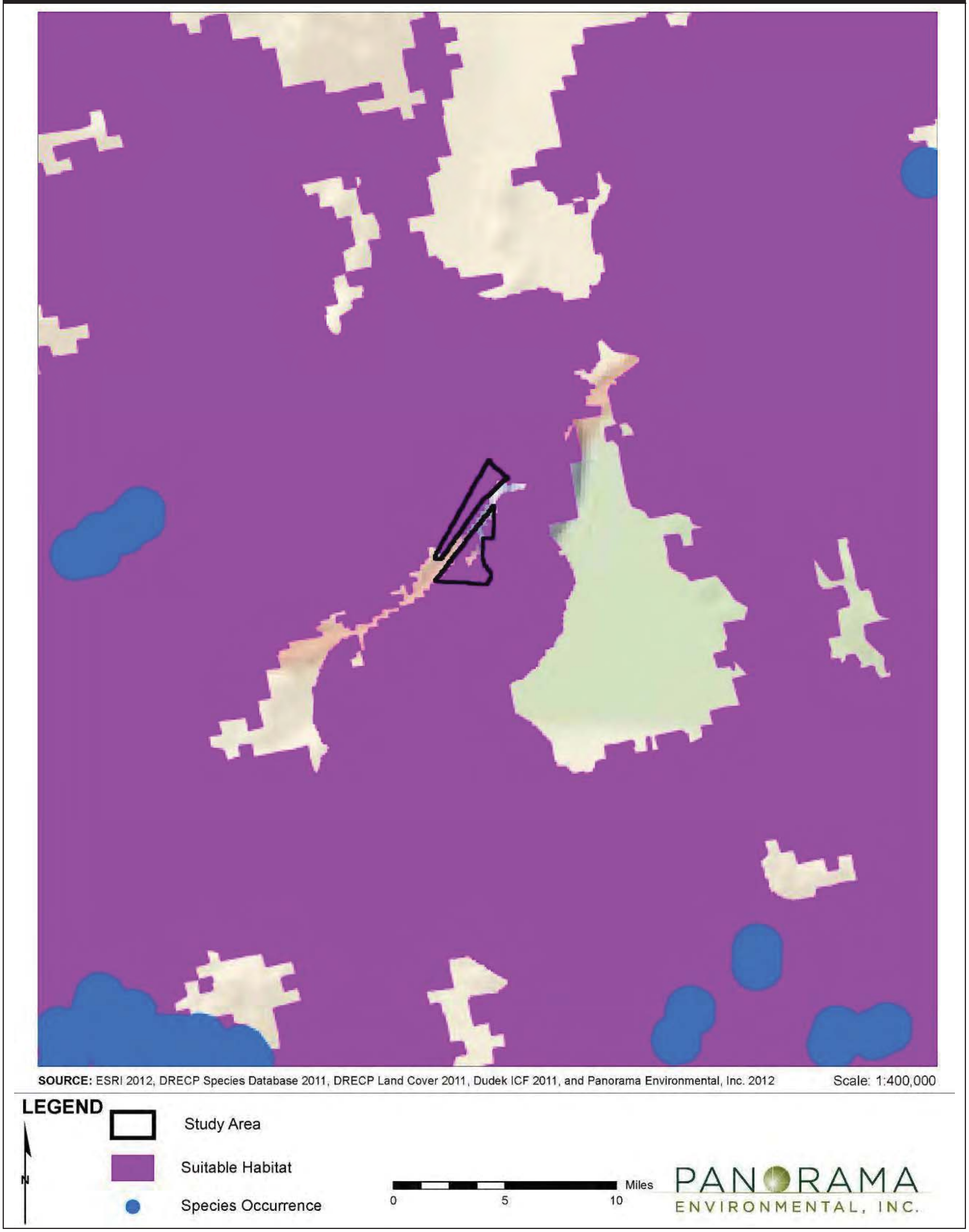


Figure 5: Bighorn Sheep Suitable Habitat (CEC 2012)

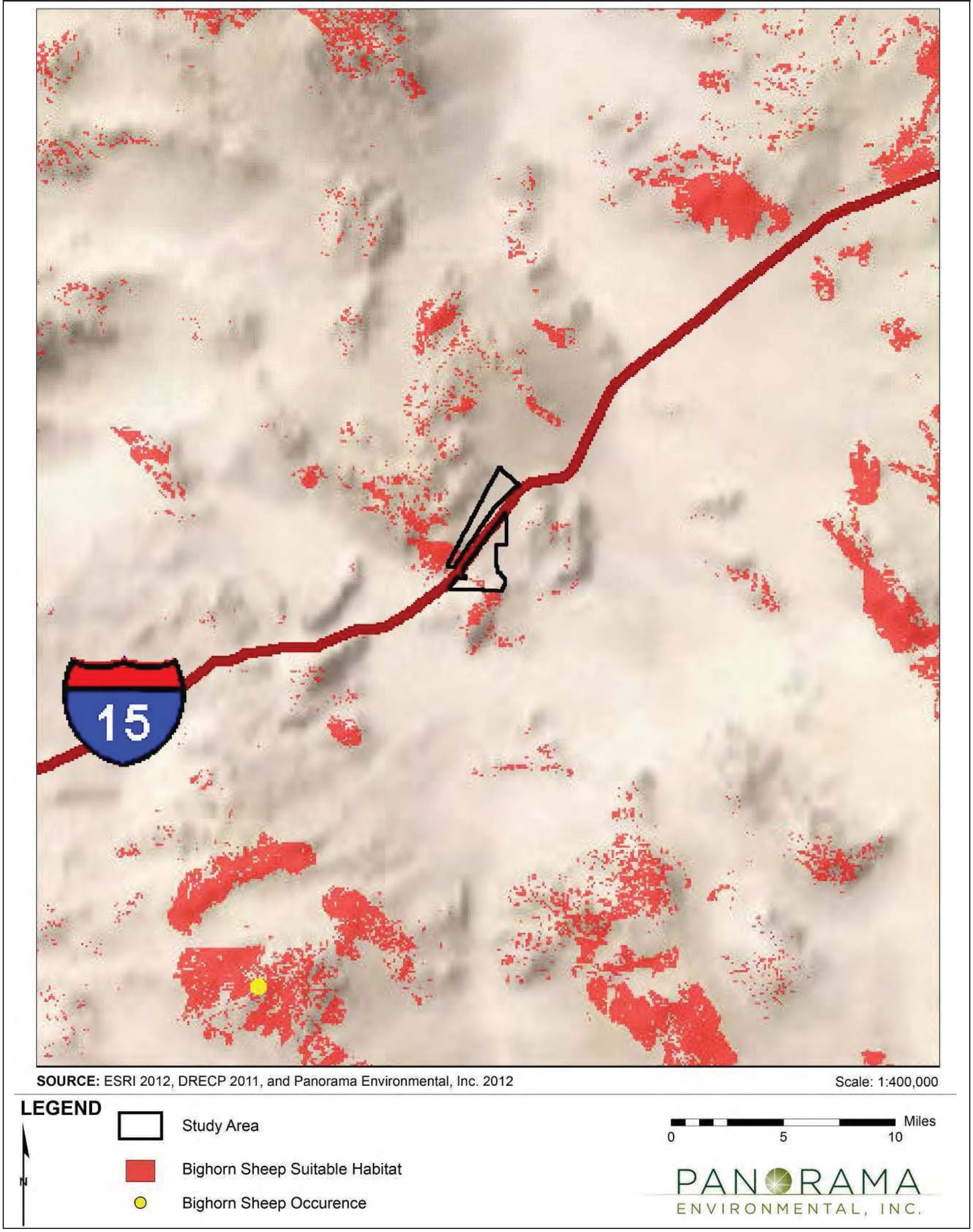
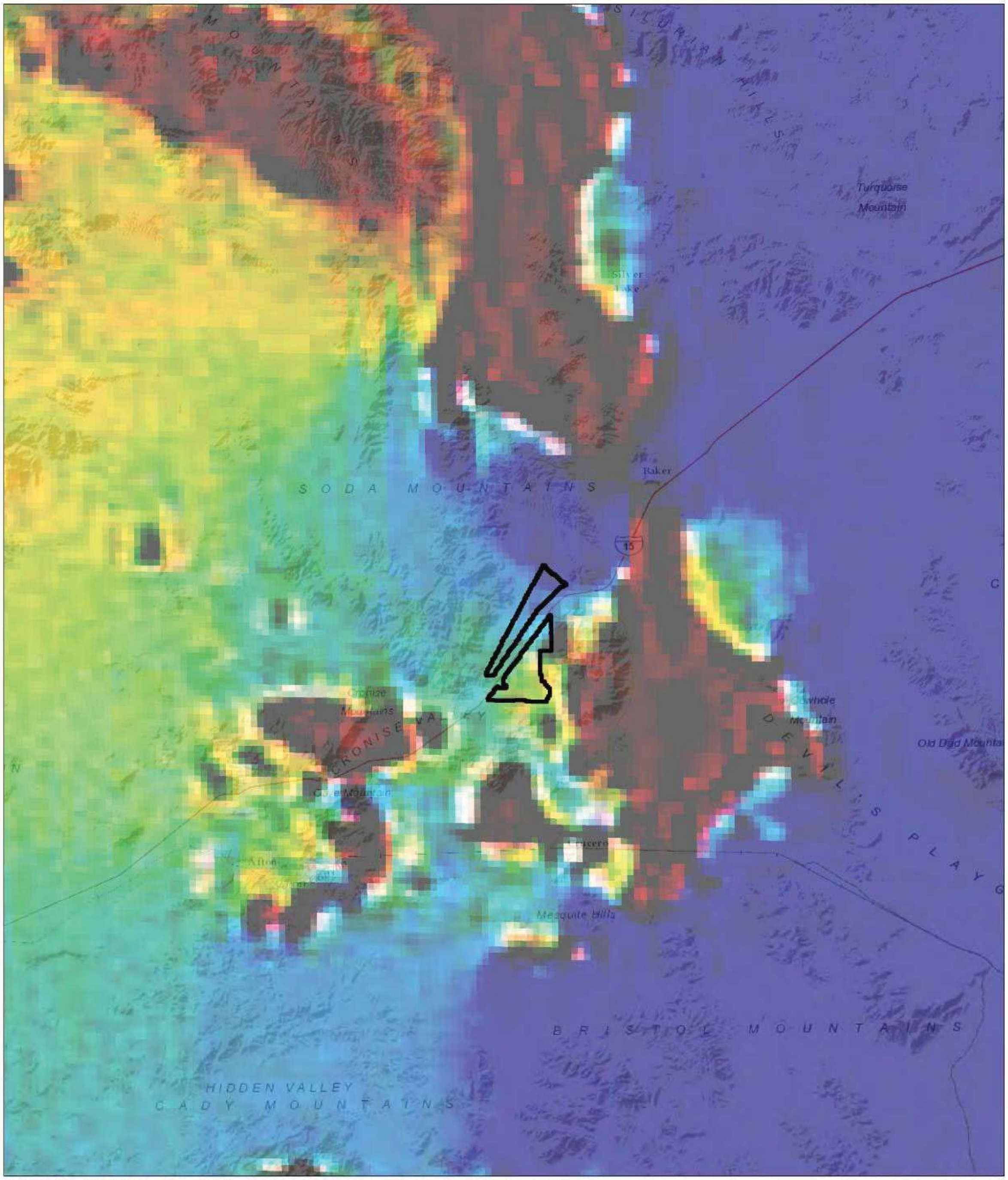


Figure 6: Barriers to Desert Tortoise Movement (Hagerty et al. 2010)



SOURCE: ESRI 2012, Hagerty et al 2010, and Panorama Environmental, Inc. 2012

Scale: 1:400,000

LEGEND

Study Area

Barrier

0 5 10 Miles

N

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Figure 7: Essential Connectivity Areas (Spencer et al. 2010)

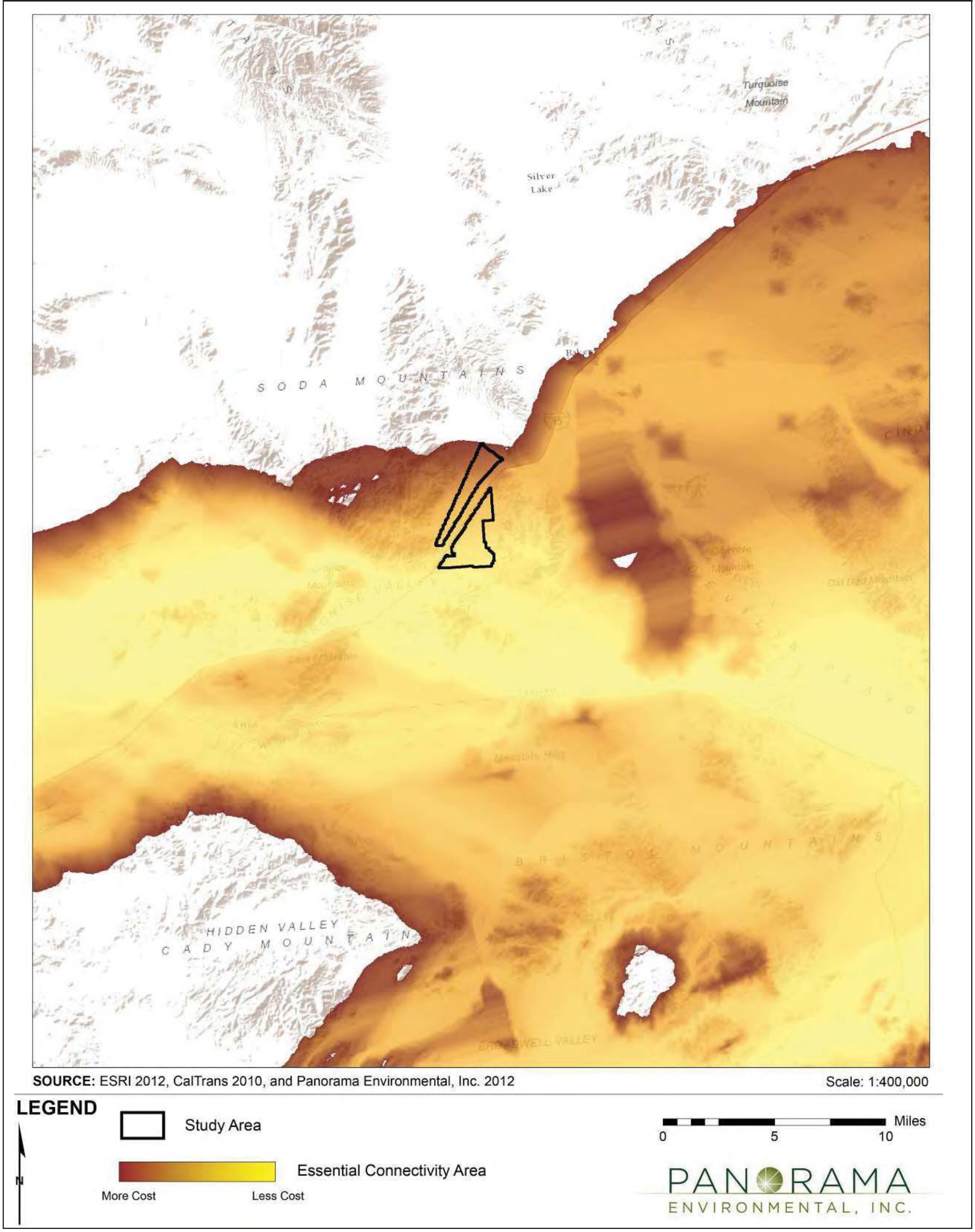
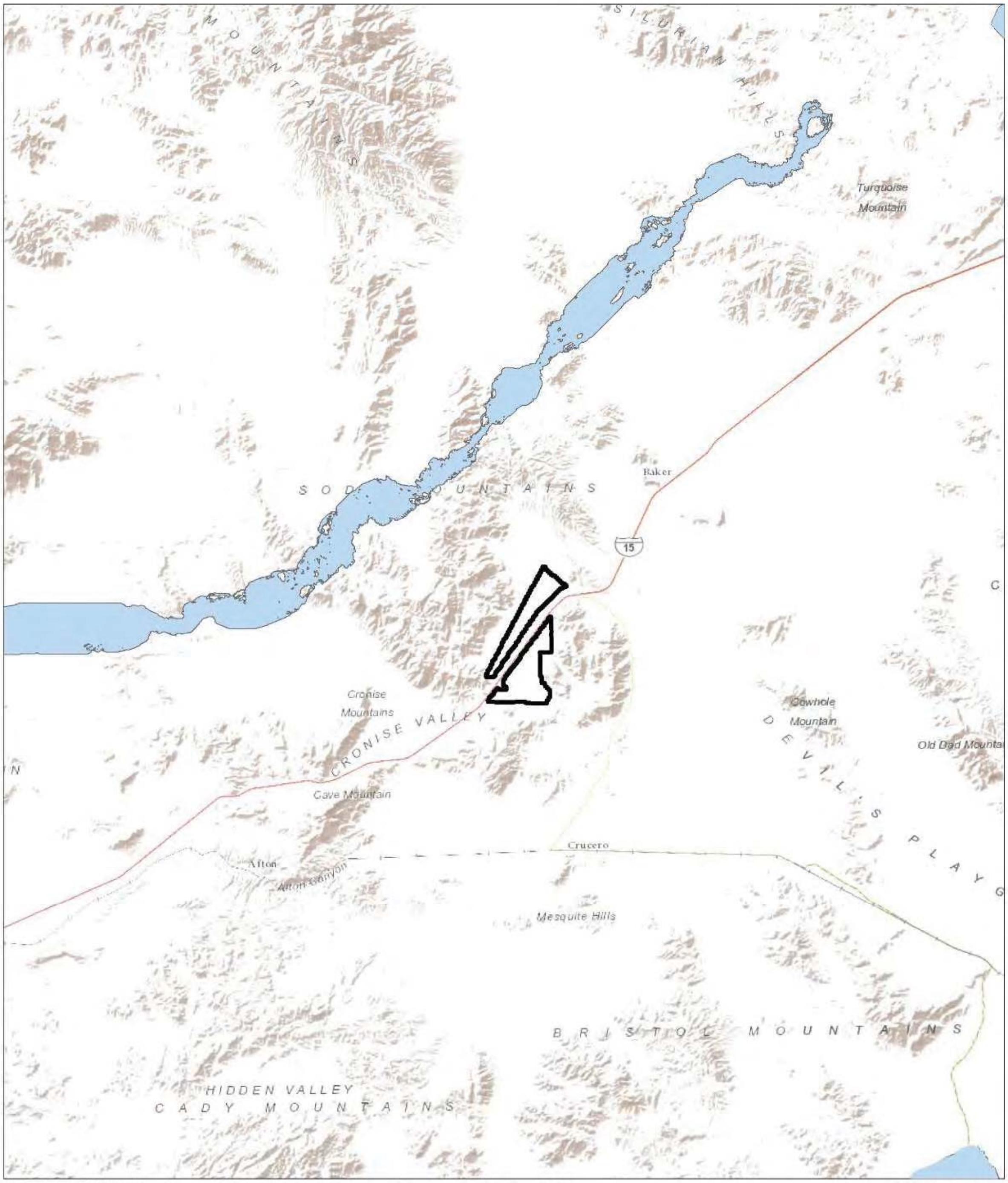


Figure 8: Desert Tortoise Linkages



SOURCE: ESRI 2012, Nussear et al 2009, and Panorama Environmental, Inc. 2012

Scale: 1:400,000

LEGEND

Study Area

Desert Tortoise Linkage

0 5 10 Miles

N

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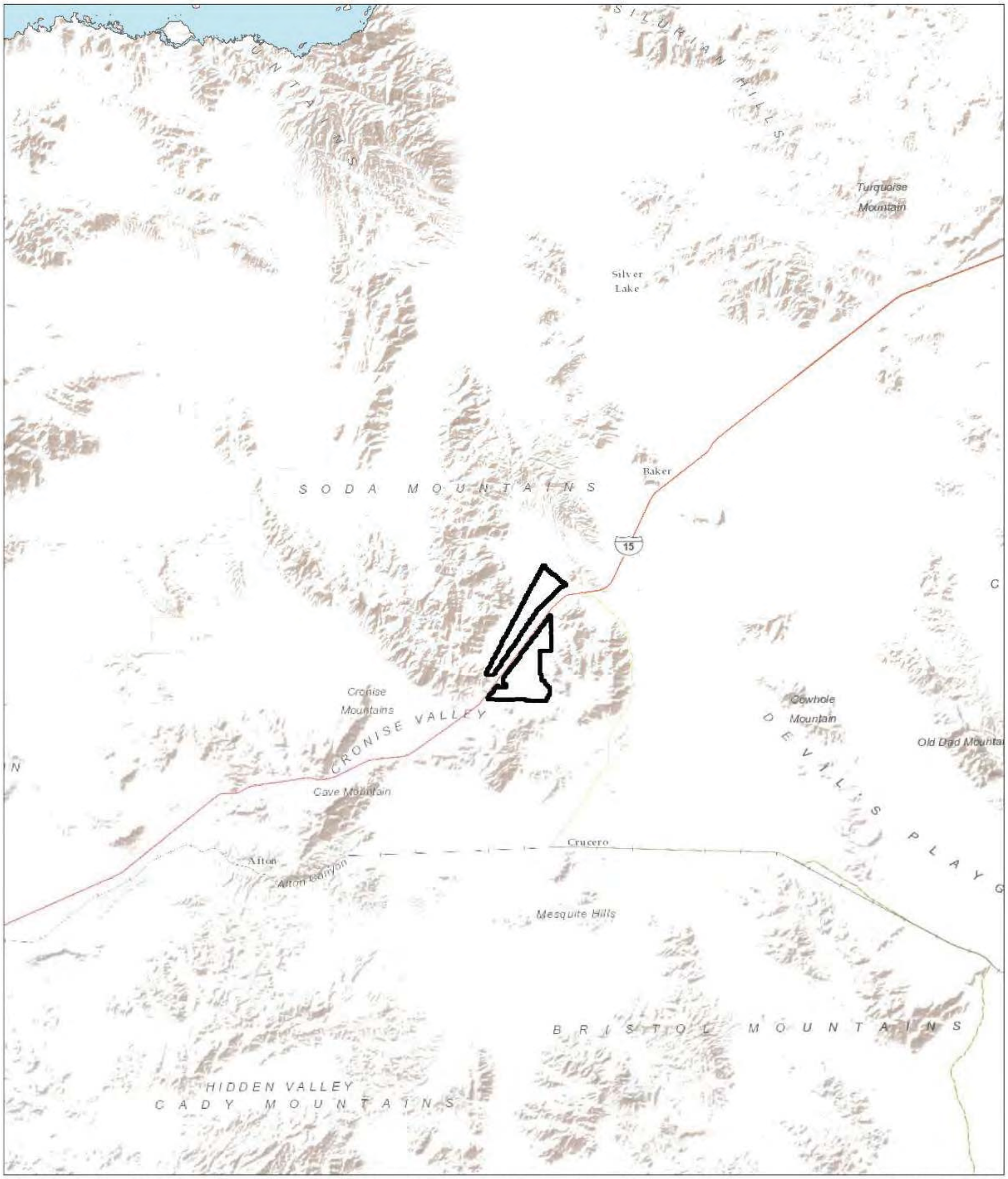
Figure 9: Bighorn Sheep Linkages



SOURCE: ESRI 2012, Mojave Desert Ecosystem Program 2012, and Panorama Environmental, Inc. 2012

Scale: 1:400,000

LEGEND

Study Area

Bighorn Sheep Linkage

0 5 10 Miles

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2.3.1 Methods

Desert Tortoise

Field surveys for desert tortoise were performed in 2001 and 2009 within the Soda Mountain Study Area and vicinity. The 2001 survey was performed in the Opah Ditch Mine area located in the foothills of the Soda Mountains north of I-15 and west of Los Angeles Department of Water and Power (LADWP) and Southern California Edison (SCE) transmission lines (Figure 10). The survey was performed on March 30 and April 4, 2001, in accordance with USFWS-recommended *Field Survey Protocol for Any Non Federal Action That May Occur Within the Range of the Desert Tortoise* (1992). Belt transects spaced approximately 10 meters (30 feet) apart were walked over approximately 80 percent of the site and the dirt-haul road that provides site access (AMEC 2001). A 30-meter-wide buffer zone survey was performed in accessible areas adjacent to the site. Desert tortoise sign were marked and mapped.

The 2009 survey was conducted for the Soda Mountain Study Area north and south of the I-15 corridor (Figure 10) between May 4 and May 29, 2009. Survey techniques followed both the 1992 USFWS protocol for desert tortoises (USFWS 1992), and the survey protocol described in *Preparing for Any Action that May Occur within the Range of the Mojave Desert Tortoise (Gopherus agassizii)* (USFWS 2009). The field survey consisted of 100 percent coverage belt transects spaced at 10 meters (33 feet) within the entire Study Area. In addition to 100 percent coverage of the study area, Zone of Influence (ZOI) transects[8] were also performed (URS 2009a). ZOI transect locations were located in areas containing potentially suitable tortoise habitat based on aerial image analysis, elevation, and field observations of potentially suitable habitat within the Study Area. ZOI transects were surveyed with transects spaced at 30, 90, 180, 370, and 730 meter intervals, where applicable (URS 2009a). Areas along the mountains where the topography was very steep were not included in the ZOI surveys.

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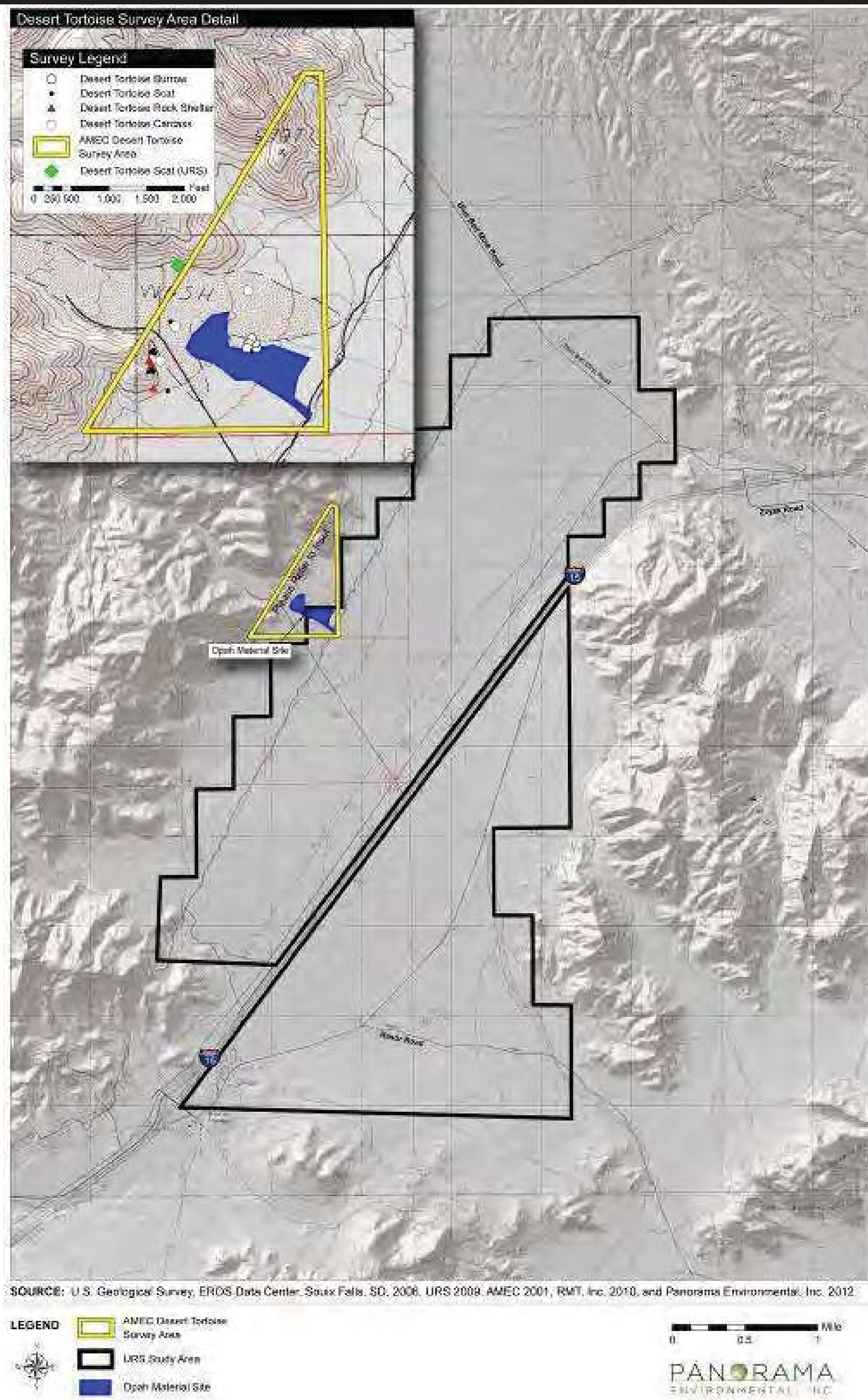
[8] The zone of influence is an area outside of the Study Area that may be affected by a land use action. Zone of influence transects were established outside of the Study Area running parallel to the Study Area boundary.

Figure 10: Desert Tortoise Survey Locations



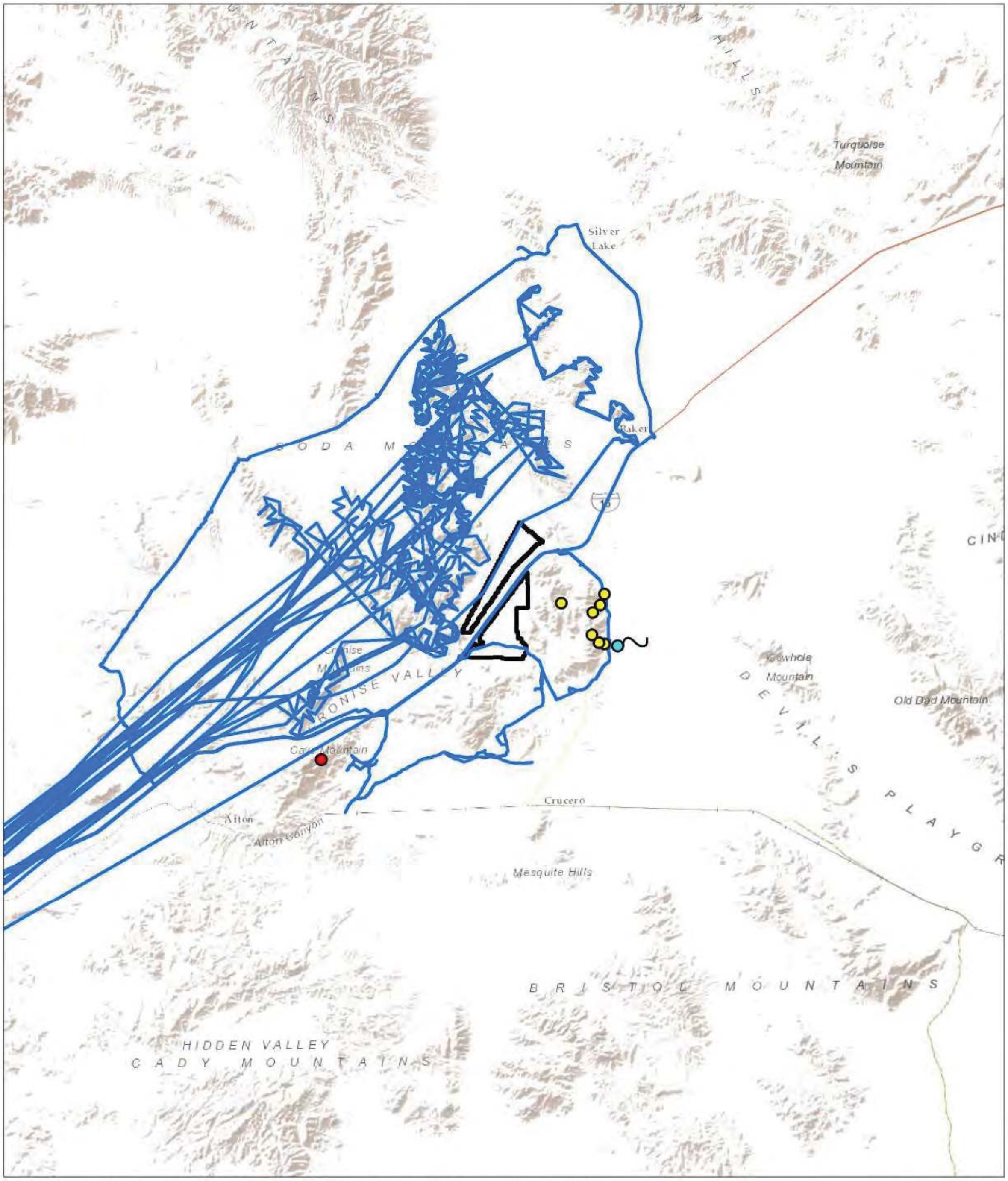
To validate the accuracy of the protocol surveys, biologists performed an additional intensive quality assurance/quality control (QA/QC) survey on 5 percent of the Study Area (USFWS 1992). This intensive survey effort was a 100 percent coverage using belt transects with spacing width reduced to 3 meters (10 feet) and was conducted in randomly chosen, representative habitats within the Study Area. QA/QC transects were conducted perpendicular to the initial transect survey direction to maximize tortoise detection. A comparison was then made between data recorded from transects during the 100 percent survey effort (10-meter belt transects) and data recorded during the intensive QA/QC survey effort (3-meter belt transects).

Bighorn Sheep
Surveys for bighorn sheep in the Soda Mountains were conducted in 2011 and 2012. Aerial surveys for bighorn sheep were conducted by BioResource Consultants on March 21 and 22, 2011 and May 9, 2011, and ground surveys between March 23 and 25, 2011 (RMT 2011c). The aerial surveys were six two-hour flights. Aerial surveys were conducted north of I-15 within the Soda Mountains. Each canyon was flown up and down. Contouring passes were made at different elevations to cover tall cliffs and long, steep slopes fully. Survey areas for bighorn sheep are identified on Figure 11. Ground surveys were conducted from observation points. During all aerial and ground-based survey work, biologists also scanned for any movement, sign, or habitat settings (e.g., water sources) that might accommodate or predict the presence of desert bighorn sheep. Potential water sources within the search area were identified in advance for surveying and evaluation. Data collected during the surveys included numbers of animals, age of animals and herd composition, general behavior, location, and habitat, where feasible (RMT 2011c).

CDFG conducted a ground survey on April 30 and May 1, 2012 in the south Soda Mountains near Zzyzx Spring. All sheep that could be located on the east side of the range in the vicinity of water were counted. Three groups of biologists explored areas not visible from the road area. One group climbed from the Zzyzx Field Station to the main ridge top above the road and followed the ridge north. Another group ascended a wash to the northwest of the main ridge and climbed into a separate section of the range. The third group searched further south of the field station along the main ridge. The location, number of sheep, class, and gender were logged at each sheep siting (Abella 2012).

Environmental Conditions
Field studies were conducted to document conditions for vegetation, wildlife, soils, water sources, and disturbance within the Soda Mountain Study Area. Biology field studies and a water resource investigation were conducted in 2009 and geology field studies were conducted in 2010 within the Soda Mountain Study Area.

Figure 11: Bighorn Sheep Survey Locations



Biology Studies

Field surveys of the Soda Mountain Study Area were performed in 2009 to assess general and dominant vegetation types, vegetation community sizes, habitat types, and wildlife and plant species present within communities (URS 2009b). Biologists documented wildlife observations for birds, mammals, amphibians, and reptiles within the Study Area during field surveys. The presence of a wildlife species was based on direct observation, wildlife sign (e.g., tracks, burrows, nests, and scat), or vocalization. Field data compiled for wildlife included the scientific name, common name, habitat, and evidence of sign when no direct observations were made. Field surveys conducted in 2009 include:

- Special status plants survey
- Desert tortoise survey (discussed above)
- Avian point count surveys
- Water resource investigation

Special Status Plants. Special status plant surveys were conducted between May 4 and May 30, 2009 in accordance with standardized guidelines issued by the USFWS, CDFG, and the California Native Plant Society (URS 2009c). Surveys were conducted in parallel belt transects spaced at approximately 10 meters throughout the entire Study Area.

Avian Point Count. Avian point count surveys were conducted in the spring and fall of 2009. Field survey methods were derived and adapted from *BLM Solar Facility Point Count Protocol* (2009) and *Managing and Monitoring Birds Using Point Counts* (Ralph et al. 1995). Point count locations were established within the Study Area using the following parameters:

- One (1) point count transect per square mile;
- Eight (8) point count locations per transect; and
- Point counts must be at least 250 meters apart

The point count locations were then further modified in the field based on placing the points in the most suitable areas for birds (e.g., washes, and high vegetation areas) (URS 2010). A total of 10 transects with 8 point count locations per transect (80 points total) were identified within the Study Area (URS 2010).

Spring surveys were conducted between April 23 and May 14, 2009, and fall surveys were conducted between September 30 and October 29, 2009 (URS 2010). Each point was surveyed for a 10-minute observation period and data were recorded on avian species observed within a 100-meter radius. Presence of avian species was determined using direct observation, vocalization, or avian sign (e.g., nests, pellets, whitewash, etc.) (URS 2010).

Water Resources Investigation. A water resources investigation was performed in May and June 2009. Water resources were delineated using U.S. Army Corps of Engineers and CDFG guidance for delineation of waters of the U.S. and waters of the State (URS 2009d). The ordinary high water mark was used to define the limits of waters within the Study Area.

Geologic Studies

Geologic field studies were conducted in September 2010 throughout the Study Area (Wilson Geosciences 2011). Fifteen geotechnical boreholes were located throughout the Study Area along dirt roads. Boreholes extended from approximately 4 meters to 30 meters (14 feet to 100 feet) feet in depth. Geologic studies defined material types and engineering properties within the construction zone (upper 6+ meters) at all 15 borehole locations; at 12 of these locations data were obtained to depths of 18 to 24 meters using geophysical methods. In addition, electrical resistivity (transient electromagnetic sounding—TEM) surveys at three locations defined general material types, saturated sediments, and estimated depth to buried bedrock.

2.3.2 Results

Desert Tortoise Surveys

The 2001 survey for desert tortoise located west of the Study Area found:

- Five desert tortoise burrows (Class 2-4)
- Nine tortoise scat (Class 2-4)
- Three highly fragmented tortoise carcasses (Class 5)
- Three desert tortoise rock shelters (Class 2)

No live tortoises were observed during the survey. All of the desert tortoise burrows observed were located within the scar of an old borrow (mining) pit, where rocks had been removed and soils were suitable for burrowing.

The 2009 survey for desert tortoise did not find live tortoise, burrows, or sign of tortoise within the Soda Mountain Study Area. One desert tortoise scat was found beyond the western edge of the Study Area during the ZOI surveys along a 370-meter (1,200 foot) interval transect. The scat was identified in the same general location as tortoise sign were previously identified (i.e., during the 2001 Opah Ditch Mine survey performed by AMEC), suggesting that conditions at the Opah Ditch site provide suitable habitat for tortoises. All of the previously identified burrows were located within the borrow pit scar, indicating that the site provides better habitat for tortoises than surrounding areas perhaps because rocks have been removed and the soil is more permeable than the surrounding areas.

Bighorn Sheep Survey

No desert bighorn sheep were observed during the March or May 2011 surveys in the Soda Mountains north and south of I-15. No springs, seeps, or pools of standing water were observed in the mountains above the desert floor. The only water resources observed in this area were the playa lake beds (east of the Soda Mountains and the project area), which still held some water during the March survey. In the plot area south of I-15, two desert bighorn sheep were observed during the March survey fleeing down a ravine approximately 13 kilometers southwest of the Study Area in the Cave Mountains (RMT 2011c). No other individuals or groups of sheep were seen during the remainder of the March survey, nor during the second survey performed in May 2011 (RMT 2011c).

A total of 47 sheep in seven groups were identified within the south Soda Mountains during the CDFG 2012 survey (Figure 11). The sheep viewed during the survey (Abella 2012) included:

- 26 adult females
- 3 yearling females
- 5 lambs
- 7 yearling males
- 6 older males (three class II, two class III, and one class IV)

The upper elevations above where these sheep were seen had very little sign of recent use by bighorn (Abella 2012). It appears that the eastern portion of the south Soda Mountains, where most of the sheep were seen is occupied primarily by females and associated younger sheep this time of year. Given that few adult males were seen, this population can be projected to fall into the 51-100 size category with the additional males not seen (Abella 2012). Conditions within the south Soda Mountains are highly suitable for bighorn sheep because of the presence of a year-round water source at Zzyzx Spring.

Environmental Conditions

Biologic Resources

Vegetation and wildlife communities within the Study Area were identified during several area surveys, including the desert tortoise survey, avian point count surveys, special status plant surveys, and water resource investigation. The Study Area is sparsely vegetated and includes three vegetation communities/land types identified in Table 2 below. Community/land types are based on dominant vegetation composition and density observed during field surveys of the Study Area (URS 2009a).

Table 2: Vegetation Communities

Vegetation Community	Vegetation Species	Description	Hectares in Study Area
Mojave Creosote Bush Scrub	creosote bush (*Larrea tridentate*) burrobush (*Ambrosia dumosa*) desert senna (*Senna armata*) Mormon tea (*Ephedra sp.*) cheesebush (*Hymenoclea salsola*) big galleta (*Pleuraphis rigida*) chollas (*Cylindropuntia sp.*) beaver tail (*Opuntia basilaris*)	Shrubs are typically widely spaced, with an open canopy and bare ground between individual plants. An annual herb layer is usually present between shrubs and may flower in late March and April with sufficient winter rains. This community is usually found on well-drained secondary soils with very low available water-holding capacity on slopes,	2651 (6,552 acres)

Table 2: Vegetation Communities

Vegetation Community	Vegetation Species	Description	Hectares in Study Area
		alluvial fans, bajadas, and valleys.	
Mojave Wash Scrub	smoke tree (*Psorothamis spinosus*) blue palo verde (*Cercidium floridum*) cheesebush (*Hymenoclea salsola*) sweetbush (*Bebbia juncea*)	Mojave Wash Scrub is a low, open desert shrub community with a scattered overstory of microphyllous trees. This community is most often observed on sandy bottoms of wide canyons, and sandy, braided, shallow washes of lower bajadas.	21 (52 acres)
Disturbed	N/A	Those areas devoid of vegetation, including unpaved roads, abandoned mining areas, OHV trails, and utility lines (e.g., transmission lines, pipelines, and fiber optic lines). Disturbed areas also include nonnative and/or native communities that have been significantly degraded due to anthropogenic activity.	65 (160 acres)

Source: URS 2009a

Wildlife. The prevailing wildlife species observed within the Study Area include a variety of commonly occurring avian species and, less frequently, commonly occurring mammals, reptiles, amphibians, and invertebrates typical of the Mojave Desert. In general, the Study Area contains relatively low species diversity with the majority of observed wildlife consisting of a few dominant species (URS 2009). This diversity is typical for many parts of the Mojave Desert where vegetation communities are generally sparse and uniform.

Avian Surveys. A total of 629 birds (22 species) were recorded within the Study Area during the spring avian point count surveys. The most abundant bird species observed during the spring surveys were horned lark (*Eremophila alpestris*), black-throated sparrow (*Amphispiza bilineta*), and white-crowned sparrow (*Zonotrichia leucophrys*) (URS 2010). Horned lark accounted for more than 65 percent of total bird observations during the spring surveys. A total of 210 birds (23 species) were recorded within the study area during the fall point count surveys. The most abundant bird species observed were horned lark (*Eremophila alpestris*), Say's phoebe (*Sayornis saya*), and common raven (*Corvus corax*) (URS 2010). Avian abundance was higher during the spring surveys, but species diversity was similar for spring and fall surveys.

Water Sources
There are no perennial water sources within the Soda Mountain Study Area or surrounding valley, all water resources are characterized as ephemeral (URS 2009d). During rain events water draining from the Soda Mountains is conveyed through the site in a series of unnamed desert washes. Water is only available on the site during and shortly after rain events, due to the low levels of precipitation in the area (approximately 4 inches annually) and high temperatures. There is a perennial water source at Zzyzx Spring, on the east side of the Soda Mountains, approximately 8 kilometers southwest of the Study Area.

Surface drainage flows predominantly east and southeast from the Soda Mountains; drainage is interrupted at the I-15 highway where it is directed to several culverts under the freeway. To a lesser extent, drainage flows from the lower mountains on the south, east, and north. Active drainage washes exit the Study Area on the northeast from north of I-15 at Zzyzx Road draining toward Silver Lake and on the southeast at Rasor Road, draining toward Soda Lake (RMT 2011a; RMT 2011b).

Geology/Soils
Soils within the Soda Mountain Study Area are predominantly sand and silty sand. Survey locations were characterized by granitic and volcanic, subangular to subrounded clasts. Particle size ranged from silt and clay to boulders, with most material in the coarse sand to cobble size range (Wilson 2011). Abundant cobbles and boulders were identified throughout the Study Area during field surveys. Alluvial fans and channels with vertical slopes up to 3 meters were observed throughout the Study Area.

Disturbance
The Soda Mountain Study Area lies within a valley that includes a designated BLM utility corridor. Highway I-15 bisects the Soda Mountain Study Area northeast to southwest and is a four-lane, divided highway. Other utilities constructed through the valley include:

- Two transmission lines (and associated access roads),
- Power distribution line
- Two fuel pipelines
- Fiber optic line
- Cell tower

The Xpress West (formerly Desert Xpress) rail right-of-way (ROW) was recently approved by BLM in December 2011 and follows the northwest edge of the I-15 ROW in the Study Area.

The Opah Ditch Mine is located just west of the Study Area. Rasor Road at the south end of the Study Area is a main entrance to the Rasor Road Off-Highway Vehicle (OHV) Recreation area. The OHV area is adjacent to and south and east of the Study Area. Evidence of OHV activity can be seen throughout the Study Area.

3 METHODS

3.1 DESERT TORTOISE HABITAT

Habitat predictions for desert tortoise presented in *Modeling Habitat of the Desert Tortoise* (Nussear et al. 2009) and the *DRECP Baseline Biology Report* (CEC 2012) were compared to desert tortoise field survey results. To evaluate model results for the Study Area, a GIS layer depicting the model results and each of the 16 GIS data source layers were obtained from the USGS (2012). Data layers were overlain with the Study Area to determine the specific results and data being used to characterize the Study Area in the model. Data obtained during field studies were compared with the data used in the model. Study Area field data, including vegetation diversity and density, area physiography and level of human disturbance, were reviewed to identify environmental conditions that could affect or fragment desert tortoise habitat.

3.2 DESERT TORTOISE CONNECTIVITY

Models of desert tortoise connectivity presented in "Making Molehills out of Mountains" (Hagerty et al. 2010) and *A Linkage Network for California Deserts* (Penrod et al. 2012) were evaluated for the Study Area. Because connectivity requires a larger scale analysis, the model results both within the study area and for the surrounding areas were evaluated to determine their accuracy in assessing field conditions and barriers to tortoise movement. Model results were compared with the results of field surveys of desert tortoise and conditions within the Study Area that could be barriers to tortoise movement. This comparison was used to assess the accuracy of connectivity predictions within the Study Area.

3.3 BIGHORN SHEEP HABITAT

Habitat predictions for bighorn sheep presented in the *DRECP Baseline Biology Report* (CEC 2012) were compared with field survey results for bighorn sheep and field-documented conditions within the Study Area.

3.4 BIGHORN SHEEP CONNECTIVITY

The following bighorn sheep experts were contacted to discuss bighorn sheep behavior and potential use of the Soda Mountain Study Area:

- Mr. Andrew Pauli, CDFG, Inland Deserts and Eastern Sierra Region, Apple Valley, California
- Dr. Jack Tuner, Sam Houston State University, Huntsville, Texas
- Mr. George Kerr, Society for the Conservation of Bighorn Sheep, Pasadena, California
- Mr. Chris Otahal, BLM, Barstow, California

The experts were provided information pertaining to the Study Area, including a map showing the study area in relation to the surrounding mountains and human-made features (e.g., I-15), and a description of the Study Area location. The experts were asked to provide information on expected bighorn sheep presence, use of the area, movement, and migration.

3.5 GENERAL WILDLIFE CONNECTIVITY

The methods for assessing wildlife connectivity presented in *California Essential Connectivity Project* (Spencer et al. 2010) and in *A Linkage Network for the California Deserts* (Penrod et al. 2012), were reviewed. Spencer et al. (2010) recommend that the generalized Essential Connectivity Areas developed by the California Essential Connectivity project be replaced by the species specific linkage designs like those prepared by the California Desert Connectivity Project (Penrod et al. 2012):

> "*Essential Connectivity Areas are placeholder polygons that can inform land-planning efforts, but that should eventually be replaced by more detailed Linkage Designs, developed at finer resolution based on the needs of particular species and ecological processes. It is important to recognize that even areas outside of Natural Landscape Blocks and Essential Connectivity Areas support important ecological values that should not be "written off" as lacking conservation value. Furthermore, because the Essential Habitat Connectivity Map was created at the statewide scale, based on available statewide data layers, and ignored Natural Landscape Blocks smaller than 2,000 acres, it has errors of omission that should be addressed at regional and local scales*".

In other words, the method of defining wildlife connectivity in the absence of species specific analysis is inherently flawed because connectivity is dependent on individual species habitat characteristics and how each species moves across the landscape (Tracy 2012). An aspect of the landscape that is a barrier for a reptile would likely not be a barrier to birds or large mammals, for example. General wildlife connectivity is not analyzed further in this case study, and connectivity is analyzed by species. Therefore, further consideration of Essential Connectivity Areas (Spencer et al. 2010) is rejected in favor of the species specific linkages presented in *A Linkage Network for the California Deserts* (Penrod et. al 2012).

4 ANALYSIS

The model results were compared with the field study results for desert tortoise habitat, desert tortoise connectivity, bighorn sheep habitat, and bighorn sheep connectivity. Results are presented in Table 3. The results presented in Table 3 are summarized from the model and field study results presented in Section 2.2.2 and 2.3.2, respectively.

Table 3: Comparison of Model Results to Field Study Results

Topic	Model Results	Field Study Results
Desert Tortoise		
Desert Tortoise Habitat	The Study Area has a predicted habitat suitability rating of 0.6 to 0.8 (Nussear et al. 2009) indicating moderately suitable habitat. The Study Area is defined as suitable habitat for desert tortoise (CEC 2012).	No live tortoise, burrows, or other sign were identified within the Study Area during desert tortoise surveys. The Study Area would not be expected to support large populations of desert tortoise because: 1) The Study Area elevation (380 meters to 470 meters amsl) is below the optimum range for desert tortoise. 2) The Study Area is sparsely vegetated. 3) Soils within the Study Area consist of sand and gravel. 4) Numerous rocks, boulders, and cobbles are present in the Study Area. 5) I-15 bisects and fragments potential habitat in the area 6) An OHV area is located south and east of the Study Area and there is evidence of OHV use throughout the Study Area.
Desert Tortoise Connectivity	The Baker Sink is a barrier to desert tortoise movement (Hagerty et al. 2010). Desert tortoise linkage corridors are not identified within the Study Area (Penrod et al.	No live tortoise, burrows, or other sign were identified within the Study Area during desert tortoise or other field surveys. Large numbers of tortoise would not be

Table 3: Comparison of Model Results to Field Study Results

Topic	Model Results	Field Study Results
	2012).	expected to move through the area because: 1) I-15 bisects the Study Area and restricts tortoise movement through the area 2) The Study Area is surrounded by mountains 3) Baker sink due east of the study area would inhibit tortoise movement 4) There are steeply sloping channels within the study area
Bighorn Sheep		
Bighorn Sheep Habitat	Suitable habitat for bighorn sheep was predicted in the southern portion of the Study Area and within the Soda Mountains north and south of the Study Area (CEC 2012).	Bighorn sheep were not identified within the Study Area or the north Soda Mountains during field surveys. A population of bighorn sheep exists within the south Soda Mountains and sheep were viewed 13 kilometers south in the Cave Mountains. There are no water sources within the Study Area. The Study Area is flat (<5% slope). There is over 450 meters of flat terrain between the Study Area and the Soda Mountains.
Bighorn Sheep Connectivity	Bighorn sheep linkage corridors were not identified within the Study Area (Penrod et al. 2012)	I-15 bisects the Study Area and is considered an impediment to bighorn sheep movement through the area, although bighorn sheep may

Table 3: Comparison of Model Results to Field Study Results

Topic	Model Results	Field Study Results
		use the culverts under the highway.

5 DISCUSSION

5.1 DESERT TORTOISE

5.1.1 Suitable Habitat

The model predictions of desert tortoise suitable habitat (Nussear et al. 2009; CEC 2012) indicate a high probability of desert tortoise presence within the Study Area. Desert tortoise field surveys covering 100 percent of the Study Area along 10-meter transects found no tortoise, burrows or sign within the Study Area. In addition, no desert tortoises were observed during avian point counts, special-status plant surveys, or water resource studies. The divergence between model predictions and field survey results could be attributed to: 1) the model scale, 2) human disturbance throughout the area, which is not accounted for in either model, and 3) there are limitations of stochastic models of habitat suitability.

The models of desert tortoise suitable habitat were constructed using 1-km^2 grid cells. The model construction requires averaging environmental data over a 1-km^2 area. For variables such as slope and rocks, the data used in the model do not accurately characterize field conditions or variability due to the scale of the model. The multi-state geographic scale of the model required the use of large data sets that could be inaccurate. The data used to generate the model identified the Study Area as containing 0% rocks. Site-specific field geology studies indicate that there are numerous rocks, boulders, cobbles, and gravel throughout the Study Area. Soil conditions would not be ideal for tortoise burrowing.

The method used by Nussear et al. (2009) to predict tortoise habitat did not involve removing areas of anthropogenic impact that would no longer be suitable habitat. The Maxent modeling method developed by Phillips et al. (2006) did provide for removal of highly disturbed areas from the model output to increase model accuracy. The adjustments to the suitable habitat model for the *DRECP Baseline Biology Report* removed highly disturbed areas from the model output (CEC 2012). However, within and adjacent to the Study Area, heavily disturbed areas are predicted as suitable habitat in the adjusted model. Both the I-15 corridor and the OHV recreation area south and east of the Study Area are identified as suitable habitat after adjustments were made to the model. The I-15 highway and OHV land uses have likely resulted in fragmentation and degradation of desert tortoise habitat in the area. While historically the area may have supported higher quality suitable habitat for desert tortoise, the quality of habitat is reduced by current land use and installation of the utilities in the corridor.

There are limitations of stochastic models of habitat suitability. The models do not account for physiological processes that are important to species habitat use. The Study Area lies within a small valley wedged between the north and south Soda Mountains. The presence of Highway I-15 through the center of the valley, and high desert tortoise mortality rates along highways render the area too small to support a population of desert tortoise (Tracy 2012). Studies of tortoise presence along highways reveal that tortoise densities increase further from the highway and high-volume highways can result in decreases in tortoise sign up to 4,000 meters from highways(Hoff and Marlow 2002). Because the Study Area is bounded by mountains, tortoises have very limited usable habitat area that is not near the highway. Analysis of population dynamics, which cannot be provided by modeling alone, is required to evaluate whether desert tortoise would use the area.

The predicted habitat suitability for the Soda Mountain Study Area does not match the documented absence of desert tortoise in the area and the low likelihood of desert tortoise presence due to the site conditions. The presence of surrounding mountains, abundant rocks and cobbles, sparse vegetation, low vegetation diversity, low elevation (below 470 meters), sand and gravel soils, and level of human disturbance indicate that the habitat is fragmented and not highly suitable for desert tortoise. If desert tortoise were to occur in the area, they would be expected in low numbers.

5.1.2 Habitat Connectivity

Habitat connectivity for desert tortoise was evaluated using genetic diversity data (Hagerty et al. 2010). That analysis indicated that genetic distance is closely tied to physiographic barriers to tortoise movement and geographic distance between populations. The Study Area is located adjacent to the Baker sink, which was identified as a physiographic barrier to tortoise movement. The Soda Mountain Study Area therefore is unlikely to lie within a major corridor for tortoise movement; however, some tortoises may move through the area as evidenced by the presence of tortoise burrows and sign west of and adjacent to the Study Area.

Habitat linkages for desert tortoise were modeled in A Linkage Network for California Deserts (Penrod et al. 2012). Desert tortoise linkage areas were not identified within the Soda Mountain Study Area. Linkages for desert tortoise were identified to the south connecting the southern end of Mojave National Preserve to Twentynine Palms and to the north connecting the Kingston Mesquite Mountains to the China Lake South Range approximately 10 miles north of the Study Area. This linkage design would be consistent with documented field conditions including the presence of the I-15 highway, incised channels, and mountainous surroundings that could restrict tortoise movement.

5.2 BIGHORN SHEEP

5.2.1 Suitable Habitat

Predicted suitable habitat for bighorn sheep was identified within the southern portion of the Study Area and the Soda Mountains north and south of the Study Area (CEC 2012). The 2012 survey identified seven groups of bighorn sheep within the south Soda Mountains east of the Study Area (Abella 2012). Areas that bighorn sheep are known to occur within the south Soda Mountains were not identified as suitable habitat by the model. Suitable habitat for bighorn sheep habitat was not identified within the Study Area during field studies (URS 2009a). While suitable habitat may exist within the north Soda Mountains, field surveys did not identify a population within that area. Bighorn sheep are unlikely to occupy the Study Area (Kerr 2010; Pauli 2010; Turner 2010). Sheep likely would have used the margins of the Study Area as a movement corridor between the mountains north and south of the Study Area prior to the I-15 highway. Sheep have, however, been sighted foraging near Zzyzx Road, adjacent to the mountains (Weasma 2012). They may be able to cross through the Study Area using the culverts under the I-15 highway.

The north side of the Study Area is potentially a "transition zone" for bighorn sheep (Kerr 2010). Bighorn would likely cross I-15 at the highway culvert north of the Study Area or the overpass at Zzyzx Road. The bighorn sheep would not stay in the area for long because it does not provide any water. The Study Area is not prime habitat and there is unlikely to be a large population in the area (Kerr 2010). Bighorn sheep rely on the flat lands for food and water, and do not remain in flat areas, except for potential food sources following heavy rains or as potential migration routes (Kerr 2010). Bighorn sheep prefer to stay in the mountainous area, their natural habitat, which provides them with views of the surrounding area and vantage points (Turner 2010). These views allow the bighorn sheep to identify any potential threats in the area.

5.2.2 Habitat Connectivity

The Study Area was not identified within a linkage corridor for bighorn sheep by Penrod et al. (2012). Although there are populations of bighorn sheep in the Soda Mountains to the south, it is unlikely that populations of bighorn sheep would cross through the Study Area due largely to presence of I-15. Individual sheep have previously been seen attempting to cross I-15 or killed along I-15 near the Study Area. Each of the bighorn sheep experts contacted stated that construction of I-15 created a migration barrier for the bighorn sheep. Major interstates are typical barriers to bighorn sheep migration (Turner 2010). Heavy traffic on I-15 discourages bighorn sheep from crossing from one side to the other. If the bighorn sheep were to cross I-15, it would most likely be in the area north of the Study Area where I-15 passes through the mountain range (Turner 2010).

6 CONCLUSION

This report presents an evaluation of five studies used to predict 1) desert tortoise habitat, 2) bighorn sheep habitat, and 3) linkages for desert tortoise and bighorn sheep connectivity. The results of these studies were compared with the results of field surveys performed within an approximately 2,800-hectare (7,000-acre) area located in a valley surrounded by the Soda Mountains.

The model of suitable habitat for desert tortoise (Nussear et al. 2009) identified the Study Area as containing moderately suitable habitat (0.6 to 0.8). Protocol surveys for the Study Area did not identify any sign of desert tortoise within the Study Area. This difference in results can occur for two major reasons: 1) errors in the model input, 2) historic changes in the presence of tortoise habitat (e.g., land use changes), or 3) limitations of the model. Errors in model input could be due to improper data used in the model (i.e., the data did not identify and account for the numerous boulders or cobbles in the Study Area) and the model resolution. Field-documented conditions including low vegetation diversity and density, presence of abundant gravel and cobbles, and the low elevation of the area (below 470 meters are not conducive to supporting a tortoise population; the area would be expected to have low numbers of desert tortoise, if any (Woodman 2012). These conditions were not correctly documented in the model input due to the scale of the model (1-km^2) and the use of data that were not field verified. Historic changes in the presence of tortoises suggest that the habitat may indeed be suitable but that tortoises are not present in the Study Area for other reasons such as population processes centered on excess mortality due to I-15. These processes are not considered in niche habitat modeling. However, population processes play a large role in species presence and can affect tortoise presence, as demonstrated by decreased tortoise sign thousands of meters from high-traffic highways. There are other limitations of stochastic habitat distribution modeling including sample bias (e.g., more samples near highways/roadways) and expected error within models. Models are representations of reality, and cannot account for all conditions that affect habitat and species use of habitat.

Similarly, the model for bighorn sheep predicted suitable habitat in flatland areas of the Study Area that do not possess characteristics of bighorn sheep suitable habitat, although the areas immediately adjacent to the mountains outside the Study Area may be used periodically for foraging. The model also underestimated suitable habitat areas within the south Soda Mountains where bighorn sheep are known to occur. The flatland areas within the southern portion of the Study Area are located adjacent to I-15 and in highly disturbed areas near a gas station. While bighorn sheep could use this area temporarily, they would not be expected to stay in the area for long. The difference in results between the models and the surveys can be attributed to the same factors that impact the accuracy of desert tortoise model results, as well as the use of a lower threshold (0.236) to classify bighorn sheep habitat and the limited number of data points (32) used in the model.

The model for connectivity used by Penrod et al. in *A Linkage Network for the California Deserts*, did not identify the Study Area as part of a linkage area for desert tortoise or bighorn sheep. This model is consistent with the results of field studies and knowledge of area physiography.

7 RECOMMENDATIONS

The Essential Connectivity Area map for the Mojave Desert provided in the *California Essential Connectivity Project* (2010), which identified the Study Area within an Essential Connectivity Area, should be replaced with the maps of habitat linkages in the *Linkage Network for the California Deserts* (2012).

Due to the large geographic area that was modeled in many of the studies reviewed, fine-scale field ground-truthing was not feasible. The *Linkage Network for the California Deserts* used a regional-scale analysis and did use field ground-truthing. Ground-truthing of the data sources used to construct the model could increase the accuracy of the models applied. It would also allow for spot verification of modeled results to increase model reliability.

Field studies are usually conducted at a much finer scale than species habitat models and provide information that are not easily gained through modeling alone. Where available, field information should be used to supplement the information provided in species habitat models to provide a greater understanding of area resources and habitat use. Land use managers should collect field data from private parties so that these data can be used for future land use planning and management. Information provided in models should also be supplemented by more detailed analysis when land use changes are being considered.

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EXHIBIT B

SODA MOUNTAIN SOLAR

26 July 2013

Jeffrey K. Childers
Bureau of Land Management, Project Manager
California Desert District Office
22835 Calle San Juan de Los Lagos
Moreno Valley, California 92553

Re: CDFW Response to April 2013 Soda Mountain Solar Bighorn Sheep Survey Results and Analysis Report

Dear Mr. Childers:

This letter addresses concerns raised by the California Department of Fish and Wildlife (CDFW) in its 19 April 2013 letter commenting on the April 2013 bighorn sheep report prepared for the Soda Mountain Solar project.

We recognize the importance ascribed by CDFW to the restoration of desert bighorn sheep connectivity in the vicinity of the Soda Mountains. We are also committed to proportionately mitigating any significant adverse effects of the Soda Mountain Solar project on the species.

However, CDFW's comment letter and the studies it relies upon focus on the potential impacts of the project on possible *future* efforts to restore connectivity in the Soda Mountains. They do not focus on the project's effects on existing conditions, which is the appropriate baseline for analysis under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).[1]

As a consequence, the connectivity mitigation measures CDFW recommends for the project mitigate the larger, pre-project adverse effects of the I-15 and other prior events. They are not commensurate with the impacts of the project itself and therefore do not meet the rough proportionality requirements of state and federal law.[2]

[1] *Tri-Valley CAREs v. U.S. Dep't of Energy*, 671 F.3d 1113, 1127 (9th Cir. 2012) (baseline is status quo); *Communities for a Better Env't v. S. Coast Air Quality Mgmt. Dist.*, 48 Cal. 4th 310, 322 (2010) (baseline must relate to actual existing circumstances).
[2] *Koontz v. St. Johns River Water Management Dist.*, No. 11-1447, slip op. at 8 (U.S. Sup. Ct. June 25, 2013) ("... the government may choose whether and how a permit applicant is required to mitigate the impacts of a proposed development, but it may not leverage its legitimate interest in mitigation to pursue governmental ends that lack an essential nexus and rough proportionality to those impacts."); 14 C.C.R. Section 15126.4(a)(4)(B).

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For the reasons explained below, we are of the opinion that the effect of the project on desert bighorn sheep is less than significant when evaluated against the correct baseline of existing circumstances and the significance thresholds of Appendix G of the CEQA Guidelines.[3]

Questions of proportionality aside, we have voluntarily incorporated two sheep guzzlers into the project design to help realize CDFW's desire to restore the long-term, regional well being of the species. It is our opinion that paying for and strategically siting two guzzlers in the vicinity of the Soda Mountains will cause the project to improve connectivity conditions over the existing baseline.

Therefore, while we agree with the spirit of CDFW's comment letter, we urge you to carefully consider CDFW's project-specific recommendations (as well as our own analyses) in light of the appropriate environmental baseline.

Legal Status of Bighorn.

The desert bighorn sheep (*Ovis Canadensis nelsoni*) is fully protected under California law.[4] As a consequence, one may not "take," that is, "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" a desert bighorn sheep.[5] This is a narrower definition of "take" than under the federal Endangered Species Act because the state definition does not include acts that "harass" or "harm," such as habitat modification.[6]

Although fully protected, California law does allow "take" of desert bighorn sheep in some instances. "Take" can occur pursuant to an approved Natural Community Conservation Plan (NCCP), for example, although no NCCP authorizing the take of desert bighorn sheep exists to date.[7] "Take" can also occur if the sheep is killed pursuant to a CDFW-authorized hunt within a specified hunt zone and prescribed quota. For example, CDFW authorized the hunting of 3 bighorn sheep within the western side of the Mojave National Preserve (MNP) near the project area during the December 2012 – February 2013 hunting season. CDFW also reported 100 percent hunter success in fulfilling the quota of 4 sheep in the same hunt zone during the 2011-2012 season.

Existing Desert Bighorn Sheep Habitat Conditions in Project Vicinity and Effect of Project on Same.

The North and South Soda Mountains constitute core desert bighorn sheep habitat.[8] The Soda Mountain valley does not constitute core habitat because it has a slope of less than 10 percent.[9]

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[3] Our analysis focuses primarily on CEQA because CDFW's comments concern state, rather than federal law.
[4] Cal. Fish & Game Code Section 4700.
[5] Cal. Fish & Game Code Section 86.
[6] 78 Ops. Cal. Atty. Gen 137 (1994).
[7] Cal. Gov. Code Section 2805(e).
[8] Wehausen, J.D. 2006. Nelson Bighorn Sheep. West Mojave Plan Species Accounts. U.S. Department of the Interior, Bureau of Land Management. January 2006. Accessed June 25, 2012. http://www.blm.gov/ca/pdfs/cdd_pdfs/Bighorn1.PDF.

However, desert bighorn sheep are known to forage on suitable alluvial fan habitat up to 0.5 miles from mountainous terrain.[10] As stated in the Bleich memorandum cited by CDFW in its 19 April 2013 letter, "… low-lying areas and, in particular, desert washes are among the most productive desert habitats and support greater cover of vegetation and far greater plant biomass than surrounding upland areas."[11] Project surveys confirmed this assertion by identifying two bighorn sheep foraging on the alluvial fan to the east of the project site, adjacent to the western slope of the South Soda Mountains.

On this basis, CDFW proposed in its letter a 0.25-mile buffer from all surrounding slopes of 10 percent or greater to mitigate impacts to bighorn lowland foraging habitat. This would result in a roughly 399-acre, 80-MW (23 percent) reduction of the project. Such aggressive mitigation is unwarranted. The project's development of the 399 acres will not have a substantial adverse effect on the desert bighorn sheep as a species (a threshold of significance drawn directly from Appendix G of the CEQA Guidelines) or even on the nearby resident bighorn population of the South Soda Mountains, which concentrates on the eastern side of the range and which can and does avail itself of ample lowland foraging habitat found within the MNP.

Such stringent buffer requirements are uncommon in the context of federally listed species (such as the desert tortoise); off-site compensatory mitigation is frequently employed instead, particularly when core habitat is not affected. Unlike bighorn sheep, federally listed species enjoy more extensive protection against the adverse effects of habitat modification (and cannot be hunted as game). Why bighorn sheep should be afforded even greater protection despite a less stringent "take" standard that does not include habitat modification is unclear.

Finally, as you are aware, Soda Mountain Solar (SMS) substantially modified the project in March 2013 to minimize impacts to bighorn sheep lowland foraging habitat by (i) adding a buffer on the east side of the project ranging from 335 to 1,000 feet from slopes of 10 degrees or more; and by (ii) redesigning all array areas to avoid major washes which, as quoted above, contain the highest value lowland grazing habitat because of the greater vegetation cover they provide.

Given the nature of the project's impact (non-core, lowland foraging habitat, the most valuable of which the project avoids) and the legal status of the bighorn ("take" does not include habitat modification), we are of the opinion that compensatory mitigation is a more appropriate solution than a hard-line buffer for any impacts of the project to bighorn foraging habitat.

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[9] *Id.*

[10] USFWS. 2000. Recovery plan for bighorn sheep in the Peninsular Ranges, California. U.S. Fish and Wildlife Service, Portland, OR. xv+251 pp.

[11] Bleich, V.C. 2012. Comments regarding the South Soda Mountains Solar Project as related to the Desert Renewable Energy Conservation Plan. Unpublished memorandum to CDFW. Page 4.

<u>Existing Desert Bighorn Sheep Connectivity Conditions in Project Vicinity and Effect of Project on Same.</u>

As you are aware, absent extraordinary circumstances, CEQA and NEPA both require the impacts of a project to be evaluated against existing conditions as of the beginning of the environmental impact review process.[12]

Under current conditions, few, if any, bighorn sheep cross between the South Soda Mountains and North Soda Mountains in the vicinity of the project. This is because, in the words of the study most frequently referenced by CDFW in its 19 April 2013 letter (Epps Study) – funded by NPS and prepared for BLM, NPS and CDFW – "Past bighorn sheep movement between the North and South Soda [sic] has been blocked by Interstate 15," such that the freeway now constitutes a "major migration barrier."[13] This is one of the reasons why the South Soda Mountains support a resident population of desert bighorn sheep but the North Soda Mountains on the other side of I-15 do not (and have not since at least the 1970s).[14]

Data obtained from four game cameras installed by CDFW at the two largest I-15 underpasses in the project vicinity (near Opah Ditch Road and near Zzyzx Road) support this assessment by revealing no sign of bighorn sheep since their installation in August 2012.

Nor have surveys conducted by SMS and CDFW in the project area identified bighorn crossing the valley between the North and South Soda Mountains, although they have identified substantial bighorn populations in the South Soda Mountains and Cave Mountains and have documented two bighorn near the project site on the west side of the South Soda Mountains.[15] There are also three anecdotal observations of bighorn sheep near the Zzyzx Road interchange to the north of the project site, as well as one anecdotal observation near the Rasor Road gas station east of 1-15 at the southwestern terminus of the proposed project ROW.[16]

Thus, under the best available evidence, the project site exhibits little, if any, desert bighorn sheep connectivity across the I-15 under existing conditions. The direct and indirect effect of the project on bighorn sheep connectivity is less than significant because there is little, if any,

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[12] See fn. 1, above.

[13] Epps, Clinton W., J.D. Wehausen, R.J. Monello, T.G. Creech. 2013. Potential Impacts of Proposed Solar Energy Development Near the South Soda Mountains on Desert Bighorn Sheep Connectivity. Unpublished memorandum to CDFW, NPS and BLM. Pages. 1, 5.

[14] Epps et al. 2013. Page 5; Epps, C.W., P.J. Palsboll, et al. 2005. Highways Block Gene Flow and Cause Rapid Decline in Genetic Diversity of Desert Bighorn Sheep. Ecology Letters 8(10): 1029-1038; Weaver, R.A., and J.L. Mensch. 1970. Bighorn Sheep in Northwestern San Bernardino and Southwestern Inyou Counties. Wildlife Management Administrative Report 70-3. California Department of Fish and Game. Page 4. And see negative results of North Soda Mountain sheep surveys conducted by BRC for the project in spring 2011.

[15] Panorama Environmental, Inc. 2013. Bighorn Sheep Survey Results and Analysis, Soda Mountain Solar Project.

[16] *Id.*

existing bighorn connectivity through the project site for the project to substantially interfere with.[17]

The project's occupation of a portion of the valley between the North and South Soda Mountains could cumulatively reinforce the "major mitigation barrier" created by I-15 that already substantially interferes with bighorn connectivity through the project site. The project counteracts this potential effect, however. As explained below, the project is located approximately one mile west of, and does not interfere with, the most important local connectivity "pinch point" at the 90-foot wide underpass east of the I-15/Zzyzx Road interchange. SMS has also redesigned the project to create a connectivity corridor through the 72-foot wide underpass at Opah Ditch Road. Finally, the two guzzlers added by SMS as design features of the project would encourage bighorn connectivity within the Soda Mountains. The cumulative contribution of the project is less than considerable because it not only would avoid local connectivity impacts, but could potentially improve them through the strategic introduction of water sources.

Connectivity Restoration Value of Project Vicinity and Effect of Project on Same.

CDFW's primary concern is that the project may hinder future bighorn connectivity restoration efforts in the vicinity of the Soda Mountains. As explained below, while the Soda Mountains are of important connectivity restoration value, they do not represent the most important "pinch-point" in the Southern Mojave Desert of California. In any event, the project's effect on potential *future* connectivity restoration efforts – which neither NEPA nor CEQA concern in light of the environmental baseline – is low.

General Connectivity Restoration Value of Soda Mountains.

The Soda Mountains are of important connectivity restoration value, but they do not constitute the most important bighorn linkage area in the region.

The Epps Study asserts that its "network analysis indicated that the North-South Soda Mountain connection is the most important restorable corridor for long-term demographic potential (i.e., population recolonization by ewes) across the entire southeastern Mojave Desert of California."[18]

This assertion is erroneous on the face of the study's own data. It is also misleading. First, because the study does not assess connectivity between the North and South Soda Mountains; it assesses connectivity between the South Soda Mountains and the Avawatz Mountains 20 miles to the north.[19] Second, while Table 1 of the study (below), indicates that the route between the South Soda Mountains *and Avawatz Mountains* is *tied* for first place out of 15 connectivity corridors for potential long-term colonization by rams and ewes, this is only one of four separate

[17] And, in any event, the remainder of this letter explains why the project avoids (and would in fact enhance) the most important local connectivity "pinch points".
[18] Epps et al. 2013. Page 1.
[19] See Epps et al. 2013. Pages 7, 10 ("AVA-SSA").

categories of analysis. Table 1 also shows the same route is tied for 13^{th} place out of 15 connectivity corridors for short-term recolonization by both rams and ewes. It is also the 8^{th} most important of 20 to 21 connectivity corridors in the southeastern Mojave Desert of California for gene transmittal by rams under short- and long-term conditions. In fact, the nearby Avawatz Mountains to Cady Mountains connection (AVA-CAD) ranks higher for long-term genetic connectivity and yet was not considered for demographic connectivity due to a technical exclusion of the North Soda Mountains from the model assumptions.

By way of comparison, the corridor across the I-40 between the Granite Mountains and Marble Mountains (GRA-MAR) ranks first overall across *all four* categories of analysis, with the adjacent North and South Bristol Mountains (NBR-SBR) corridor across the I-40 ranking as a close second.

In short, the locations of highest connectivity restoration value in the southeastern Mojave Desert lie across the I-40 corridor by the Granite and Bristol mountains, with the Soda Mountains exhibiting a significantly lower weighted value overall.

That said, the findings of the Epps Study are generally consistent with the Desert Renewable Energy Conservation Plan (DRECP) "*Updated Expert Species Models*" map released in December 2012 that depicts critical linkage areas for bighorn sheep at potential highway crossing locations along I-15 and I-40, including the entire Soda Mountain valley (Figure 1, attached hereto).

Table 1.
Restorable Corridor Rankings

Table 1. Prioritization of restorable corridors in the genetic and demographic networks based on ECP[a] and MWC[b]. The Δ value is the proportional increase in connectivity (as measured by ECP or MWC) when the specified corridor is restored to the network. Corridors are ranked from highest to lowest importance, with separate rankings for each combination of network type and network metric. Results for the Avawatz–S. Soda corridor (AVA-SSO) are highlighted in red. See Fig. 1 for patch name abbreviations.

Genetic network						Demographic network					
ECP			MWC			ECP			MWC		
Corridor	Δ value	Rank	Corridor	Δ value	Rank	Corridor	Δ value	Rank	Corridor	Δ value	Rank
GRA-MAR	0.246	1	GRA-MAR	0.342	1	GRA-MAR	0.231	1.5	AVA-SSO	0.196	1
NBR-SBR	0.197	2	NBR-SBR	0.308	2	NBR-SBR	0.231	1.5	GRA-MAR	0.196	2
EMO-ORO	0.123	3	CLI-PRO	0.280	3	LSB-SGO	0.108	3	NBR-SBR	0.185	3
CHU-EMO	0.115	4	BUL-CAD	0.225	4	EMO-ORO	0.092	4	CLI-PRO	0.110	4
CLI-PRO	0.090	5.5	BUL-NBR	0.217	5	CHU-EMO	0.077	5.5	EMO-ORO	0.101	5
LSB-ORO	0.090	5.5	CAD-NOR	0.205	6	LSB-NSB	0.077	5.5	CHU-EMO	0.096	6
ORO-QUE	0.066	7	AVA-CAD	0.171	7	LSB-ORO	0.062	7.5	LSB-SGO	0.094	7
AVA-CAD	0.049	8.5	AVA-SSO	0.166	8	ORO-QUE	0.062	7.5	COX-PRG	0.090	8
AVA-SSO	0.049	8.5	CHE-DEA	0.159	9	NSB-SGA	0.031	9.5	LSB-ORO	0.084	9
ORO-SHE	0.033	10	EMO-ORO	0.155	10	SGA-SGO	0.031	9.5	LSB-NSB	0.072	10
BUL-CAD	0.025	11.5	CHU-EMO	0.148	11	AVA-SSO	0.015	13	ORO-QUE	0.071	11
SGA-SGO	0.025	11.5	KME-OKM	0.147	12	CHE-DEA	0.015	13	COX-IRO	0.071	12
CAD-NOR	0.016	15.5	CSS-PRO	0.142	13	CLI-PRO	0.015	13	CHE-DEA	0.028	13
CHE-DEA	0.016	15.5	LSB-ORO	0.141	14	COX-IRO	0.015	13	NSB-SGA	0.020	14
CSS-PRO	0.016	15.5	CSS-WHA	0.141	15	COX-PRG	0.015	13	SGA-SGO	0.018	15
CSS-WHA	0.016	15.5	ORO-QUE	0.132	16						
KME-OKM	0.016	15.5	ORO-SHE	0.094	17						
NSB-SGA	0.016	15.5	CHU-PRG	0.081	18						
BUL-NBR	0.008	20	SGA-SGO	0.041	19						
CHU-PRG	0.008	20	NSB-SGA	0.039	20						
NOR-SGA	0.008	20	NOR-SGA	0.022	21						

[a] **Effectively connected pairs, a measure of short-term network connectivity.**
[b] **Mean weighted closeness, a measure of long-term network connectivity.**

Source: Epps et al. (2013).

Areas of Higher Connectivity Restoration Value within Vicinity of Project.

The Epps Study identifies four I-15 underpasses within the project area as potential bighorn sheep connectivity crossing areas. The largest underpass is approximately 90-feet wide and lies roughly one mile east of the project site, near mountainous terrain to the east of the I-15 Zzyzx Road interchange, identified in the study as location "D". The second largest underpass is roughly 72 feet wide, lying in the middle of the 3-mile wide Soda Mountain valley near Opah Ditch Road, identified as location "B". The third and fourth overpasses are culverts of approximately 15 feet in width. They are located within the Soda Mountain valley to the north and south of the Opah Ditch underpass, identified as locations "A" and "B."[20]

The Epps Study states "our site inspections in February 2013 found that none of these [four underpasses] was too narrow for sheep use, and that there is no fencing across the underpass entrances that might inhibit use by bighorn sheep. All four locations lie outside of habitat with >10% slope, but C [15 feet wide] and D [90 feet wide] are closer to such habitat, especially the north side of D, where steep habitat is immediately adjacent."[21]

The conclusion regarding the width of underpasses A and C is at odds with other studies determining a minimum underpass width of 26.3 feet as necessary for ungulate use (Penrod et al. 2008). However, the conclusion regarding underpass D's proximity to mountainous terrain is consistent with an empirical study determining that 88 percent of bighorn underpass crossings occur at underpasses located in the most rugged terrain at the narrowest highway span.[22]

The same empirical study also concluded that higher intensity culvert use was most associated with proximity to traditional trails of bighorn sheep.[23] This is of relevance to underpass D because of, in the words of CDFW's comment letter, "ample trailing near the Zzyzx off-ramps indicating where the original native population crossed back and forth between the North and South Soda Mountains to obtain water."[24]

Thus, while the Epps Study ascribes connectivity value to all four underpasses, it is readily apparent that underpass D, to the east of Zzyzx Road, has the highest potential for restoring bighorn sheep connectivity in the area due to its size, proximity to mountainous terrain, and proximity to historic bighorn trails. Underpass B is of more moderate restoration potential because, although almost as wide as underpass D, it is located farther away from mountainous habitat in the middle of a three-mile-wide valley. Culverts A and C are likely too narrow for bighorn use. It should be noted that CDFW appears to have drawn the same conclusion when it chose to install bighorn cameras in August 2012 at underpass D and B, but not at the smaller, 15-foot wide A and C culverts.

Ascribing the greatest connectivity restoration potential to underpass D also appears to be consistent with the February 2012 Draft Conservation Plan for Desert Bighorn Sheep in California. The conservation plan reportedly calls "for the strategic placement of one [or more]

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[20] Epps et al. 2013. Page 4.
[21] *Id.*
[22] AZDOT (Arizona Department of Transportation). 2008. Evaluation of Distribution and Trans-Highway Movement of Desert Bighorn Sheep: Arizona Highway 68. Prepared by Kirby Bristow and Michelle Crabb of the Arizona Game and Fish Department for AZDOT.
http://www.azdot.gov/TPD/ATRC/publications/project_reports/PDF/AZ588.pdf.
[23] *Id.*
[24] CDFW. 2013. Soda Mountain Solar Project, April 2013 Bighorn Sheep Survey Results and Analysis Report; and see Epps et al. 2013. Page 4.

water sources in the vicinity of underpasses at the north end of the South Soda Mountains in an effort to reestablish connectivity between these geographic areas."[25]

DRECP "*Updated Expert Species Models*" maps released in December 2012 draw the same conclusion (Figures 2 and 3, attached hereto). The maps identify a potential movement corridor for bighorn sheep across the I-15 to the east of the project site near Zzyzx Road at the same location as underpass D. They do not identify desert bighorn mountain habitat or intermountain habitat through the project site.

Identifying underpass D as the most important pinch-point between the North and South Soda Mountains also accords well with the incidental observation of bighorn sheep on the Zzyzx Road overpass and in the North Array area.[26]

Effect of Project on Connectivity Restoration.

As stated above, the proposed project's effect on future connectivity restoration efforts is not germane to its environmental impact review. Future connectivity restoration efforts are not part of the environmental baseline under CEQA and NEPA. Even if this were not the case, the effect of the project would still be less than significant, particularly after taking the guzzler design features of the project into consideration. First, because the primary "pinch point" for restoring desert bighorn connectivity in the Soda Mountains lies one mile east of the project site at undercrossing D. Second, because SMS modified the project in March 2013 to create a 0.32 – 0.45-mile wide corridor through the middle of the project from the South Soda mountains to underpass B, thereby preserving – and, by creating a funnel-shaped corridor narrowing towards underpass B, potentially guiding and enhancing – bighorn use of underpass B for connectivity.

The project would lie between the mountains and the other existing culverts. As explained above, those culverts are of lower suitability for connectivity due to their narrower width and distance from mountainous terrain, and are not being monitored by CDFW. There is no evidence that bighorn have used them. Reduced access to the smaller culverts would not substantially interfere with bighorn connectivity, particularly when offset by the installation of guzzlers at overpass B and D.

The Epps Study also calls for construction of a future wildlife bridge/overpass to restore connectivity across I-15 between the south and north Soda Mountains. The Epps Study found that the most suitable location for this future bridge is in steep habitat near Zzyzx Road[27], in an

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[25] Bleich, V.C. 2012. Comments Regarding the South Soda Mountains Solar Project as Related to the Desert Renewable Energy Conservation Plan. Unpublished memorandum to CDFW. Page 3. A copy of the draft bighorn management plan has not been made available to SMS after multiple requests made to the CDFW, notwithstanding CDFW's use of the plan in its own comment letter, including a claim that the SMS bighorn study is lacking for failure to include the draft management plan.

[26] Otahal, Chris. 2010. BLM. Personal communication with Brent Miyazaki (RMT, Inc.) 1 March 2010.

[27] The Epps Study analyzed a possible Rasor Road overpass in comparison to a possible Zzyzx Road overpass as follows:

area that is not proposed for solar development. The project would not interfere with future construction of the wildlife bridge or bighorn sheep use of the bridge because the project would be located within flat areas approximately 0.8 mile or more from the proposed bridge location. The Epps Study also identified a second potential location for a wildlife bridge near Rasor Road that overlaps with the project ROW. Even in the absence of the project, it is unlikely that bighorn sheep would use a wildlife bridge in this location due to the absence of steeply sloped suitable habitat adjacent to the bridge.[28]

CDFW Mitigation Proposal.

The CDFW comment letter proposes mitigation to enhance bighorn connectivity between the South Soda Mountains and the North Soda Mountains.

One such measure is the installation of sheep guzzlers. As mentioned above, the Draft Conservation Plan for Desert Bighorn Sheep in California appears to recommend one or more water sources in the vicinity of overpass "D." CDFW's April 19 comment letter expands this concept by recommending a total of 6 water sources as mitigation for the project: 2 water sources on each side of the I-15 in the project area, a water source in the northern reach of the North Soda Mountains and another water source in the southern reach of the North Soda Mountains.

CDFW also proposes the construction of a costly I-15 wildlife overpass at either the northern or southern ends of the Soda Mountain valley.

However fitting CDFW's water source and highway overpass mitigation measures may be for restoring connectivity in the Soda Mountains, they are inappropriate mitigation for the project. As explained above, the project will not result in significant impacts to desert bighorn sheep connectivity. But, even if it did, and connectivity mitigation were in order, the measures proposed by CDFW are still inappropriate because they are designed to mitigate the pre-project

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> [T]here is a lack of steeper sloped habitat immediately adjacent to where the overpass would begin on the south side of the freeway. Currently, evidence of bighorn sheep use ends in steeper habitat about 1.5 km south of where the overpass would begin. In contrast, at location 2 [the Zzyxx road corridor] there is steep habitat right to where the overpass would begin and clear sign of current bighorn sheep use (observed February 2013) at the site where the overpass would begin and the adjacent habitat. Additionally, at this site there remain decades old bighorn sheep trails from many sheep crossing at this location prior to the construction of Interstate Highway 15. The abundant water on the east edge of the South Soda Mountains readily explains the historic high use of this crossing point. Sheep would have moved between this water and the North Soda Mountains frequently in summer.

Contrary to the assertion of CDFW in its comment letter, the project does not propose a new access road near the identified northern overpass site; it merely proposes using the existing road during construction.

[28] McKinney, Ted and Thorry Smith. 2007. US93 *Bighorn Sheep Study: Distribution and Trans-Highway Movements of Desert Bighorn Sheep in Northwestern Arizona: Final Report 576.* Prepared for Arizona Department of Transportation. January 2007.

adverse effects of the I-15 and other prior events, not the impacts of the project, and therefore do not meet the rough proportionality requirements of state and federal law.[29]

Conclusion.

We are of the opinion that the Soda Mountain Solar bighorn sheep report and this letter both provide ample evidence of why the Soda Mountain Solar project will not have a substantial adverse impact on desert bighorn sheep or substantially interfere with desert bighorn sheep connectivity. As such, the project does not present a significant impact under the commonly accepted significance thresholds of appendix G of the CEQA guidelines. This is primarily because the I-15 has already severely compromised connectivity in the Soda Mountains.

We have voluntarily incorporated two sheep guzzlers as design features of the project to help realize CDFW's desire to restore the long-term, regional well being of the species above and beyond our proportionate obligation. It is our opinion that paying for and strategically installing two guzzlers in the vicinity of the Soda Mountain Mountains will improve connectivity conditions over the existing baseline.

While we agree with the spirit of CDFW's comment letter, we urge you to carefully consider CDFW's project-specific recommendations (as well as our own analyses) in light of the appropriate environmental baseline.

Please do not hesitate to contact me regarding the above.

Sincerely,

Adriane E. Wodey
Manager
Soda Mountain Solar, LLC

[29] See fn. 2, above.

Figure 1: Bighorn Sheep Critical Linkages (CEC 2012)

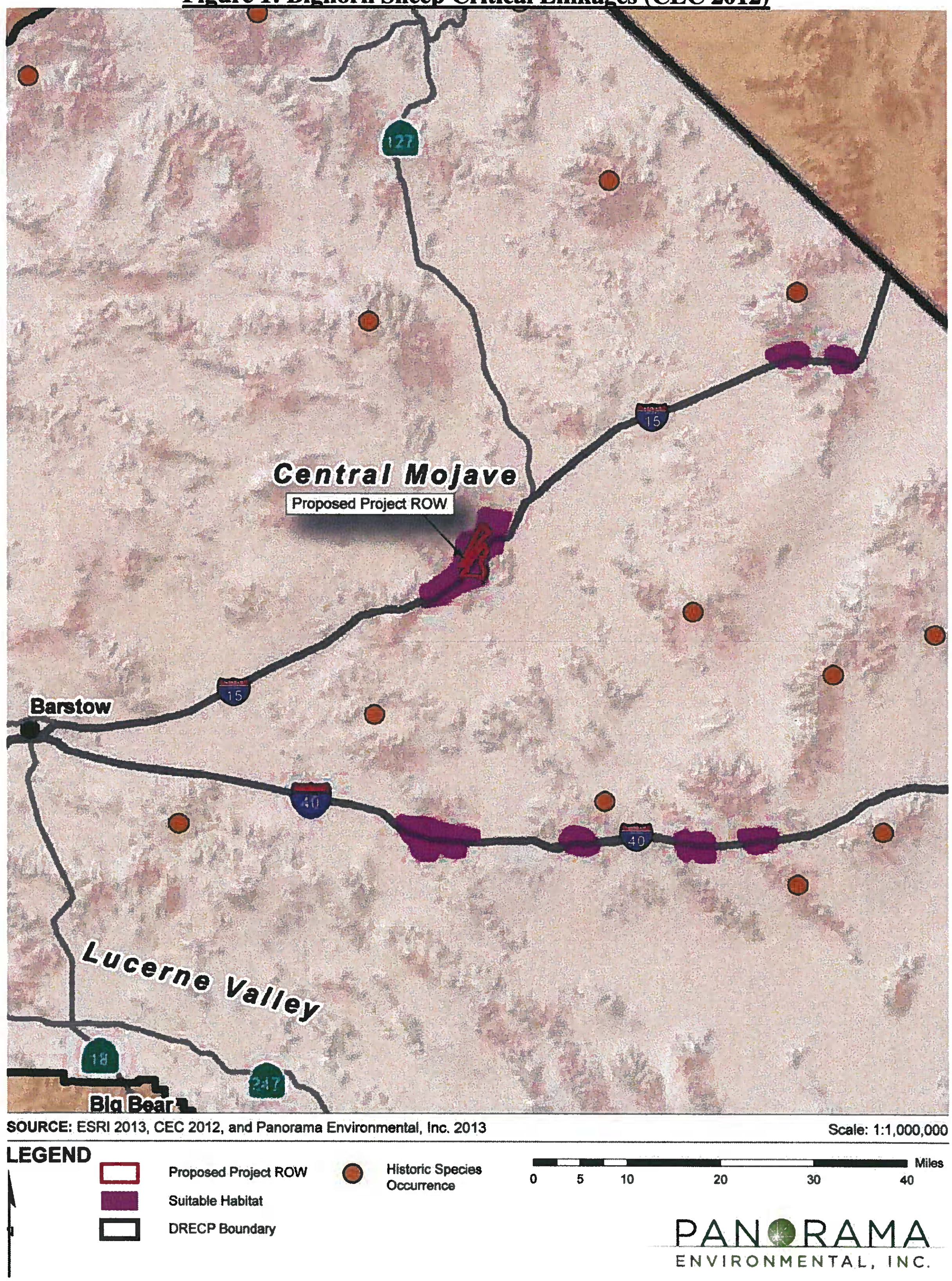

Figure 2: Bighorn Sheep Mountain Habitat (CEC 2012)

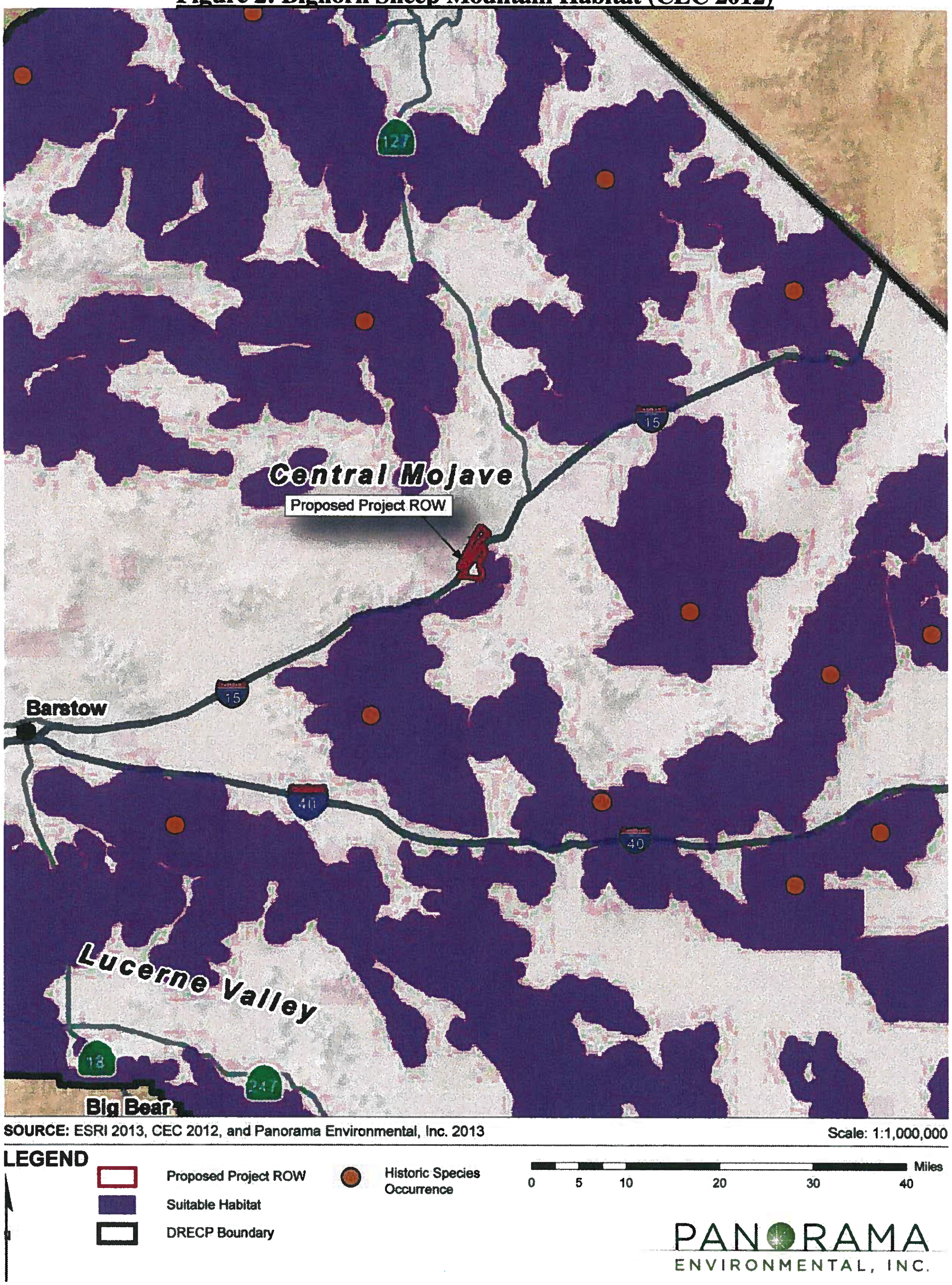

Figure 3: Bighorn Sheep Intermountain Habitat (CEC 2012)

Bighorn Sheep Survey Results and Analysis

Soda Mountain Solar Project

BLM Case No. CACA-49584

July 2013

PANORAMA ENVIRONMENTAL, INC.

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ENVIRONMENTAL, INC.

Bighorn Sheep
Survey Results and Analysis

Soda Mountain Solar Project
BLM Case No. CACA-49584

Submitted to:

United States Department of the Interior
Bureau of Land Management
California Desert District Office
22835 Calle San Juan De Los Lagos
Moreno Valley, CA 92553

Submitted by:

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PEER REVIEW

We would like to thank Art Davenport for his review and contributions to this report. Mr. Davenport has both regulatory and fieldwork experience with bighorn sheep. Mr. Davenport briefed the U.S. Fish and Wildlife Service Regional Director on the grounds for listing the Peninsular bighorn sheep prior to federal listing under the Endangered Species Act of 1973, as amended. Mr. Davenport wrote the final rule that resulted in the listing of the Peninsular bighorn sheep as endangered. In early 2009, Mr. Davenport was hired by SDG&E and initiated surveys and project monitoring for Peninsular bighorn sheep within the Sunrise Powerlink project area; these surveys and monitoring activities are ongoing. Mr. Davenport wrote the Peninsular Bighorn Sheep Monitoring Plan for the Sunrise Powerlink Project as well as a baseline report on Peninsular bighorn sheep within the Sunrise Powerlink project area.

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1 INTRODUCTION

1.1 REPORT PURPOSE

Soda Mountain Solar, LLC (Soda Mountain Solar), proposes to construct and operate a photovoltaic solar electric power generating facility in the Soda Mountain Valley, San Bernardino County, California. Nelson's bighorn sheep (*Ovis canadensis nelsoni*), a California fully protected species and a U.S. Department of the Interior, Bureau of Land Management (BLM), sensitive species, are known to occur in the project area and the adjacent South Soda Mountains.

This report presents a description of bighorn sheep habitat. This report also evaluates the potential for bighorn sheep to use the project area for grazing and migration, and identifies measures and practices that Soda Mountain Solar could implement to reduce project impacts to bighorn sheep.

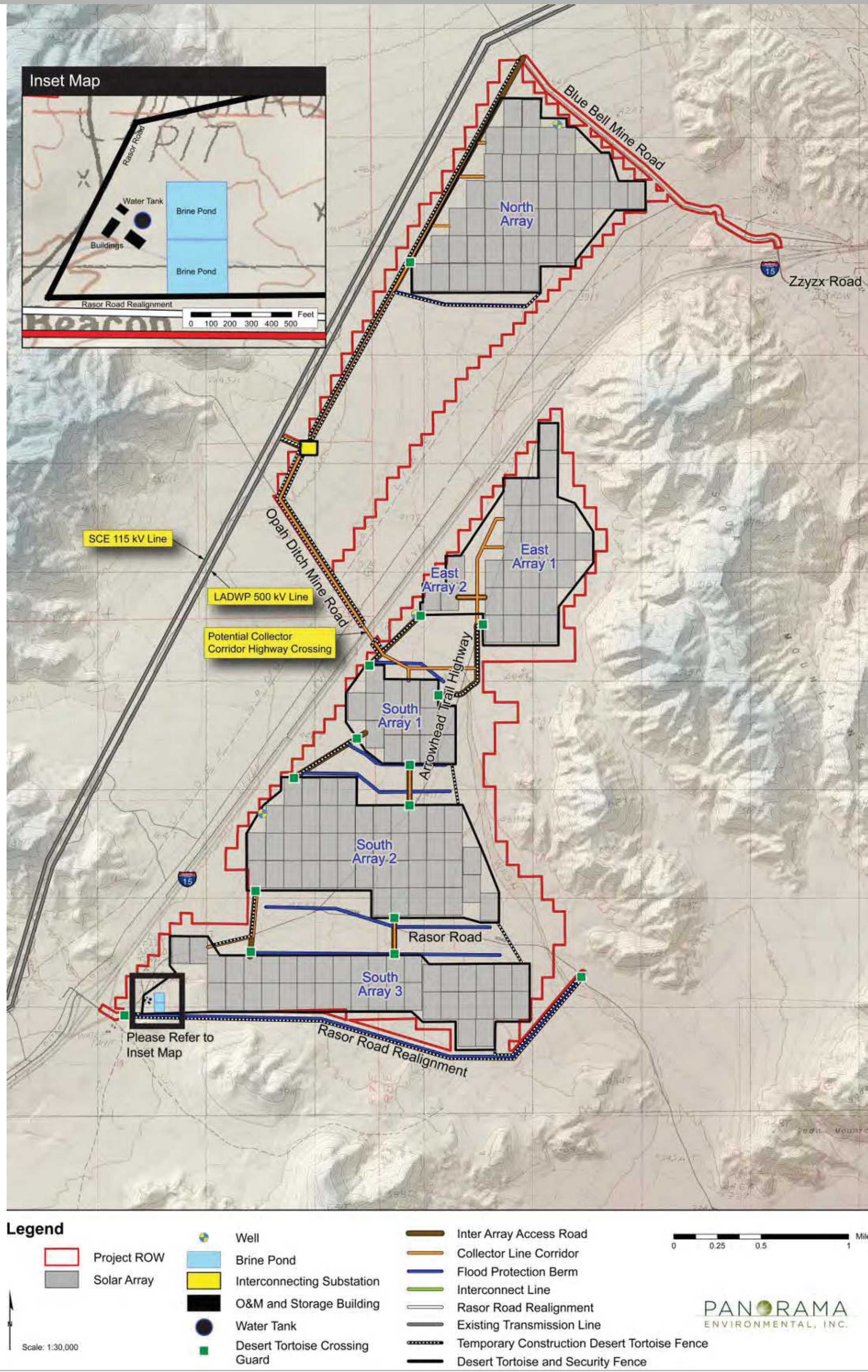
1.2 PROPOSED PROJECT AND LOCATION

1.2.1 Project Overview

The proposed Soda Mountain Solar Project (project) includes construction, operation, and decommissioning of a 350-megawatt photovoltaic solar electric power generating facility on federal land managed by BLM. The project is proposed by Soda Mountain Solar under BLM case number CACA-49584.

The solar arrays and associated infrastructure will occupy approximately 2,244 acres. The proposed BLM right-of-way (ROW) is approximately 4,179 acres (Figure 1.2-1). The project includes an interconnection to the City of Los Angeles Department of Water and Power (LADWP) Marketplace to Adelanto 500-kilovolt transmission line, which is adjacent to the proposed ROW.

Figure 1.2-1: Proposed Project



Construction

The project will be constructed in several stages over 24 to 30 months. Approximately 200 workers will be on site daily during project construction. Construction will include the following main elements and activities:

- Improvement of Rasor Road from I-15 to the main entrance of the facility; re-routing of the portion of Rasor Road that is located in the proposed South Array to provide continued access to the Rasor Off-Highway Vehicle (OHV) Area
- Clearing of vegetation from temporary laydown areas within the array areas
- Construction of operation and maintenance buildings
- Grading of some areas and removal and/or mowing vegetation within array areas
- Construction of foundations and mounts for the panel arrays, inverters, trackers, and medium-voltage transformers
- Well drilling, water storage, and water treatment
- Installation of the electrical collection system
- Solar panel assembly, mounting, commissioning, and energizing
- Grading and construction of the substation and switchyard for interconnection to the LADWP transmission line
- Final grading
- Installation of fencing around the arrays
- Restoration activities

Operation

Project operation will be managed from an operations and maintenance building at Rasor Road. There will also be security on site throughout project operation including nighttime security and monitoring personnel. Approximately 25 to 38 workers would be on site daily during routine operation of the facility.

Maintenance activities will include inspecting, repairing, and maintaining the arrays, tracking systems, and the supervisory control and data acquisition (SCADA) system, and washing panels once or twice per year. Additional maintenance will be required for the administrative buildings, fencing and signage, roadways, and other ancillary facilities at the site.

Decommissioning

The project will be decommissioned at the end of the operating period, which is anticipated to be 30 years. Upon decommissioning, aboveground structures will be dismantled and removed from the site. Where required, concrete pads or foundations will be demolished and rubble will be removed to an off-site disposal facility authorized to accept the waste. Belowground facilities may be disconnected at the surface and left in place in conformance with guidance from BLM.

1.2.2 Project Location and Setting

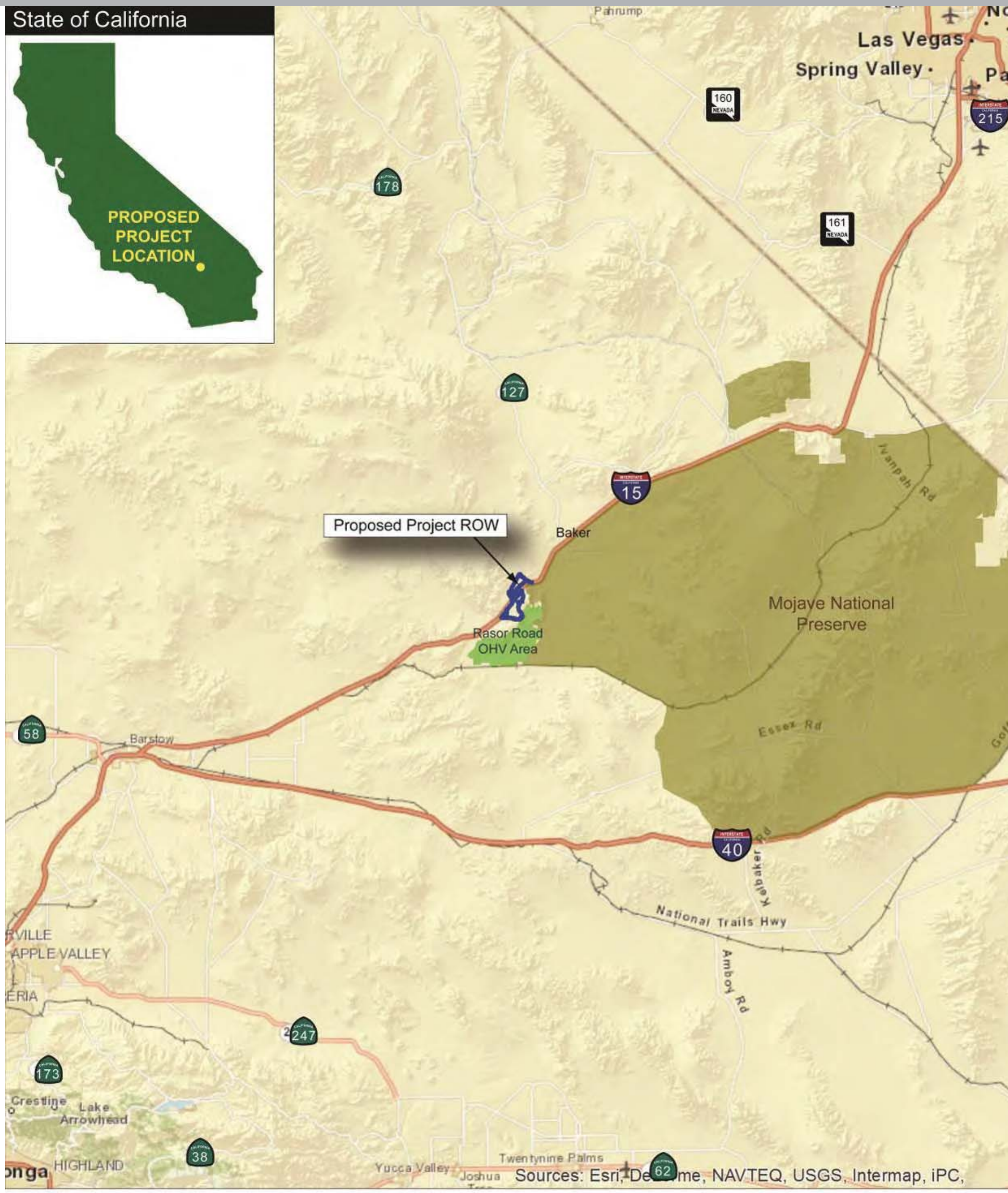
The project area is located approximately 6 miles southwest of Baker, California, on BLM-administered public lands northwest and southeast of Interstate 15 (I-15) in San Bernardino

County. The solar array areas will be accessed from I-15 at the Rasor Road and the Zzyzx Road exits. There is a Shell service station at the Rasor Road exit.

The project area is located on gently sloping alluvial fans within the Soda Mountains valley. The Soda Mountains are a horseshoe-shaped range surrounding the project ROW. The South Soda Mountains are located south of I-15, south and east of the project. The North Soda Mountains are located north of I-15, north and west of the project. Average annual precipitation in the project area is approximately 4.1 inches (WRCC 2013). Elevations within the project site range from 1,250 to 1,600 feet. Vegetation communities on the project site include creosote bush-white bursage scrub, creosote bush scrub, cheesebush scrub, smoke tree woodland, and unvegetated developed and disturbed areas (CSESA 2013). The proposed project will occupy approximately 18 percent of the 12,000-acre valley.

Portions of the project area are located within a federal utility corridor designated under Section 368 of the Energy Policy Act of 2005. The northwestern portion of the project area (northwest of I-15) is bounded by Blue Bell Mine Road, two transmission lines, mining areas, pipelines, and fiber optic lines. The southeastern portion of the project area (southeast of I-15) is bounded by Rasor Road, I-15, and the Rasor OHV area. The Mojave National Preserve is located east of the project area, following the crest of the South Soda Mountains (Figure 1.2-2).

Figure 1.2-2: Project Location



SOURCE: ESRI 2013 and Panorama Environmental, Inc. 2013

Scale: 1:1,250,000

LEGEND

Proposed Project ROW

0 20 40 Miles

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2 METHODS

Habitat, use, and connectivity for bighorn sheep in the project area and surrounding regions were evaluated through:

- Conferral with experts
- Literature search
- Field surveys
- Geographic information system (GIS) analysis

2.1 CONFERRAL WITH EXPERTS

BLM, the California Department of Fish and Wildlife (CDFW), and additional scientists, volunteers, and experts were contacted to discuss bighorn sheep behavior, use of the project area, and potential impacts associated with the proposed project. The following individuals were contacted:

Chris Otahal	BLM, Barstow Field Office, Barstow, California
Ted Weasma	National Park Service, Mojave National Preserve, Barstow, California
Regina Abella	CDFW, Bighorn Sheep Coordinator, Sacramento, California
Andrew Pauli	CDFW, Inland Deserts and Eastern Sierra Region, Apple Valley, California
Bob Burke	Society for the Conservation of Bighorn Sheep, Barstow, California
George Kerr	Society for the Conservation of Bighorn Sheep, Pasadena, California
Jack Tuner, Ph.D.	Sam Houston State University, Huntsville, Texas
John Wehausen, Ph.D.	UC White Mountain Research Station, Bishop, California
Arthur Davenport	Wildlife Biologist, Barstow, California

BLM comments on the initial Plan of Development for the project indicated that Soda Mountain Solar would be required to conduct a study of Nelson's bighorn sheep in the area. Neither BLM nor CDFW has a survey protocol for bighorn sheep.

The experts contacted were provided information pertaining to the project, including a map showing the project area in relation to the surrounding mountains and manmade features (e.g., I-15 and culverts), and a description of the project size and location. Topics discussed include the following:

- Project location and general scale
- Bighorn sheep habitat and use of the project area
- Typical migration patterns in the project region
- Suitability of I-15 underpasses for bighorn sheep use
- Previous sightings of bighorn sheep in the project area or vicinity
- Existing efforts to monitor bighorn sheep habitat use or migration
- Potential effects of the proposed project on bighorn sheep
- Suggested measures to avoid or mitigate adverse effects to sheep

2.2 LITERATURE SEARCH

Literature pertaining to bighorn sheep habitat requirements, migration habits, and the Mojave Desert population of bighorn sheep were reviewed. Documents reviewed and referenced included scientific journal articles, agency publications, and survey reports for the Soda Mountain area. References are included in Section 7 of this report.

2.3 FIELD SURVEYS

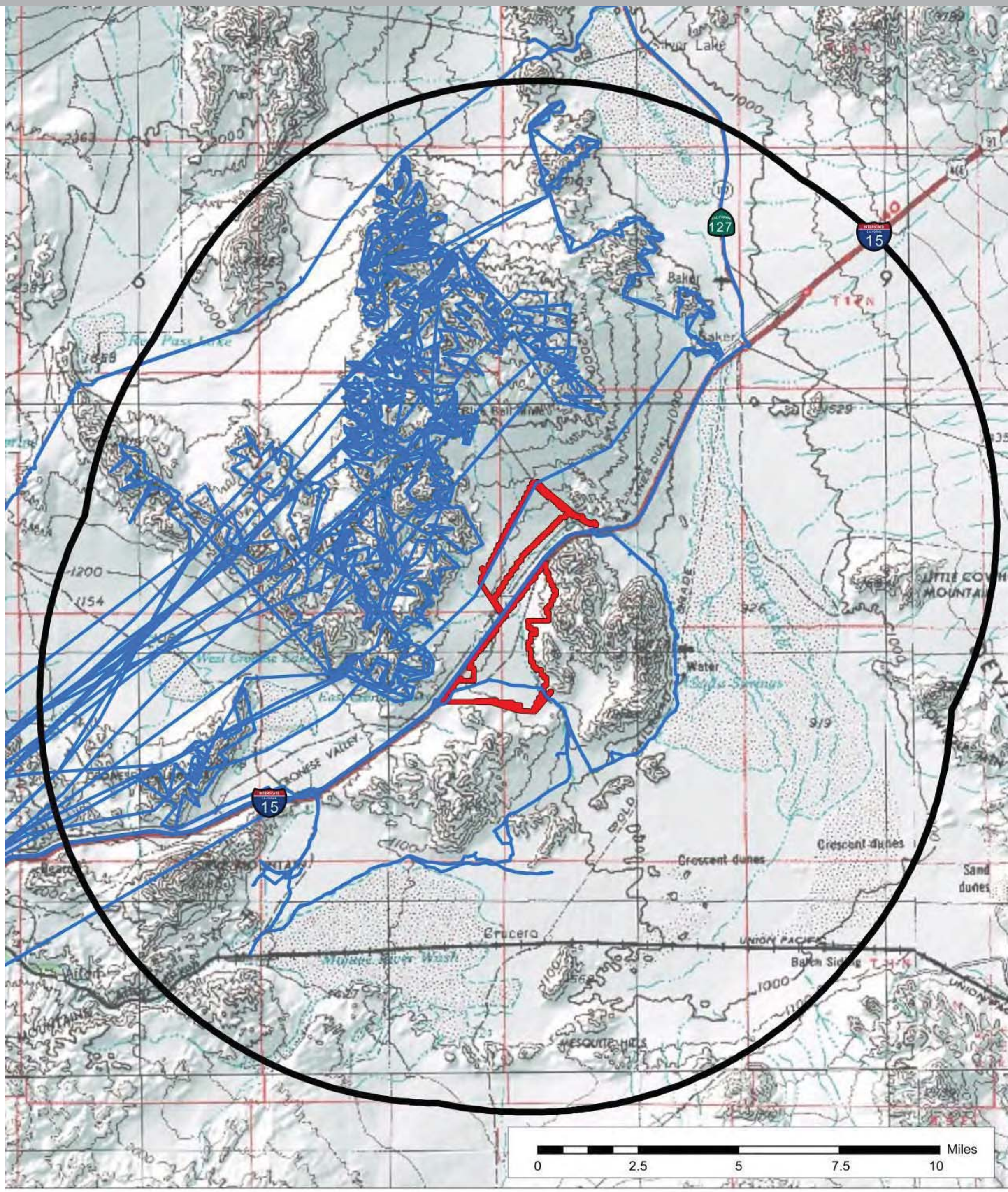
2.3.1 Soda Mountain Solar Surveys

Bighorn sheep surveys were conducted in the vicinity of the project area by BioResource Consultants (BRC) in spring 2011. BRC conducted surveys for golden eagles and bighorn sheep within a 10-mile radius of the project area, including the North Soda Mountains and Cady Mountains, as shown on Figure 2.3-1. The survey protocol was discussed with Regina Abella of CDFW, who requested that aerial surveys avoid the South Soda Mountains to prevent helicopters from flying over the area during the lambing season.

Aerial surveys consisting of six 2-hour flights were conducted on March 21 and 22, 2011, and May 9, 2011. The aerial surveys covered the canyons north of I-15 in the North Soda Mountains. The surveyors made contouring passes at different elevations to fully cover tall cliffs and long, steep slopes. Biologists scanned for any movement, sign, or habitat characteristics (e.g., water sources) that might accommodate or predict the presence of desert bighorn sheep. Data collected during the surveys included numbers of animals, age of animals and herd composition, general behavior, location, and habitat, as feasible (BRC 2011).

BRC conducted ground surveys for golden eagles and bighorn sheep on March 23 through March 25, 2011, and May 10, 2011, in areas of the search polygon excluded from the aerial surveys. The biologists performed the surveys using a four-wheel-drive vehicle and on foot. They drove or hiked to observation points that provided panoramic views of the mountains.

Figure 2.3-1: Bighorn Sheep Survey Locations



SOURCE: ESRI 2013, BRC 2011, and Panorama Environmental, Inc. 2013

Scale: 1:250,000

LEGEND

- Proposed Project ROW
- BRC Survey Routes
- 10 Mile Buffer

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They also drove along the transmission line ROW that passes diagonally through the search area. Observations were made with 10x40 binoculars and a tripod-mounted or window-mounted 20-60x spotting scope. Observations began at dawn to avoid heat waves, which interfere with optics. The first ground survey was performed over a total of 18.75 hours over three days. A follow-up survey was conducted on May 10, 2011, and involved observing the territory previously covered during the first survey and duplicating the route of that survey (BRC 2011).

Biologists conducting desert tortoise, avian, and botanical field surveys for the project in spring 2009 and fall 2012 documented general wildlife observations including bighorn sheep; however, the surveys were not focused on bighorn sheep (URS 2009a; Kiva Biological 2012; CSESA 2012).

Arthur Davenport conducted a 2-day site reconnaissance on February 11 and 12, 2013, to assist in identifying sheep habitat suitability, potential use of the project area and potential sheep movement routes. The Soda Mountain valley and the surrounding Soda Mountains were assessed for bighorn sheep habitat suitability. The assessment included portions of the valley outside of the project ROW including the alluvial fans and Blue Bell Mine, located north of the ROW. Potential bighorn sheep travel routes were assessed from the Cave Mountains, Cronese Mountains, North Soda Mountains, South Soda Mountains, and Rasor Road along both sides of I-15.

2.3.2 CDFW Surveys

CDFW conducted a survey for bighorn sheep on April 30 and May 1, 2012, in the South Soda Mountains, near Zzyzx Spring (located on the west side of Soda Lake and accessible by Zzyzx Road). Surveyors counted all sheep that could be located on the east side of the range in the vicinity of water. Three groups of biologists explored areas not visible from the Zzyzx access road. One group climbed from the Desert Studies Center to the main ridge top above the road and followed the ridge north. Another group ascended a wash northwest of the main ridge and climbed into a separate section of the range. The third group searched farther south of the field station along the main ridge. Surveyors documented the location, number of sheep, class, and gender at each sheep siting (Abella 2012a).

CDFW installed four game cameras at the Opah Ditch and Zzyzx Road underpasses of I-15 in August 2012 (Burke 2012). Data have been downloaded from the cameras and analyzed regularly by CDFW since August 2012 (Abella 2013c).

2.3.3 General Wildlife Surveys

Spring and fall avian point counts (URS 2010), desert tortoise surveys (URS 2009b) were conducted in the project area and surrounding portions of the Soda Mountain Valley in spring and fall 2009. Desert tortoise surveys (Kiva Biological 2012; Kiva Biological 2013) and floristic surveys (CSESA 2012; CSESA 2013) were also performed in 2012 and 2013.

2.4 GIS ANALYSIS

The 1-15 underpasses and culverts near the project area were analyzed and experts were conferred with to determine whether the underpasses could be used by bighorn sheep for passage under I-15. The GIS analysis included identifying the locations of underpasses and culverts using Google Earth aerial photography, sizing of underpasses and culverts using Google Earth's street view function, and measuring the distance between underpasses/culverts and the base of nearby mountains using ArcGIS 10.

A viewshed analysis was conducted using ArcGIS 10 to identify the aerial extent of nearby areas where the project could be viewed by bighorn sheep. RMT, Inc. used the ArcGIS 10.1 observer points tool, which identified array areas that would be visible from the surrounding mountains using elevation data from the U.S. Geological Survey digital elevation model (DEM) at 10-meter resolution. Bighorn sheep height was specified at 1 meter and the array heights were specified at 2 meters to evaluate visibility at each observation point.

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3 HABITAT

3.1 MOUNTAIN HABITAT

Bighorn sheep populations in the desert are generally found above the desert floor, near or in steep, rocky mountainous areas and commonly on slopes of 10 percent or greater (Wehausen 2006). Bighorn sheep prefer visually open areas without dense vegetation, which presumably helps in avoiding predators (Geist 1971). The open mountainous terrain allows bighorn sheep to detect predators from a great enough distance to allow them to seek refuge (Geist 1971; Wehausen 2006; Turner 2010). Habitat use patterns also change according to needs arising after the breeding season. Males and females frequently use different habitat after breeding season. Females will occupy steep, safer areas to bear and rear lambs, at times migrating to other mountain ranges (Wehausen 2006). Males will occupy less steep habitat (Wehausen 2006).

3.2 FORAGING HABITAT

Bighorn sheep can feed on and digest a wide variety of plant material but they seem to prefer green, succulent grasses and forbs located in areas close to escape cover (i.e., steep, open topography) (Davenport 2013a). Their diet changes with season and geography due to natural changes in forage quantity and quality (Wehausen 2006).

Rolling terrain and washes act as a vital source of forage that becomes even more important in summer and at times when forage is otherwise limited (USFWS 2000). Alluvial fans and washes are important late winter, spring, and summer habitat after rain events, particularly for lactating ewes during the lambing season, because they provide excellent forage (USFWS 2000). As the lambs grow and gain strength within their first year, they accompany ewes onto the alluvial fans during foraging episodes (Davenport 2013a). Alluvial fans typically have more productive soils that support more vegetation than do rockier areas (USFWS 2000), and provide a source of high-quality forage. Habitat within 0.5 mile of the 20 percent slope is most frequently used for foraging (USFWS 2000). CDFW has recommended avoidance of areas within 0.25 mile of the 10 percent slope to reduce impacts to bighorn sheep foraging habitat (Hawk 2013). Desert bighorn sheep have been observed using foraging habitat up to 1.6 miles away from escape cover on alluvial fans and valley floors (Davenport 2013a; USFWS 2000). Flat terrain provides temporary access to resources such as water, forage, and/or lambing habitat in neighboring areas.

3.3 WATER REQUIREMENTS

Water is an important resource for bighorn sheep (Jones et al. 1957; Blong and Pollard 1968; Leslie and Douglas 1979; Turner and Weaver 1980; Elenowitz 1984; Cunningham and Ohmart 1986). During the summer, desert bighorn sheep will generally frequent areas near water, with most animals occurring within 2 to 3 miles of the water source (Jones et al. 1957; Leslie and Douglas 1979; Cunningham and Ohmart 1986).

A study in Arizona found that desert bighorn sheep resided within 1.24 miles of a perennial water source 95 percent of the time (Bristow et al. 1996). Ewes were less likely than rams to travel more than 1.24 miles from a water source (Bristow et al. 1996). Lactating ewes and lambs are often more dependent on water and may, therefore, be found near water on a more regular basis (Blong and Pollard 1968; Leslie and Douglas 1979; Bleich et al. 1997).

Rainfall within a particular geographic area varies seasonally and ultimately affects water resource requirements of desert bighorn sheep. During periods of high rainfall, the distribution of bighorn sheep is less dependent on the location of perennial water sources (Leslie and Douglas 1979). The most important water sources are close to terrain that provides a suitable escape route (i.e., steep, rugged terrain with open visibility) (USFWS 2000). Bighorn sheep will live in areas with water sources during the summer, when rainfall is lower, and move away from water sources and expand their ranges in the winter, when rainfall is higher (Zeiner et al. 1990). Some small populations of bighorn sheep occur where perennial water is absent (Krausman and Leopold 1986; Broyles 1995), but water is generally a limiting factor for bighorn sheep population size and dispersal.

3.4 ADAPTATION TO HUMAN ACTIVITY

Bighorn sheep are considered a "wilderness animal" because "they do not thrive in contact with human development" (USFWS 2000). The response of bighorn sheep to humans varies widely and is dependent on factors that include (USFWS 2000):

- Activity type
- Previous exposure to humans
- Sheep group size and/or composition
- Elevation and location of sheep relative to the human activity
- Proximity to adequate escape terrain

Ewes with lambs are usually more sensitive to disturbance than are rams (USFWS 2000). Bighorn sheep are more sensitive to human disturbance during spring and fall (lambing and rutting seasons). Ongoing construction activities have caused abandonment of lambing habitat (USFWS 2000).

Effects of human activity on bighorn sheep have been studied in the habitat of the Peninsular population of the species, which occurs within the Peninsular Ranges along the Pacific coast. Activity adjacent to roads and trails can deter sheep from these areas even when the area appears to be suitable habitat (USFWS 2000). Recreational activities, such as hiking and OHV use, can disrupt normal resource use (USFWS 2000). Studies have found a 50 percent reduction in use of important watering holes on days when there was off-road vehicle traffic or avoidance of waterholes when there were audible motorcycles nearby (USFWS 2000). Use of springs by humans reduced bighorn sheep use of those springs (USFWS 2000). The South Soda Mountains population of bighorn sheep regularly uses multiple springs on the east side of the South Soda Mountains. The spring area (Zzyzx) provides freshwater and green forage. The sheep are typically observed in the hottest months of the year (April to November) but also use the area in winter during dry periods. The Desert Studies Center and Zzyzx Road are located near the springs. The sheep "are very habituated to people" (Abella 2012a).

One study concluded, however, that "bighorn sheep coexist best with people when human activity in sheep habitat is predictable" (Schoenecker and Krausman 2002).

3.5 HABITAT IN THE PROJECT AREA AND VICINITY

3.5.1 Population Groups

There are 69 discrete bighorn sheep population groups documented within the Mojave Desert (Bare et al. 2009). Ranges of the population groups are shown on Figure 3.5-1. The Mojave population of Nelson's bighorn sheep is divided into three metapopulations[1]: north, central, and south. The metapopulations are separated by the I-15 and I-40 highways (Wehausen 2006). The project area is located within the Central Mojave metapopulation area and is located within the range of the Soda Mountains population on Figure 3.5-1. The South Soda Mountain population consisted of 51 to 100 sheep in 2012 (Abella 2012a).

Nearby populations include the Cady Mountains population (Figure 3.5-1), which contained approximately 174 sheep in 2010 (CDFW 2011). The Kelso/Old Dad Mountain population to the east of the project area consisted of 179 sheep as of 2009 (CDFW 2011). There is also a population of 51 to 100 bighorn sheep in the Avawatz Mountains (Wehausen 2006) located approximately 20 to 30 miles north of the project area. The locations where bighorn sheep were previously observed in the Cady Mountains and Avawatz Mountains are shown on Figures 3.5-2 and 3.5-3, relative to the project area.

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[1] A metapopulation occurs "where populations in each mountain range are largely demographically independent and extinction and re-colonization are common" (Epps et al. 2006).

Figure 3.5-1: Bighorn Sheep Populations

Figure 3.5-2: Bighorn Sheep Intermountain Habitat (CEC 2012)

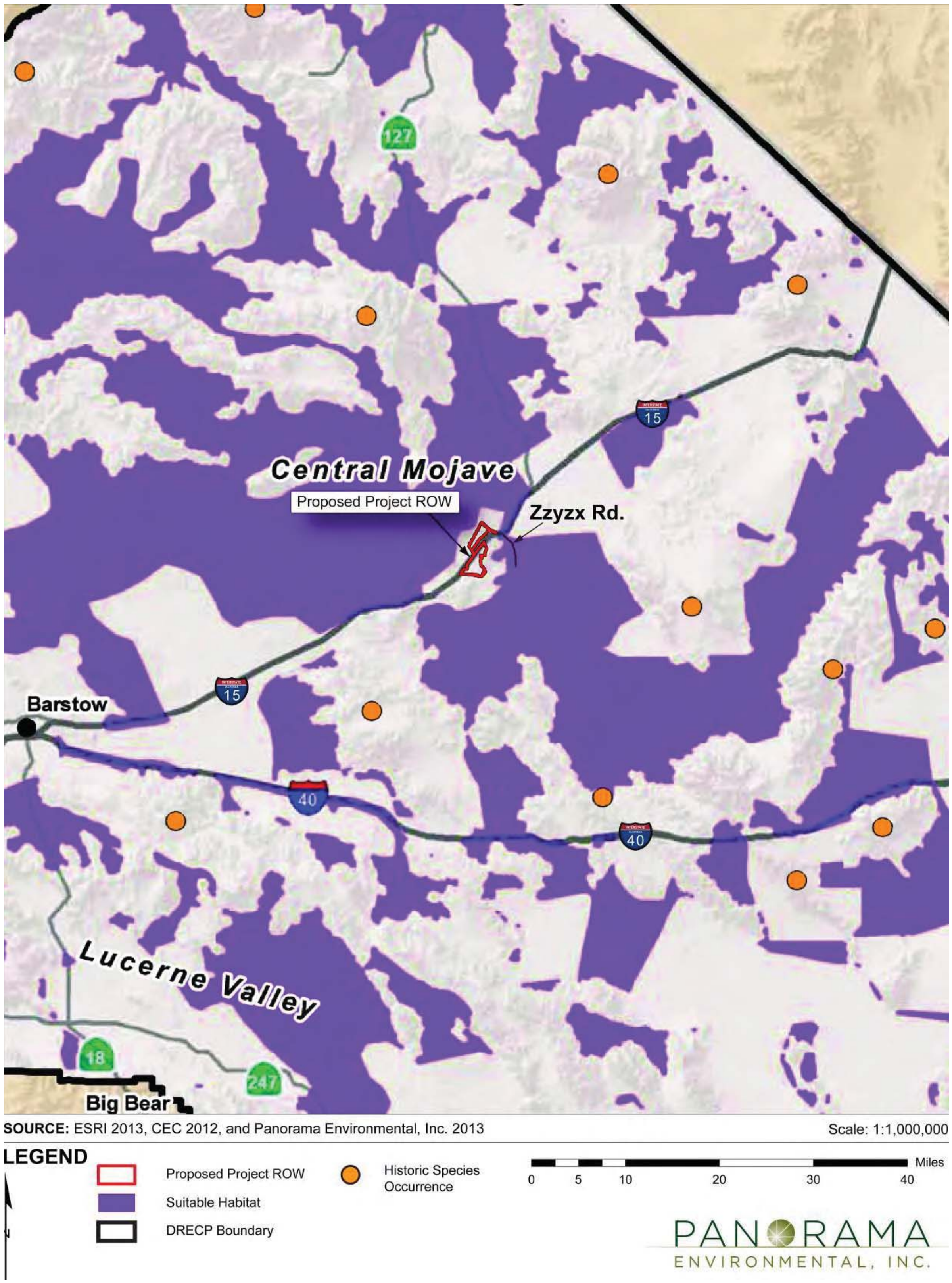
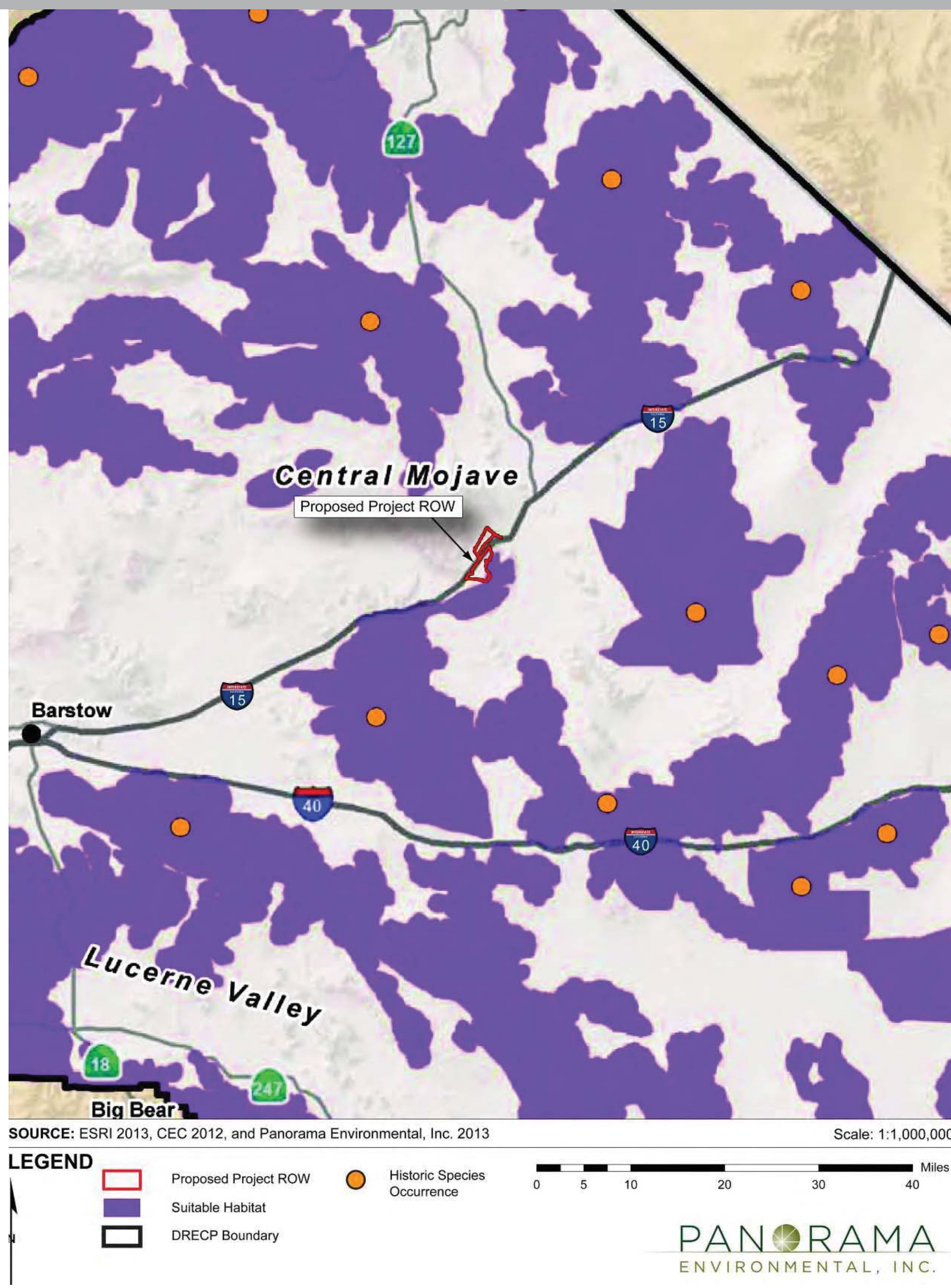


Figure 3.5-3: Bighorn Sheep Mountain Habitat (CEC 2012)



SOURCE: ESRI 2013, CEC 2012, and Panorama Environmental, Inc. 2013

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3.5.2 Habitat Suitability

Habitat Suitability Models

The Desert Renewable Energy Conservation Plan (DRECP) "Updated Expert Species Models" provides the results of bighorn sheep habitat modeling (CEC 2012). Figures 3.5-2 and 3.5-3 show the model results for intermountain and mountain habitat, respectively. Model results indicate the project area, which is located in a valley between mountains, is neither intermountain nor mountain habitat. Modeled bighorn sheep mountain habitat is located south and east of the project area within the South Soda Mountains. The model results did not identify mountain habitat in the North Soda Mountains (located north and west of the project area).

Project Area Habitat Suitability Analysis

Mountain Habitat

Approximately 2,238 acres of the 2,244-acre area of project development, including the area for access roads and the substation and switchyard, is not bighorn sheep mountain habitat based on the following characteristics:

- Flat terrain (2 to 4 percent slope)
- No steep, rocky slopes
- Open area, vulnerable to predators
- No perennial water source within 3 miles
- No limestone outcrops

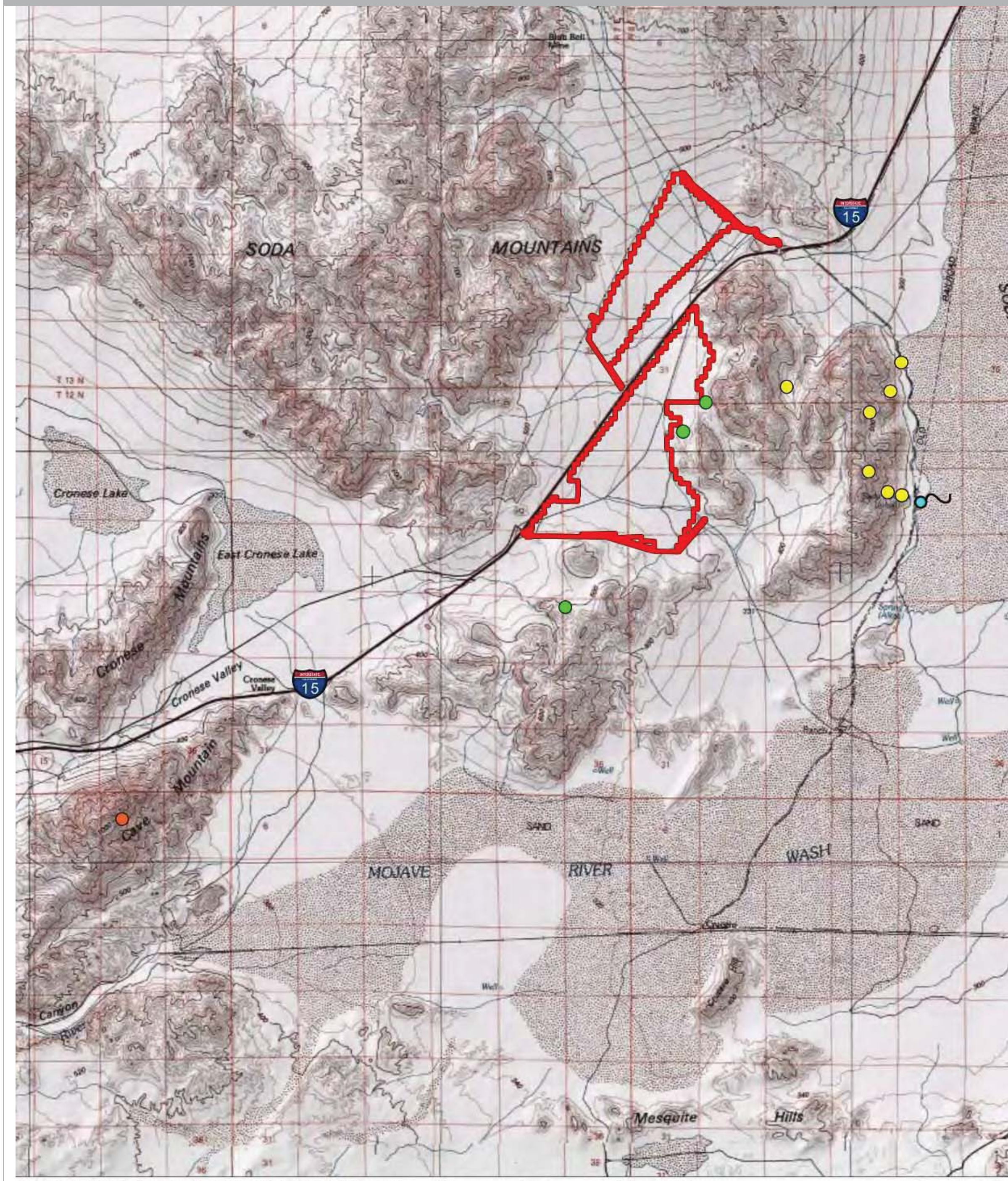
Bighorn sheep are unlikely to occupy the solar array area for long periods of time (i.e., more than for foraging or migration) (Kerr 2010; Pauli 2010; Turner 2010). Bighorn sheep usually avoid large, open areas and rely on them only for food and water following heavy rains or as seasonal migration routes (Kerr 2010).

Approximately 116 acres of the project ROW near the Rasor Road service station contains mountain habitat (i.e., 10 percent slope or greater). The operations and maintenance facility, water storage tank, and reverse osmosis facility would occupy approximately 6 acres of this mountain habitat. The area is also close to the highway, Rasor Road service station, and Rasor Road, all of which experience a high level of human activity. There is evidence of human use including numerous OHV tracks and debris within the 6-acre area. There is no evidence of bighorn sheep use of this part of the ROW. The nearest sign of bighorn sheep use is approximately 1.25 miles southeast of the proposed operations and maintenance facility and 1 mile south of the service station (Figure 3.5-4). Bighorn sheep tend to avoid humans, and would not be expected to permanently reside in this area of the ROW due to the high level of human activity and absence of a nearby perennial water source.

Foraging Habitat

Approximately 610 acres of the project area occurs on alluvial fans within 0.5 mile of the 20 percent slope and provides suitable foraging habitat for bighorn sheep during the late winter, spring, and early summer (Davenport 2013b; USFWS 2000). Bighorn sheep may forage for green vegetation on the alluvial fans within the project area after rainfall (Kerr 2010). Two bighorn

Figure 3.5-4: Bighorn Sheep Locations



SOURCE: ESRI 2013, BRC 2011, CDFW 2012, Kiva 2012, and Panorama Environmental, Inc. 2013

Scale: 1:150,000

LEGEND

- Proposed Project ROW
- Zzyzx Spring
- BRC Bighorn Sheep and Golden Eagle Nest Location
- CDFW Bighorn Sheep Location
- Kiva Bighorn Sheep or Sign

0 1 2 3 4 Miles

N

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sheep were observed foraging on the alluvial fans located at the north end of the East Array area, south of I-15 in February 2013 (Davenport 2013b).

Mountains Adjacent to Project Area

The South Soda Mountains provide suitable bighorn sheep mountain habitat, as shown on Figure 3.5-3 and are occupied by bighorn sheep. Bighorn sheep sign and trails were identified within mountain habitat areas during surveys in 2012 (Abella 2012a; Kiva Biological 2012). The water bodies at Zzyzx Spring provide a perennial water source for the bighorn sheep population in the South Soda Mountains.

The North Soda Mountains (north and west of the project area) may also provide suitable mountain or intermountain habitat for bighorn sheep as shown on Figures 3.5-2 and 3.5-3. The North Soda Mountains are not known to be occupied by bighorn sheep but could become occupied habitat in the future through recolonization by populations currently occupying the South Soda Mountains, Cady Mountains, or Avawatz Mountains (Davenport 2013b). The Avawatz Mountains population of bighorn sheep is located approximately 20 to 30 miles north of the project area.

CDFW identifies the range of the Soda Mountains population to include the Soda Mountains both north and south of the project area, as well as the Soda Mountain valley (Figure 3.5-1). The range identified by CDFW includes the full species range and does not appear to be adjusted for anthropogenic disturbance that may have fragmented or reduced the historical range size. The range size of the Soda Mountains population has been reduced by the I-15 highway, which has altered and/or impaired historical habitat access and use (Epps et al. 2007; Epps et al. 2013).

3.5.3 Survey Results

Soda Mountain Solar Surveys

SMS commissioned surveys for Nelson's bighorn sheep in the Soda Mountains in 2011 (BRC 2011). Biologists observed two desert bighorn sheep in March 2011 moving down a ravine approximately 8 miles southwest of the project area in the Cave Mountains (BRC 2011). No bighorn sheep were identified in the west or north Soda Mountains during surveys in 2004 or 2011 (Epps et al. 2005; BRC 2011).

Five bighorn sheep and bedding sites were observed on the slope east and south of the project area during a survey for desert tortoise in October 2012 (Kiva Biological 2012). Areas where bighorn sheep were identified during surveys are shown on Figure 3.5-4. Three adult ewes were also observed foraging within and adjacent to the north end of the East Array area south of I-15 during an investigation in February 2013 (Davenport 2013b).

2012 CDFW Survey Results

A total of 47 sheep in seven groups were identified within the South Soda Mountains during the 2012 CDFW survey (Abella 2012a). The population is estimated to consist of approximately 51 to 100 sheep. Survey results are presented in Table 3.5-1. At the time of the surveys, the animals were located on the east side of the South Soda Mountains close to Zzyzx Spring. Because of the presence of perennial water, there are frequent sightings of bighorn sheep near the Desert Studies Center at Zzyzx Spring. The elevations above where the sheep were seen in the South Soda Mountains had little sign of recent use by bighorn sheep (Abella 2012a). It appears that the eastern portion of the South Soda Mountains, where most of the sheep were seen, is occupied primarily by females and associated younger sheep in the spring. Given that few adult males were seen, and that there are likely additional males present in the group, this population can be projected to fall into the 51 to 100 population size category (Abella 2012a). Habitat conditions in the South Soda Mountains are highly suitable for bighorn sheep because of the presence of a year-round water source at Zzyzx Spring and steep slopes and limestone outcrops for lambing habitat. Locations where bighorn sheep have been observed are shown on Figure 3.5-4. CDFW has analyzed data from game cameras that were installed in August 2012 at the two largest I-15 underpasses in the Soda Mountain Valley. No bighorn sheep have been observed to date.

Table 3.5-1: CDFW 2012 Survey Results

Type		Count
Adult, female		26
Adult, male	Class II	3
	Class III	2
	Class IV	1
Yearling, female		3
Yearling, male		7
Lamb		5
Total		*47*

Source: Abella 2012a

3.5.4 Other Observations

Sightings

There is anecdotal evidence of bighorn sheep in and near the project area. One or more bighorn sheep sightings have been reported in the following areas:

- Between Basin Road and Zzyzx Road approximately 300 feet east of I-15 (Burke 2012)
- West of I-15 near Rasor Road (Burke 2012)
- West of I-15 near the Zzyzx Road interchange (Otahal 2010)
- On the ridge southeast and above the Zzyzx Road interchange (Weasma 2012)

Bighorn scat was observed in the North Soda Mountains by Glen Sudmeier and reported to CDFW (Abella 2013b).

Mortality

Bighorn sheep mortality has been documented in the region. Caltrans reported a bighorn sheep death (suspected adult ram) in 2010 at Post Mile 113 of southbound I-15 (Kopulsky 2013). This area is approximately 3 miles north of Afton Canyon and approximately 9 miles south of the ROW area at Rasor Road.

There have been at least three mortalities near the Desert Studies Center in the past 7 years. A female bighorn sheep was found approximately 30 feet away from Zzyzx Road; the cause of death was undetermined (Abella 2013a). Two lambs were reported to have drowned in Zzyzx Spring (Abella 2013a).

Arctos Database[2]

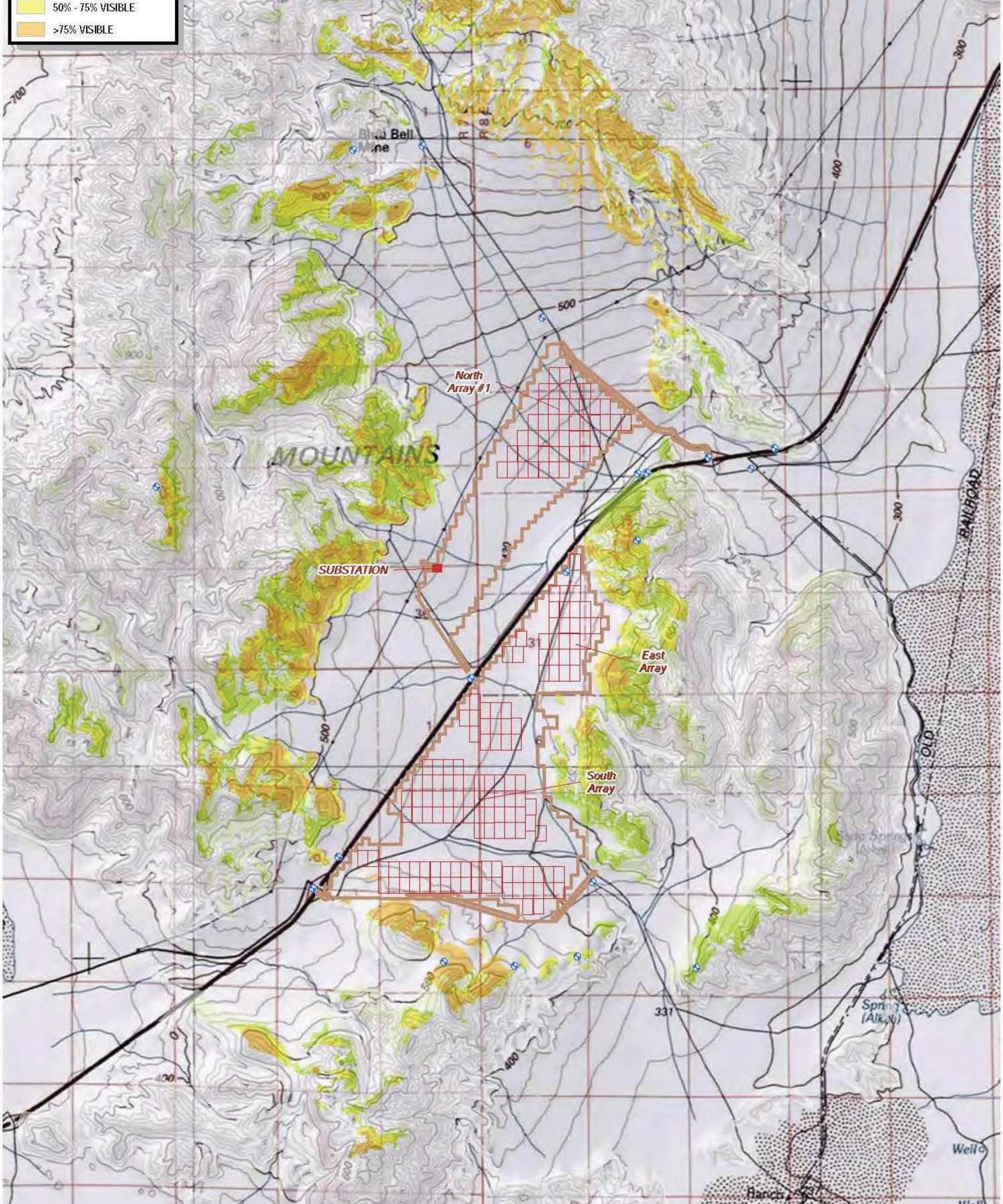
No museum specimens have been collected in the project area or immediate vicinity (Arctos 2013).

3.6 VIEWSHEDS

The viewshed analysis (Figure 3.6-1) indicates that the solar arrays would be visible from 11.6 percent of the mountainous area within a 2-mile analytical boundary surrounding the project area. In general, the project area is visible from the slopes of the Soda Mountains that face the project area (i.e., northwest face of South Soda Mountains and south face of North Soda Mountains).

The solar arrays would not be visible from the canyons present throughout the surrounding mountains. In addition, many mountain ridges block the direct line-of-sight view of the solar array fields from other nearby ridges. The project site is not visible from the east face of the South Soda Mountains, near Zzyzx Spring.

[2] Arctos is a museum collection management information system that includes specimen records, observations, tissues, parasites, field notes and media.



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NO.	DATE	REVISION	BY	CHK'D	APV'D

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SODA MOUNTAIN SOLAR PROJECT SAN BERNARDINO CO., CA

ALL PROJECT ELEMENTS

PROJ. NO. | DWG. NAME 06748_Viewshed_20130510.mxd | SHT NO. FIGURE 6

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4 CONNECTIVITY

4.1 BIGHORN SHEEP DISPERSAL

4.1.1 Typical Dispersal Patterns

Male bighorn sheep typically have an average home range size of approximately 9.8 square miles and ewes typically have an average home range size of approximately 7.8 square miles (USFWS 2000). Bighorn sheep establish and use trails to migrate through areas; the trails provide the sheep with familiar paths and known escape routes (Kerr 2010).

Bighorn sheep migrate throughout the Mojave Desert, sometimes traveling long distances (particularly males), and generally move through mountains (Penrod et al. 2012). Intermountain movement can also occur across relatively flat terrain, although it is less common (Penrod et al. 2012; Wehausen 2006). Topography is a significant factor in bighorn sheep dispersal and gene flow. The presence of flat terrain (less than 10 percent slope) between bighorn populations is negatively correlated with gene flow (i.e., transfer of genes from one population to another through reproduction). "[B]ighorn sheep prefer to travel over sloped terrain offering security from predators" (Epps et al. 2007). Bighorn sheep have been documented moving large distances to colonize new populations or to seek a mate (Bare et al. 2009). The longest documented travel distance for a ewe is approximately 18.6 miles, whereas the longest distance for a male is 34.8 miles (Penrod et al. 2012).

4.1.2 Impacts of Highways on Dispersal and Population Composition

Interstate highways typically serve as barriers to bighorn sheep connectivity (Turner 2010), although sheep sometimes cross highways. Frequent traffic can make sheep, particularly ewes, reluctant to cross roads, and crossing exposes the sheep to mortality (USFWS 2000). Roads have reduced long-term population viability when they bisect the range of a bighorn sheep population group (USFWS 2000). Epps et al. (2005a) used genetic studies to evaluate the impact of anthropogenic barriers such as highways, urban development, large mining operations, and canals on bighorn sheep dispersal and genetic diversity. In a study of 27 populations of bighorn sheep, anthropogenic barriers were significantly correlated with a reduction in gene flow at an inter-population distance of 9.3 miles (Epps et al. 2005a). Populations of bighorn sheep that were isolated by anthropogenic barriers experienced a 15 percent reduction in genetic diversity relative to non-isolated populations over a 40-year period (Epps et al. 2005a).

Bighorn sheep occasionally use underpasses to cross highways. One study in Arizona monitored wildlife use at three highway underpasses for 10 months and recorded 25 times when bighorn sheep crossed under the highway (AZDOT 2008). Most (88 percent) of the crossings occurred at the culvert located in the most rugged terrain at the narrowest highway span (AZDOT 2008). The study concluded that higher intensity culvert use was most commonly associated with their proximity to traditional trails of bighorn sheep, while other factors like proximity to steep terrain, underpass structure, lines of sight, and other animals' presence may also be important influences (AZDOT 2008). Another study found that ungulate underpasses must be a minimum of 14 feet high and 26.3 feet wide (Penrod et al. 2008).

The I-15 and I-40 highways that bound the Mojave Desert metapopulations have reduced the natural intermountain movement and gene flow within the species (Epps et al. 2007a). The I-15 highway has blocked bighorn sheep movement between the North and South Soda Mountains (Epps et al. 2013).

4.2 CONNECTIVITY IN THE PROJECT AREA AND VICINITY

4.2.1 Connectivity Models and Studies

Several population connectivity models have been used to evaluate both the potential for existing connectivity between bighorn sheep populations in the Mojave Desert and the potential for restoration of linkages. The following studies were reviewed for existing and potential bighorn sheep linkage corridors in the project vicinity:

- "A Linkage Network for the California Deserts" (Penrod et al. 2012)
- DRECP "Updated Expert Species Model Results" (CEC 2012)
- "Optimizing Dispersal and Corridor Models Using Landscape Genetics" (Epps et al. 2007)
- "Potential Impacts of Proposed Solar Energy Development Near the South Soda Mountains on Desert Bighorn Sheep Connectivity" (Epps et al. 2013)

A Linkage Network for the California Deserts

Habitat connectivity was modeled for bighorn sheep in the Mojave and Sonoran Deserts in "A Linkage Network for the California Deserts". Least-cost corridor modeling was used to define potential linkages between landscape blocks.[3] Landscape blocks in the study included highly protected areas such as wildlife management areas and Department of Defense lands. The

[3] Least-cost corridor modeling involves calculating the "cost" of movement from one cell in a model to the next cell based on the habitat suitability for a particular species. Areas with highly suitable habitat have a lower cost of movement than those with less suitable habitat. The cost of movement is aggregated over the distance between the start and end points. The least-cost corridor includes areas with the most suitable habitat and shortest distance between two points.

landscape blocks were not species specific and did not reflect population centers for bighorn sheep.

The Soda Mountain valley is not part of a modeled linkage corridor for bighorn sheep in the study (Figure 4.2-1) (Penrod et al. 2012). The nearest modeled linkage corridor for bighorn sheep is in the Avawatz Mountains, approximately 25 miles north of the project area, as shown on Figure 4.2-1.

DRECP Updated Expert Species Models

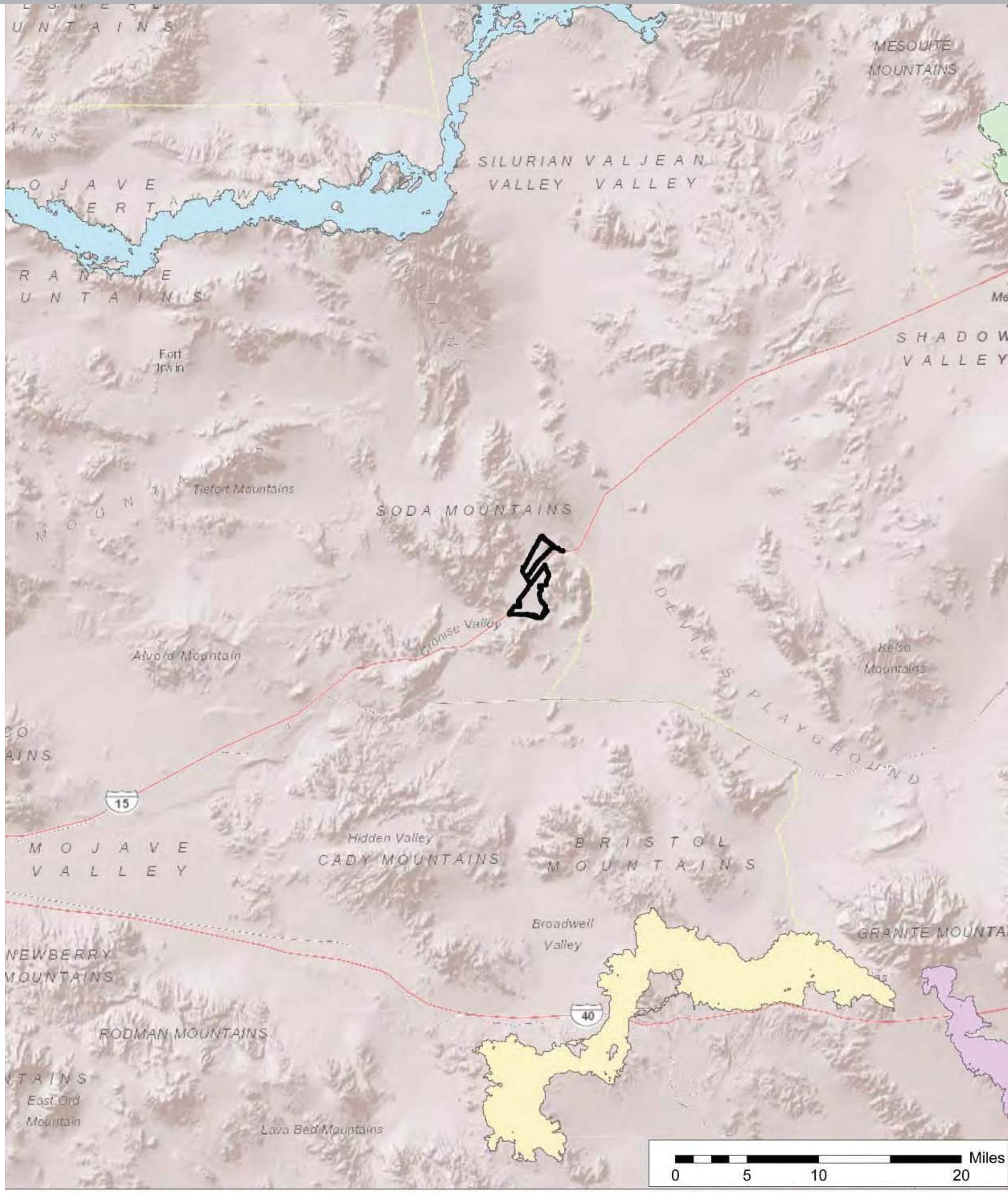
The DRECP "Updated Expert Species Model Results" identifies critical linkage areas, as well as mountain and intermountain habitat for bighorn sheep (Figures 4.2-2, 3.5-2, and 3.5-3, respectively). The models were developed by CDFW and John Wehausen and reflect the results of habitat suitability modeling and expert opinion. The critical linkage map (Figure 4.2-2) shows potential highway crossing locations for bighorn sheep. The entire Soda Mountain valley, including the project site, is identified as a critical linkage on the critical linkage map. The critical linkage map is not consistent with the bighorn sheep habitat modeling in the study because the project area provides neither intermountain nor mountain habitat. The habitat suitability models show an area of intermountain habitat connecting the North and South Soda Mountains near the Zzyzx Road exit from I-15.

Optimizing Dispersal and Corridor Models Using Landscape Genetics

Epps et al. (2007) used a least-cost corridor model and measures of gene flow to evaluate dispersal corridors and impacts of anthropogenic barriers on genetic diversity. The least-cost corridor model used a resistance surface where effective geographic distance (a measure of topography and maximum dispersal distance) were used to define the least-cost path. Highways, areas of urban development, and canals were defined as impermeable barriers in the model. Connectivity corridors were defined using the least-cost paths and anthropogenic barriers. The least-cost path results were validated using radio-telemetry and radio-collar data documenting bighorn sheep movement. Genetic distance and gene flow were measured using genetic data from 26 populations of bighorn sheep and estimated migration rates. Both effective geographic distance and anthropogenic barriers were negatively correlated with genetic flow in the statistical model.

Epps et al. (2007) found that topography significantly influences gene flow and that anthropogenic barriers have fragmented several populations that previously had high connectivity. The model predicted a likely connectivity corridor between the bighorn sheep population in the Cady Mountains and the population in the Avawatz Mountains, which was severed by I-15. The model did not include the population of bighorn sheep in the South Soda Mountains, and therefore, did not predict a linkage corridor in the project area.

Figure 4.2-1: Bighorn Sheep Connectivity (Penrod et al. 2012)



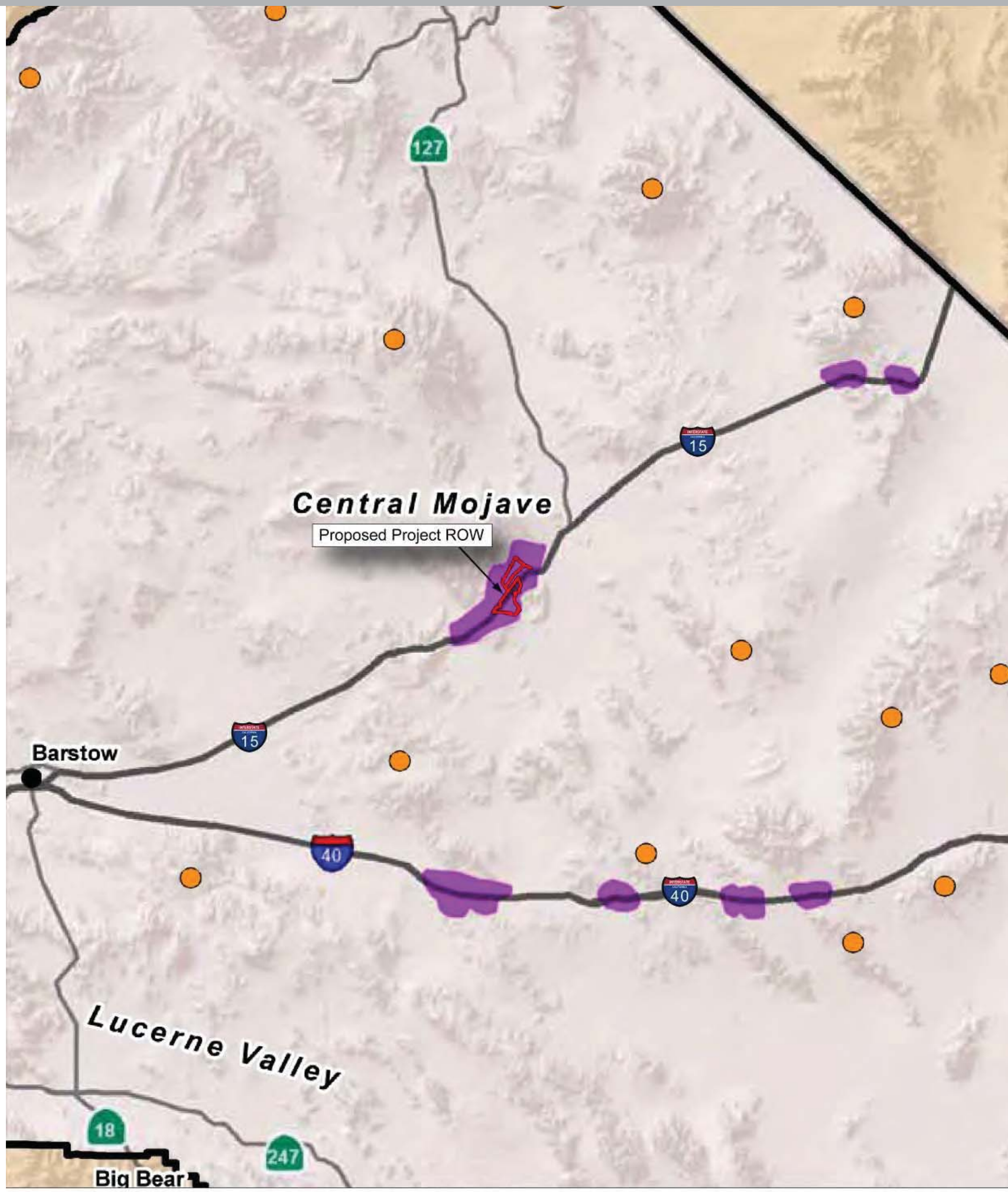
SOURCE: ESRI 2012, Penrod et al 2012, Mojave Desert Ecosystem Program 2012, and Panorama Environmental, Inc. 2012 Scale: 1:700,000

LEGEND

- Study Area
- China Lake South - Mesquite Wilderness Area Bighorn Sheep Linkage
- Mojave National Preserve - Twentynine Palms and Newberry Rodman ACEC Bighorn Sheep Linkage
- Mojave National Preserve - Stepladder Turtle mountains Wilderness Area Bighorn Sheep Linkage
- Kingston Mesquite Wilderness Area - Mojave National Preserve Bighorn Sheep Linkage

N

Figure 4.2-2: Bighorn Sheep Critical Linkages (CEC 2012)



SOURCE: ESRI 2013, CEC 2012, and Panorama Environmental, Inc. 2013

Scale: 1:1,000,000

LEGEND

Proposed Project ROW
Suitable Habitat
DRECP Boundary
Historic Species Occurrence

0 5 10 20 30 40 Miles

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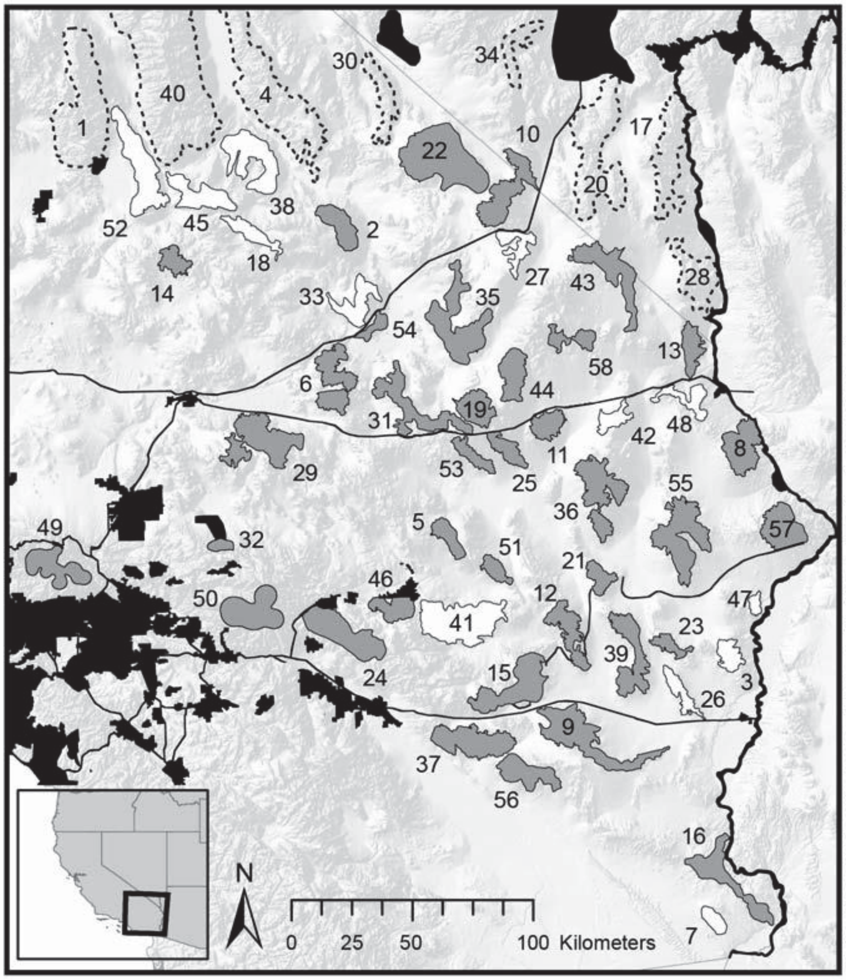
Potential Impacts of Proposed Solar Energy Development Near the South Soda Mountains on Desert Bighorn Sheep Connectivity

This study (Epps et al. 2013) builds on the dispersal and corridor models developed by Epps et al. in "Optimizing Dispersal and Corridor Models Using Landscape Genetics" (2007). This study focuses more specifically on bighorn connectivity in the immediate vicinity of the project area and includes the population in the South Soda Mountains. The study employed a network analysis of an empirically-derived connectivity model for desert bighorn sheep (described above) to evaluate the short- and long-term consequences of restoring the Soda Mountains for recolonization by bighorn sheep.

Table 4.2-1 (Table 1 from the Epps et al. [2013] study) indicates that the corridor between the South Soda Mountains east of the project area and the Avawatz Mountains approximately 20 miles north of the project area is approximately the eighth most important restorable corridor for gene flow (out of 20 to 21 corridors) in the southeast Mojave Desert. The table also indicates that the same connectivity corridor is ranked 13 out of 15 corridors analyzed for short-term recolonization of unoccupied habitat by both rams and ewes and is tied for first out of the 15 connectivity corridors for long-term recolonization by rams and ewes. As a comparison, the corridor across I-40 between the Granite Mountains and the Marble Mountains (GRA-MAR) ranks first overall across all categories of analysis. The adjacent North and South Bristol Mountains (NBR-SBR) corridor across I-40 ranks as a close second (Figure 4.2-3). Epps et al. (2013) claim that the South Soda Mountains to Avawatz Mountains corridor is the most important restorable corridor in the Mojave Desert; however, the results in Table 4.2-1 show that there are other corridors including GRA-MAR and NBR-SBR that are a significantly higher priority for restoration across all categories of analysis. Furthermore, corridors within the Mescal Range/Ivanpah Mountains were not included in the analysis even though the Mescal Range/Ivanpah Mountains present an opportunity for recolonization of unoccupied habitat along the I-15 highway. In addition, because the model did not incorporate historic, but presently unoccupied sheep habitat, the restoration value of a corridor from the Cady Mountains to the Avawatz Mountains (AVA-CAD) is undervalued because the high restoration value of the North Soda Mountains (as recognized by Epps et al. and CDFW) was not taken into account, thereby incorporating a greater connectivity distance (and correspondingly lower results for genetic connectivity and no results for demographic connectivity) than would likely obtain under actual conditions.

Figure 4.2-3: Desert Bighorn Sheep Habitat Patches in the Mojave Desert Region (Epps et al. 2013)



1-Argus Mtns (ARG); 2-Avawatz Mtns (AVA); 3-Big Maria Mtns (BMA); 4-Black Mtns/Greenwater Range (BGR); 5-Bullion Mtns (BUL); 6-Cady Mtns (CAD); 7-Cargo Muchacho Mtns (CAR); 8-Chemehuevi Mtns (CHE); 9-Chuckwalla Mtns (CHU); 10-Clark Mtns/S. Spring Range (CSS); 11-Clipper Mtns (CLI); 12-Coxcomb Mtns (COX); 13-Dead Mtns (DEA); 14-Eagle Crags (ECR); 15-Eagle Mtns (EMO); 16-E. Chocolate Mtns (ECH); 17-Eldorado Mtns (EDO); 18-Ft. Irwin Granite Mtns (FIG); 19-Granite Mtns (GRA); 20-Highland Range/McCullough Range (HMC); 21-Iron Mtns (IRO); 22-Kingston Mtns/Mesquite Range (KME); 23-Little Maria Mtns (LMA); 24-Little San Bernardino Mtns (LSB); 25-Marble Mtns (MAR); 26-McCoy Mtns (MCY); 27-Mescal Range/Ivanpah Mtns (MIV); 28-Newberry Mtns (NNV); 29-Newberry Mtns/Ord Mtns (NOR); 30-Nopah Mtns (NOP); 31-N. Bristol Mtns (NBR); 32-N. San Bernardino Mtns/-Cushenbury Mtns (NSB); 33-N. Soda Mtns (NSO); 34-N. Spring Range (NSP); 35-Old Dad Pk/Kelso Mtns/Marl Mtns/Club Pk/Indian Spring (OKM); 36-Old Woman Mtns (OWO); 37-Orocopia Mtns (ORO); 38-Owlshead Mtns (OWL); 39-Palen Mtns/Riverside Granite Mtns (PRG); 40-Panamint Mtns (PAN); 41-Pinto Mtns (PIN); 42-Piute Mtns (PIU); 43-Piute Range/Castle Pks/Castle Mtns (PCC); 44-Providence Mtns (PRO); 45-Quail Mtns (QUA); 46-Queen Mtn (QUE); 47-Riverside Mtns (RIV); 48-Sacramento Mtns (SAC); 49-San Gabriel Mtns (SGA); 50-San Gorgonio Mtns (SGO); 51-Sheephole Mtns (SHE); 52-Slate Range (SLA); 53-S. Bristol Mtns (SBR); 54-S. Soda Mtns (SSO); 55-Turtle Mtns (TUR); 56-W. Chocolate Mtns (WCH); 57-Whipple Mtns (WHI); 58-Woods Mtns/Hackberry Mtns (WHA)

Table 4.2-1: Prioritization of Restorable Corridors from Epps et al. 2013

Table 1. Prioritization of restorable corridors in the genetic and demographic networks based on ECP[a] and MWC[b]. The Δ value is the proportional increase in connectivity (as measured by ECP or MWC) when the specified corridor is restored to the network. Corridors are ranked from highest to lowest importance, with separate rankings for each combination of network type and network metric. Results for the Avawatz--S. Soda corridor (AVA-SSO) are highlighted in red. See Fig. 1 for patch name abbreviations.

Genetic network						Demographic network					
ECP			MWC			ECP			MWC		
Corridor	Δ value	Rank	Corridor	Δ value	Rank	Corridor	Δ value	Rank	Corridor	Δ value	Rank
GRA-MAR	0.246	1	GRA-MAR	0.342	1	GRA-MAR	0.231	1.5	AVA-SSO	0.196	1
NBR-SBR	0.197	2	NBR-SBR	0.308	2	NBR-SBR	0.231	1.5	GRA-MAR	0.196	2
EMO-ORO	0.123	3	CLI-PRO	0.280	3	LSB-SGO	0.108	3	NBR-SBR	0.185	3
CHU-EMO	0.115	4	BUL-CAD	0.225	4	EMO-ORO	0.092	4	CLI-PRO	0.110	4
CLI-PRO	0.090	5.5	BUL-NBR	0.217	5	CHU-EMO	0.077	5.5	EMO-ORO	0.101	5
LSB-ORO	0.090	5.5	CAD-NOR	0.205	6	LSB-NSB	0.077	5.5	CHU-EMO	0.096	6
ORO-QUE	0.066	7	AVA-CAD	0.171	7	LSB-ORO	0.062	7.5	LSB-SGO	0.094	7
AVA-CAD	0.049	8.5	AVA-SSO	0.166	8	ORO-QUE	0.062	7.5	COX-PRG	0.090	8
AVA-SSO	0.049	8.5	CHE-DEA	0.159	9	NSB-SGA	0.031	9.5	LSB-ORO	0.084	9
ORO-SHE	0.033	10	EMO-ORO	0.155	10	SGA-SGO	0.031	9.5	LSB-NSB	0.072	10
BUL-CAD	0.025	11.5	CHU-EMO	0.148	11	AVA-SSO	0.015	13	ORO-QUE	0.071	11
SGA-SGO	0.025	11.5	KME-OKM	0.147	12	CHE-DEA	0.015	13	COX-IRO	0.071	12
CAD-NOR	0.016	15.5	CSS-PRO	0.142	13	CLI-PRO	0.015	13	CHE-DEA	0.028	13
CHE-DEA	0.016	15.5	LSB-ORO	0.141	14	COX-IRO	0.015	13	NSB-SGA	0.020	14
CSS-PRO	0.016	15.5	CSS-WHA	0.141	15	COX-PRG	0.015	13	SGA-SGO	0.018	15
CSS-WHA	0.016	15.5	ORO-QUE	0.132	16						
KME-OKM	0.016	15.5	ORO-SHE	0.094	17						
NSB-SGA	0.016	15.5	CHU-PRG	0.081	18						
BUL-NBR	0.008	20	SGA-SGO	0.041	19						
CHU-PRG	0.008	20	NSB-SGA	0.039	20						
NOR-SGA	0.008	20	NOR-SGA	0.022	21						

[a] Effectively connected pairs, a measure of short-term network connectivity.
[b] Mean weighted closeness, a measure of long-term network connectivity.

Source: Epps et al. 2013

4.2.2 Existing Connectivity in the Project Vicinity

Bighorn sheep recolonized the South Soda Mountains in 2004. It is hypothesized that this population was recolonized from a population in the Cady Mountains (Hughson 2013). The presence of bighorn trails along the mountains east and south of the project area (observed by Kiva Biological in fall 2012) indicates that there is likely existing movement through these mountains. These trails indicate sheep could be moving between the population in the South Soda Mountains and the population in the Cady Mountains through the Cave Mountains, where bighorn sheep were observed in 2011 (BRC 2011).

There is continuous modeled mountain habitat between the South Soda Mountains and the Cady Mountains (Figure 3.2-3). The model results, bighorn trails, and recolonization suggest that there is an existing bighorn sheep migration corridor between the South Soda Mountains and the Cady Mountains through mountain habitat (Figure 4.2-4).

4.2.3 Barriers to Connectivity

Highway 1-15

Studies of other bighorn sheep populations in the Mojave Desert have found that highways have blocked gene flow between populations (Epps et al. 2005a; Epps et al. 2007). Highway I-15 is considered to have truncated a potential migration corridor at Zzyzx Road overpass on I-15, and at Rasor Road. There was historically a known population of bighorn sheep in the North Soda Mountains. There are trails in the hills south of the Zzyzx Road overpass that bighorn sheep may have used to cross between the South Soda Mountains and North Soda Mountains prior to the construction of I-15. The North Soda Mountains population was documented as extirpated by Glen Sudmeier in 2004 (in Epps et al. 2005b) and bighorn sheep were not observed in the North Soda Mountains during helicopter surveys of the area in 2011 (BRC 2011).

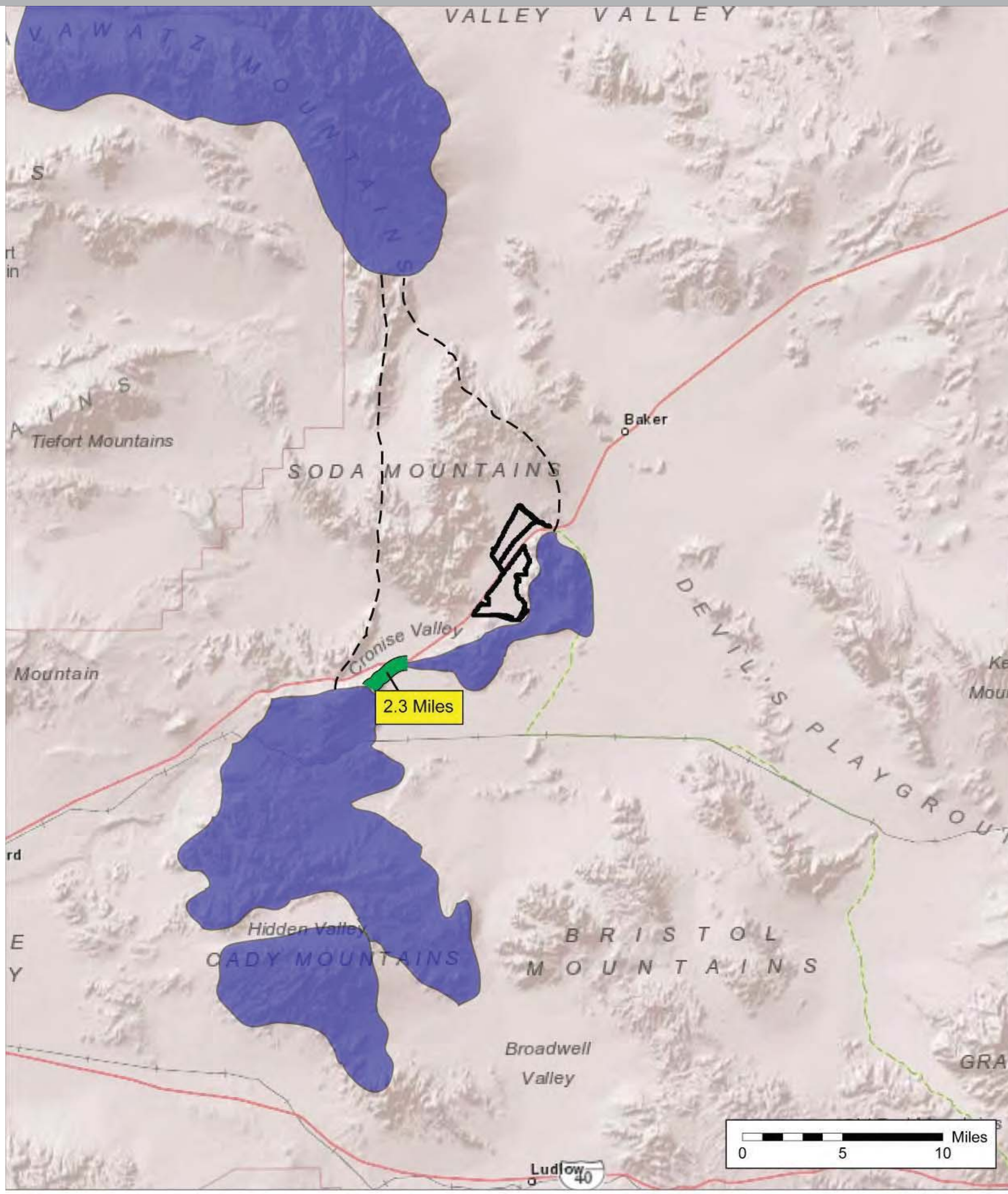
There are recent anecdotal observations of bighorn sheep on the west and north sides of I-15 near Rasor Road and Zzyzx Road, indicating that I-15 is not a complete barrier to bighorn sheep movement. These observations indicate that individual bighorn sheep have crossed the I-15 highway.

It is unlikely that there is existing connectivity between the bighorn sheep population in the South Soda Mountain and the bighorn sheep population in the Avawatz Mountains. Although it is possible that the individual bighorn sheep that were observed on the west and north sides of I-15 near the project area could travel to the Avawatz Mountains and breed with that population of bighorn sheep, this travel is unlikely in the absence of trails to guide the movement , lack of water sources, and the distance from the South Soda Mountains (20 to 30 miles). Gene flow between the south Soda Mountains and the Avawatz Mountains is, therefore, unlikely under current conditions.

Topography

The Soda Mountain Valley is ill-suited for bighorn sheep connectivity. Bighorn sheep dispersal is correlated with topography and bighorn sheep favor routes with 10 percent or greater slope with access to escape terrain (Epps et al. 2005a). The Soda Mountain Valley has a slope of less than 5 percent, is three miles wide, and is segmented by the I-15, a significant barrier to bighorn movement. It is, therefore, unlikely that the project valley is used for bighorn sheep intermountain movement and population connectivity. It is more likely that bighorn sheep would disperse through the surrounding Soda Mountains in areas with 10 percent or greater slope.

Figure 4.2-4: Existing Bighorn Sheep Connectivity Corridor



SOURCE: ESRI 2013, CEC 2012, BRC 2011, Kiva 2012, CDFW 2013, Davenport 2013b, and Panorama Environmental, Inc. 2013

Scale: 1:500,000

LEGEND

- Study Area
- Bighorn Sheep Population
- Cady Mountains to South Soda Mountains
- Potential Future Corridor

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4.2.4 Potential Restorable Connectivity Corridors

Bighorn sheep connectivity corridors across I-15 may be restored in the future. There are two potential bighorn sheep connectivity corridors in the project region that have the potential to be restored:

1. Cady Mountains to Avawatz Mountains
2. South Soda Mountains to Avawatz Mountains

These potential connectivity corridors (shown on Figure 4.2-5) are discussed below.

Cady Mountains to Avawatz Mountains

There is a potential connectivity corridor from the bighorn sheep population in the Cady Mountains to the population in the Avawatz Mountains through the North Soda Mountains (Figure 4.2-5). This corridor would pass through the Cave Mountains to the Cronese Mountains (across I-15 between Basin Road and Afton Road) and through the west side of the North Soda Mountains to the Avawatz Mountains.

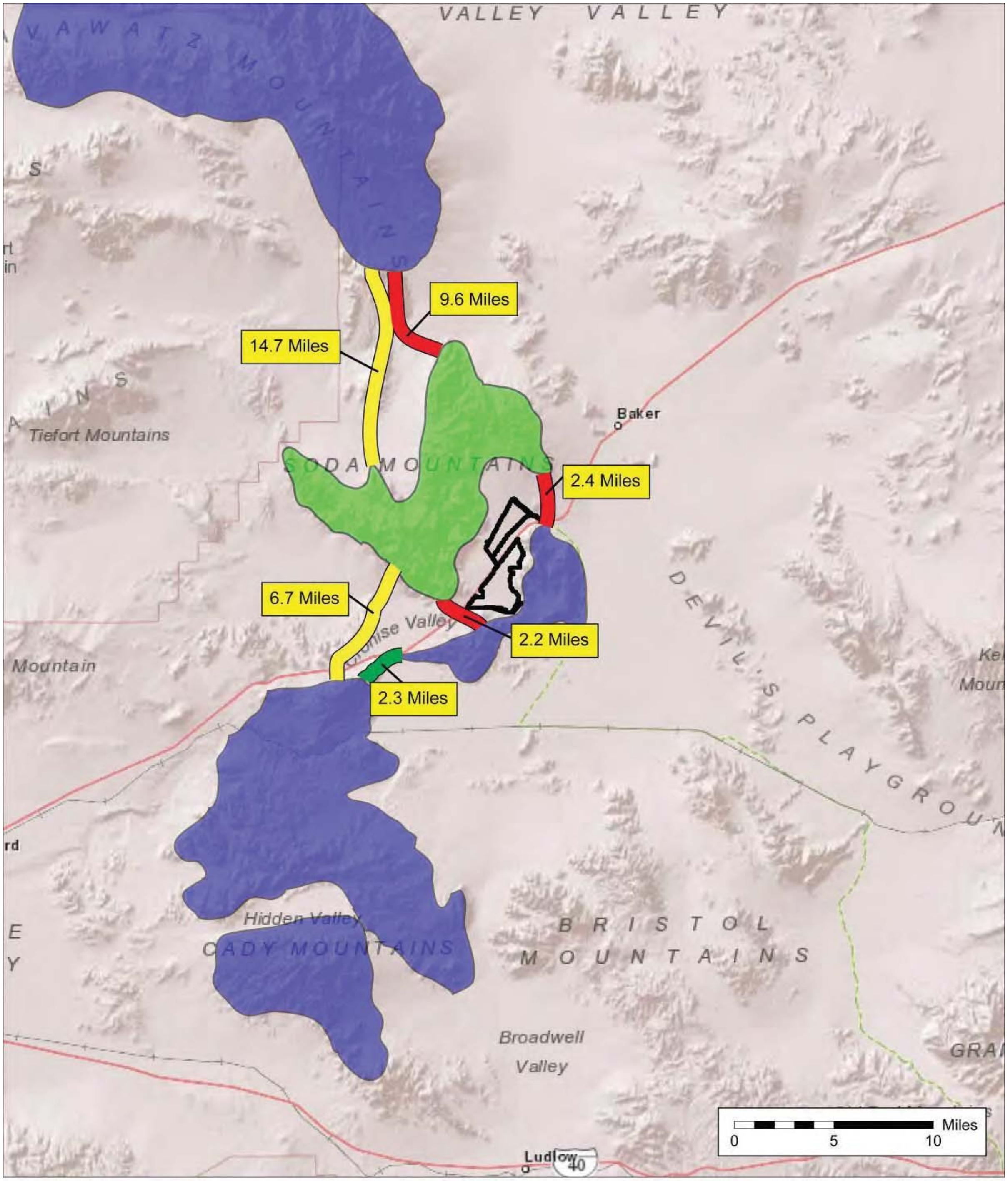
The bighorn sheep fatality recorded by Caltrans on I-15 between the Cave and Cronese Mountains (Kopulsky 2013) may indicate that bighorn sheep are attempting to cross I-15 and use this potential corridor and that I-15 continues to be a barrier to movement (Epps 2007). The viability of this route would depend on the recolonization of the North Soda Mountains because the distance from the Cady Mountains to the Avawatz Mountains is approximately 30 miles, greater than the maximum travel range for ewes and approaching the maximum range for travel by rams (Penrod et al. 2012). Recolonization of the North Soda Mountains would increase the likelihood of the use of this connectivity corridor due to the decreased travel distance between populations.

South Soda Mountains to Avawatz Mountains

There is a potential connectivity corridor from the population in the South Soda Mountains through the North Soda Mountains to the population in the Avawatz Mountains. This route would require crossing I-15 between the South Soda Mountains and the North Soda Mountains (likely near Zzyzx Road) and then traversing the North Soda Mountains to the Avawatz Mountains.

The intermountain distance between the North and South Soda Mountains is approximately 0.25 mile near Zzyzx Road with rugged mountainous terrain on either side of the highway. The incidental observation of bighorn sheep on the Zzyzx Road overpass and in the North Array area (Otahal 2010) suggests that individual bighorn sheep may be crossing the highway between the North and South Soda Mountains in this area. There are also numerous bighorn sheep trails and bighorn sheep sign on the hills south of I-15 near Zzyzx Road (Epps et al. 2013). The existing trails indicate that there was historical use of this area for bighorn sheep movement (Epps et al. 2013).

Figure 4.2-5: Potentially Restorable Dispersal Corridors



SOURCE: ESRI 2013, CEC 2012, BRC 2011, Kiva 2012, CDFW 2013, Davenport 2013b, Epps et al 2007, Epps et all 2013, and Panorama Environmental, Inc. 2013

Scale: 1:500,000

LEGEND

N

- Study Area
- Bighorn Sheep Population
- Potential Bighorn Sheep Recolonization Area
- Cady Mountains to Avawatz Mountains
- South Soda Mountains to Avawatz Mountains
- Cady Mountains to South Soda Mountains

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The DRECP (CEC 2012) modeling shows continuous intermountain habitat (Figure 3.5-2) between the South Soda Mountains and the Avawatz Mountains (Figure 4.2-5), which suggests that there is the potential to restore bighorn sheep connectivity through intermountain habitat in the North Soda Mountains. Bighorn sheep previously colonized the North Soda Mountains. The gene flow between the Soda Mountains and Avawatz Mountains will likely be restored if the North Soda Mountains are recolonized. Recolonization of the North Soda Mountains and the use of this route for connectivity becomes more likely as the population in the South Soda Mountains rebounds (Davenport 2013a).

4.2.5 Potential to Restore Connectivity Between the South Soda Mountains and Avawatz Mountains

The potential to restore connectivity between the South Soda Mountains and the Avawatz Mountains is discussed here in greater detail due to the proximity of this connectivity corridor to the project area. Freeway overpasses (wildlife bridges) and underpasses have been proposed by CDFW to promote bighorn sheep movement across I-15 (Hawk 2013). Epps et al. (2013) analyzed the potential to restore connectivity between the South Soda Mountains and the Avawatz Mountains. The study recommended restoration of the corridor through (1) construction of one or more wildlife bridges, and (2) development of water sources in the North Soda Mountains to encourage bighorn sheep use of existing highway underpasses.

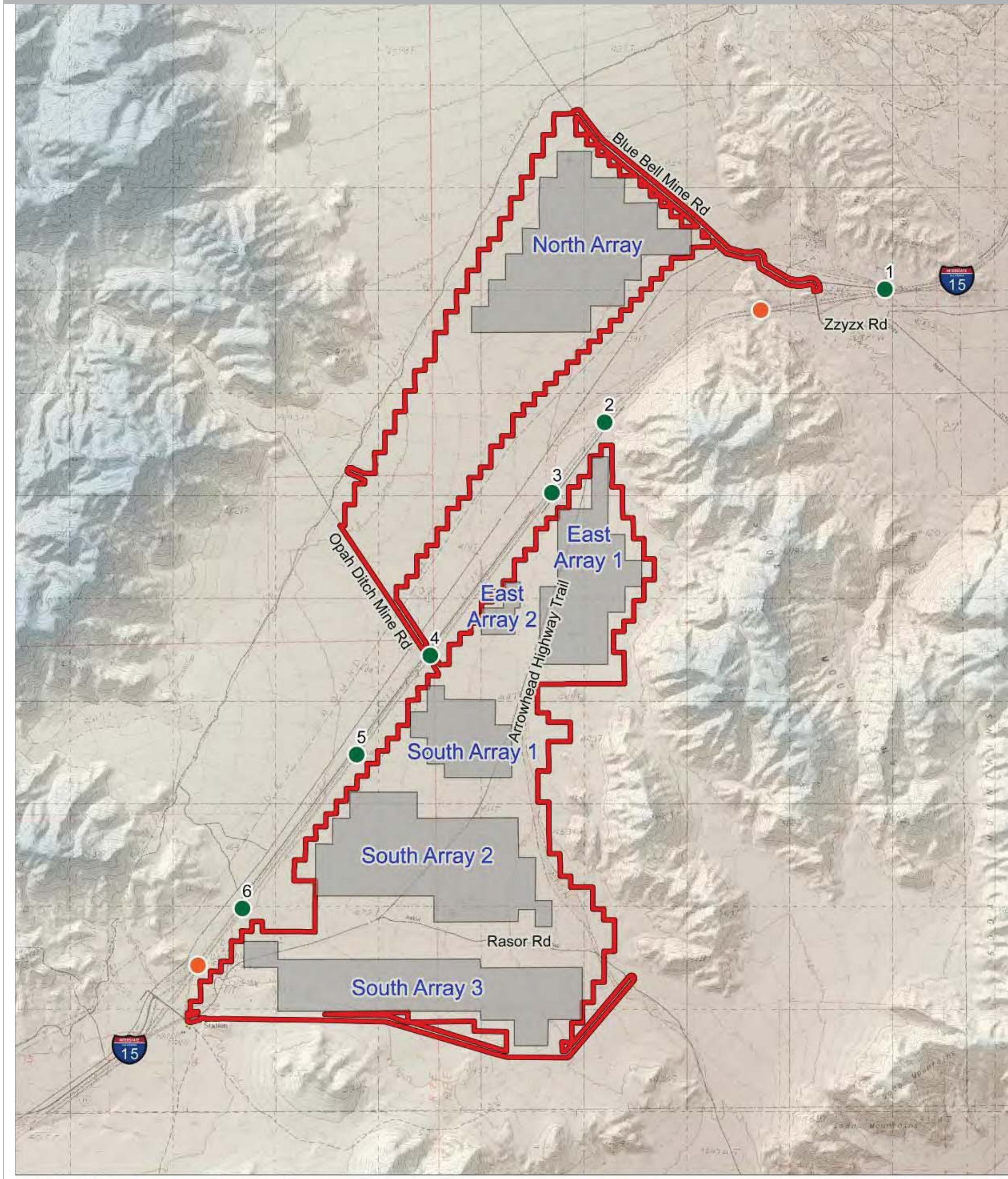
AZDOT and the Arizona Game and Fish Department (AGFD) have studied bighorn sheep use of overpasses and underpasses to cross highways. A study of bighorn sheep movement along Highway 93 near the Hoover Dam was used to recommend placement of overpasses and underpasses to promote bighorn sheep crossing. The study found that the overpasses were "needed to connect elevated habitats on both sides of the highway" and that ROW fencing was useful in directing bighorn sheep movement towards underpasses (McKinney and Smith 2007). In June 2012, 229 bighorn sheep reportedly used the three wildlife overpasses constructed over Highway 93 (AGFD 2012). The most important factors affecting bighorn sheep use of underpasses are proximity to traditional travel corridors and steep terrain, line of sight through the underpass, and structure size (AZDOT 2008).

Wildlife Bridges

Epps et al. (2013) identify two potential locations for construction of wildlife bridges for bighorn sheep to cross over I-15 (Figure 4.2-6).

> *These locations were chosen because topographic features are most favorable for bighorn sheep use (e.g., Epps et al. 2007). Prior to the construction of Interstate Highway 15 bighorn sheep would have readily crossed between the North and South Soda Mountains at both locations. Currently there are differences between these two potential overpass sites. At location 1 there is a lack of steeper sloped habitat immediately adjacent to the location where the overpass would begin on the south side of the freeway. Currently, evidence of bighorn sheep use ends in steeper habitat about 1.5 km south of where the overpass would begin. In contrast, at location 2 there is steep habitat right to where the overpass would begin and clear sign of current bighorn sheep use (observed February 2013) at the site where the overpass would begin and the adjacent habitat. Additionally,*

Figure 4.2-6: Locations for Potential Restoration of Connectivity



SOURCE: ESRI 2013, CDFW 2013, and Panorama Environmental, Inc. 2013

Scale: 1:60,000

LEGEND

- Proposed Project ROW
- Solar Array
- Existing Culvert
- Proposed CDFW Bridge

0 0.5 1 2 Miles

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> *at this site there remain decades old bighorn sheep trails from many sheep crossing at this location prior to the construction of Interstate Highway 15. The abundant water on the east edge of the South Soda Mountains readily explains the historic high use of this crossing point. Sheep would have moved between this water and the North Soda Mountains frequently in summer.*

The analysis presented by Epps et al. (2013) suggests that the area near Zzyzx Road is a more suitable location to build a bighorn sheep overpass than the area near Rasor Road due to the absence of sign in the potential crossing corridor and the absence of steeply sloped habitat immediately adjacent to I-15.

Highway Underpasses

Epps et al. (2013) analyzed bighorn sheep use of underpasses in the Soda Mountain Valley. The study found that two highway box culverts and a bridge underpass in the Soda Mountain valley and one bridge underpass located near Zzyzx Road could be used occasionally by bighorn sheep to cross I-15 (Epps et al. 2013).

Highway box culverts and bridges are currently the safest locations for bighorn sheep to cross the highway between the north and south Soda Mountains because there is a high level of traffic on I-15 at all hours of the day. Two anecdotal observations of bighorn sheep crossing the I-15 highway in traffic near the project area have been reported (Whalon 2013; Weasma 2012), and a recorded mortality on I-15 near Afton Canyon (Kopulsky 2013), indicating that bighorn sheep are attempting to cross the highway at other locations. In addition to the existing Rasor Road and Zzyzx Road freeway overpasses, there are six highway underpasses adjacent to the project area (four box culverts and two bridges) as shown on Figures 4.2-7, 4.2-8, and 4.2-9. The six underpasses were evaluated for size, location in proximity to mountainous terrain, and suitability for use by bighorn (Table 4.2-2). The four box culverts (underpasses 2, 3, 5, and 6) are not likely to be used by bighorn sheep because they are dark and smaller than the documented minimum width for bighorn sheep underpass use (Burke 2012; Penrod et al. 2008); however, other experts have stated they are not too small for bighorn use (Epps at al. 2013).

The bridge at Opah Ditch (underpass 4, Figure 4.2-9) is suitable for bighorn sheep movement because it is of sufficient size; however, it is also far from steep terrain and existing trails (approximately 3 mile intermountain distance). The underpass at Zzyzx Road (underpass 1, Figure 4.2-7) is more suitable for bighorn sheep use because the underpass is wider and is closer to steep terrain (approximately 0.5 mile intermountain distance). In addition, there is sign of bighorn sheep use, including trails, on the ridge south of the Zzyzx Road overpass (Weasma 2012).

Game cameras installed by CDFW at the underpasses at Opah Ditch and Zzyzx Road in August 2012 have not detected any bighorn sheep use to date (Abella 2013c). While it is unlikely that these underpasses are currently being used by bighorn sheep, the Opah Ditch and Zzyzx Road underpasses present opportunities to restore connectivity with habitat enhancement actions (e.g., installation of water sources).

Table 4.2-2: Suitability of Box Culverts/Bridges for Bighorn Sheep Undercrossing

#	Underpass	Dimensions (width by length in feet)	Distance to Nearest Mountainous Terrain (miles)	Proximity to Nearest Known Bighorn Sheep Occurrence	Suitability of Use
1	Zzyzx Road bridge	90 by 15	0.15 north	2.2	**High.** Of adequate size, close to steep terrain, near historic bighorn sheep trails that crossed the valley before I-15, approximately 2.5 miles from mapped occurrence
2	Box culvert	15 by 15	0.16 east	1.6	**Low.** Less than minimum width of 26.3 feet (Penrod et al. 2008). Close to steep terrain and observations
3	Box culvert	15 by 15	0.49 east	1.3	**Low.** Less than minimum width of 26.3 feet (Penrod et al. 2008), far from steep terrain
4	Opah Ditch bridge	70 by 15	1.14 east	1.3	**Moderate** Of adequate size, far from steep terrain, no bighorn sheep trail or evidence of use
5	Box culvert	15 by 15	1.5 east	1.7	**Low.** Less than minimum width of 26.3 feet (Penrod et al. 2008), far from steep terrain
6	Box culvert	15 by 15	0.12 west	2.7	**Low.** Less than minimum width of 26.3 feet (Penrod et al. 2008), far from known occurrences

Figure 4.2-7: Box Culverts 2, 3, 5, and 6

SOURCE: TerraMetrics 2012, GeoEye 2012, USDA Farm Service Agency 2012, DigitalGlobe 2012, Google Earth Pro 2012, and Panorama Environmental, Inc. 2012

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Figure 4.2-8: Underpass 1, North of Zzyzx Road

SOURCE: ESRI 2012, TerraMetrics 2012, GeoEye 2012, USDA Farm Service Agency 2012, DigitalGlobe 2012, Google Earth Pro 2012, and Panorama Environmental, Inc. 2012

LEGEND

Proposed Project ROW

Existing Culvert

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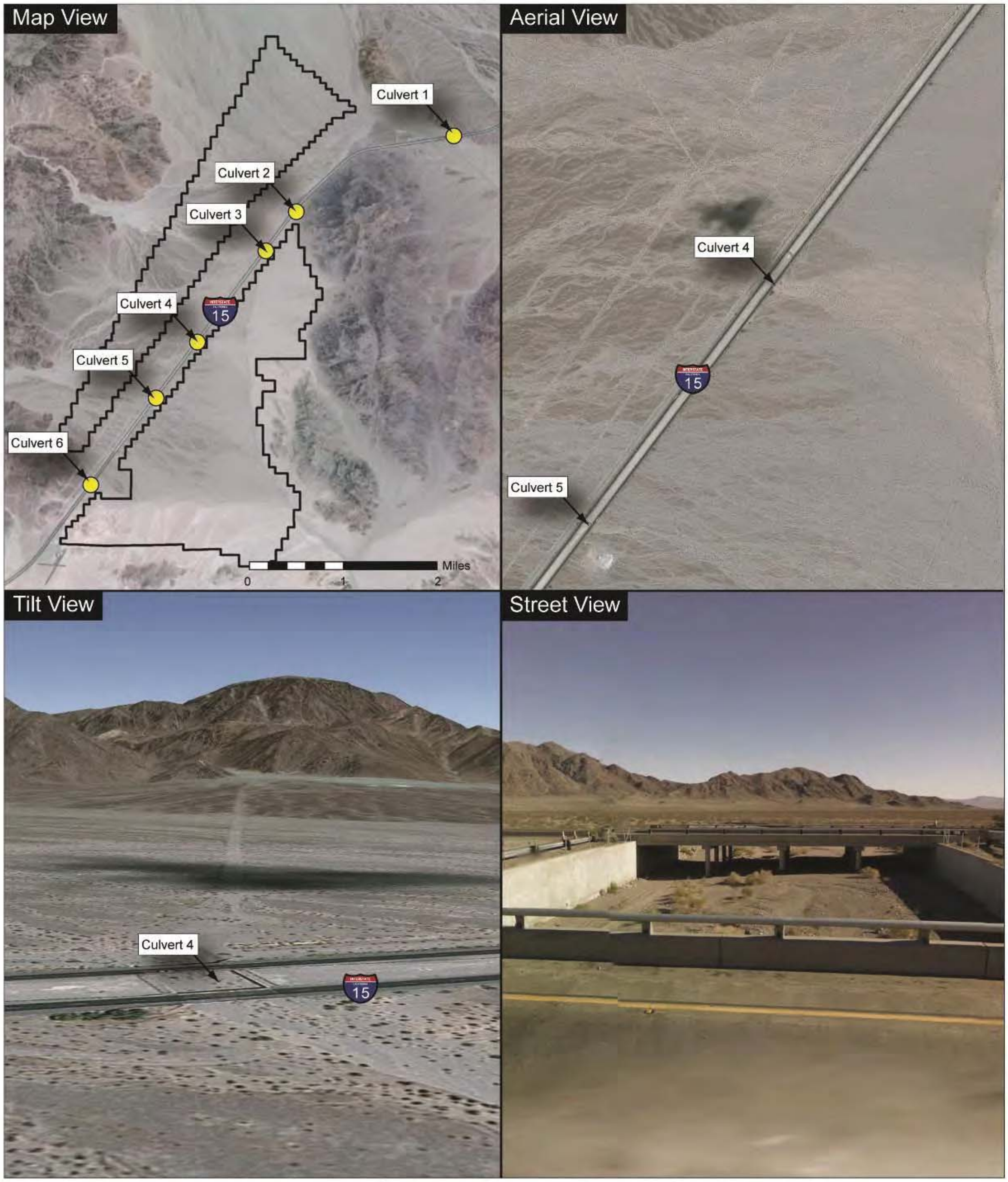
Figure 4.2-9: Underpass 4, Opah Ditch



SOURCE: ESRI 2012, TerraMetrics 2012, GeoEye 2012, USDA Farm Service Agency 2012, DigitalGlobe 2012, Google Earth Pro 2012, and Panorama Environmental, Inc. 2012

LEGEND

Proposed Project ROW

Existing Culvert

N

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5 ANALYSIS

This section describes potential project-related impacts on bighorn sheep habitat, individuals, and connectivity.

5.1 EFFECTS TO HABITAT

5.1.1 Construction

Foraging Habitat

Portions of the project area are located on alluvial fans within 0.5 mile of the mountains. Alluvial fan areas are commonly used by bighorn sheep for foraging (USFWS 2000). Two bighorn sheep have been observed foraging on alluvial fans next to the toe of the western slope of the South Soda Mountains, in the project area (see Section 3.5.2).

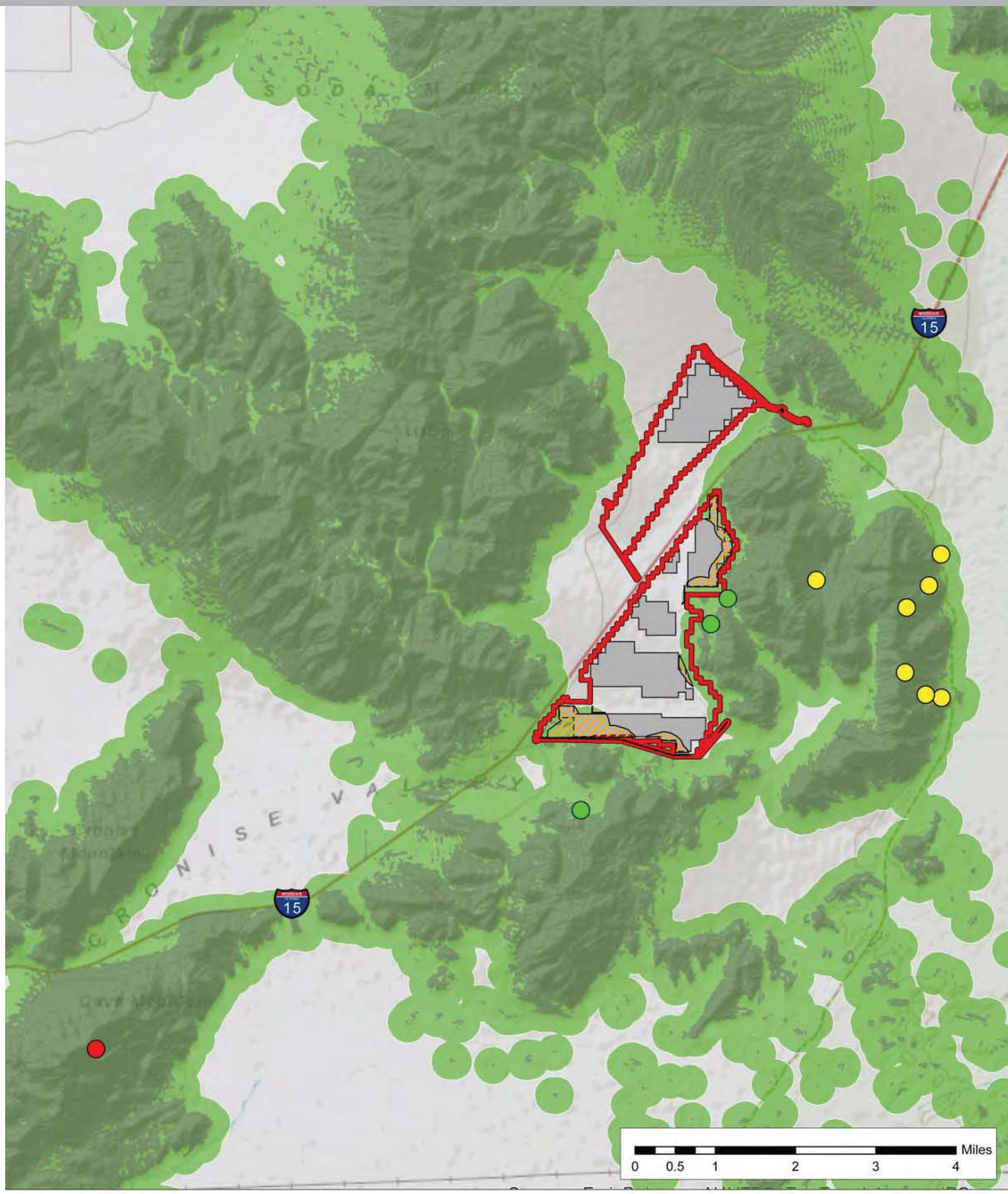
Construction of the project will involve vegetation removal or trimming to install the solar arrays and associated facilities (e.g., collector lines, berms, and access roads). Construction will also include installation of security fencing around the array areas that would prevent bighorn sheep access (Figure 1.2-1). Approximately 610 acres of the solar arrays are located on alluvial fans within 0.5 mile of the 20 percent slope contour and 399 acres are located within 0.25 mile of the 10 percent slope contour (Figure 5.1-1). Removal of vegetation and fencing of these areas will result in the loss of likely foraging habitat for bighorn sheep. Areas within the Soda Mountain valley located more than 0.5 mile from the mountains (approximately 1,900 acres) will also be disturbed during project construction and would result in the loss of potentially suitable foraging habitat for bighorn sheep.[4]

Mountain Habitat

A small portion of the project ROW near Rasor Road includes approximately 116 acres of mountain habitat suitable for bighorn sheep. Construction of the operations and maintenance buildings, warehouses, water tank, reverse osmosis facility, and brine ponds will result in

[4] This loss of bighorn dispersal habitat does not contribute to a potential "take" under California's fully protected species laws because habitat modification is not incorporated into California's statutory definition of "take" as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (California Fish and Game Code, Section 86).

Figure 5.1-1: Bighorn Sheep Foraging Habitat Within 0.25 Mile of 10 Percent Slope



SOURCE: ESRI 2013, BRC 2011, Kiva 2012, CDFW 2013, and Panorama Environmental, Inc. 2013

Scale: 1:140,000

LEGEND

N

- Proposed Project ROW
- Solar Array
- Slope 10% or Greater
- Bighorn Sheep Foraging Habitat
- Bighorn Sheep Foraging Area Intersect - Project
- BRC Bighorn Sheep Sighting Location
- CDFW Bighorn Sheep Sighting Location
- Kiva Bighorn Sheep Sighting Location

temporary impacts for construction activities on approximately 12 acres of mountain habitat. These areas will be disturbed during the 6- to 12-month construction period for the buildings and facilities. The facilities will occupy 6 acres when construction is complete and will be fenced.

5.1.2 Operation and Maintenance

Foraging Habitat

Foraging habitat within the fenced array area and operations and maintenance building area will be occupied during project operation. Approximately 610 acres of the solar arrays will be located on alluvial fans within 0.5 mile of the 20 percent slope and 399 acres will be located within 0.25 mile of the 10 percent slope. Project operation will also occupy approximately 35 acres of foraging habitat where the substation, relocated Rasor Road, and access roads will be located. These areas will have regular vehicle traffic or structures and will be maintained clear of vegetation.

The project will preserve a corridor through the arrays that will provide access between the South Soda Mountains and the Opah Ditch underpass at I-15. The corridor will be approximately 1,700 feet wide at its narrowest point and 2,400 feet wide at its widest point. This corridor may allow bighorn to move through the valley and access forage outside of the fenced array areas during operation of the project.

Mountain Habitat

The operations and maintenance buildings, warehouses, water tank, brine ponds, and reverse osmosis facility will occupy approximately 6 acres of suitable mountain habitat.

5.2 INDIVIDUAL SHEEP

Biologists identified bighorn sheep on the western slope of the South Soda Mountains and in the mountains south of the project site (Kiva Biological 2012). Two bighorn sheep were also identified along the alluvial fan in and near the East Array area (Davenport 2013b). The South Soda Mountains population of bighorn sheep is likely to use the mountains adjacent to the project area and alluvial fans within the project area. The South Soda Mountains population size is estimated to be in the range of 51 to 100 sheep. Construction and operation of the project may affect this population of bighorn sheep through increased human activity, noise, and alteration of the viewshed.

5.2.1 Construction

Human Activity

Construction of the project will result in approximately 200 workers traveling daily to the work site over the 24- to 30-month construction period. Heavy equipment will be used throughout the active work area. It is expected that approximately 90 to 180 acres will be open for construction at any given time. Construction will substantially increase the level of human activity within the Soda Mountain valley and adjacent to the South Soda Mountains.

The sheep in the South Soda Mountains are thought to be habituated to humans. CDFW (2011) reported:

> Along the eastern base of the South Soda Mountains are multiple excellent natural springs that provide the sheep water and green forage at the edge of Soda Dry Lake. A California State University field station is situated here and these sheep are seen readily and frequently by people there because the water sources used by sheep are right along the access road as well as at the field station, and the sheep are very habituated to people.

Approximately 2,300 people visit the Desert Studies Center every year (Adamstein 2011). Visits often involve larger groups, usually occur more often on weekends, and vary from season to season.

Construction activities will represent a much more intense level of human disturbance than is currently experienced by bighorn sheep at the Desert Studies Center. Construction activities will be inconsistent with the current use of the area. It is unlikely that the sheep will become habituated to the construction activities because the active construction area will change throughout the construction period. Bighorn sheep are more sensitive to human activity that is unpredictable (Schoenecker and Krausman 2002).

Buffers will be maintained between the solar array area and the mountains (Figure 1.2-1). The buffer between the solar array area and the mountains is provided in Table 5.2-1. There will likely be decreased use of the western slope of the South Soda Mountains during construction. Bighorn sheep are also likely to avoid foraging on the alluvial fans west of the South Soda Mountains during construction of the East and South Arrays.

Table 5.2-1: Distance Between Mountains and Array Fields

Array	Direction	Approximate Buffer Distance
South Array	East	1,000 feet
	South	740 feet
East Array	East	335 feet
North Array	West	2,870 feet
	North	1,570 feet
	East	2,220 feet

Noise

East and South Arrays

Construction will result in increased noise in the vicinity of the active work area. Trucks, bulldozers, scrapers, graders, and other equipment that will be used for construction generate noise that would exceed background levels for the area. The increased noise will be expected to reduce bighorn sheep use of areas in the vicinity of active construction, including the hill slopes to the east and south of the project. Bighorn sheep have been observed within 300 feet of the highway (Burke 2012) and may, therefore, be habituated to traffic noise.

Noise generated by construction equipment and vehicles will be closer to mountain habitat on the west slope of the South Soda Mountains, and the noise level and frequency will be different than noise generated from highway traffic. Construction of the project may result in reduced bighorn sheep use of habitat in areas where construction vehicle and equipment are audible to sheep.

Project construction activities will not be audible on the eastern side of the South Soda Mountains near Zzyzx, or in the Cady or Cave Mountains approximately 8 to 10 miles west of the project.

North Array

One anecdotal sighting of bighorn sheep north of the North Array has been reported. Sheep that use this area may avoid the area during construction of the North Array due to the increased noise and human presence.

Views of the Project

Bighorn sheep will be able to see the project from the west slope of the South Soda Mountains and the hills south of the project area. Due to the irregular topography and series of generally north-south-trending ridges and intervening canyons that surround the project area, the solar arrays will not be visible from many slopes (Figure 3.6-1). The project area will be out of view for the majority of potential bighorn sheep habitat in the South Soda Mountains. Construction of the project may deter bighorn sheep use of habitat areas where construction activity is within sight.

5.2.2 Operation and Maintenance

Human Activity

Sheep can be deterred by human presence or activity (USFWS 2000). Project operation and maintenance will involve limited personnel on site (approximately 25 to 38), who will primarily use the operations and maintenance facility proposed near Rasor Road. The operation and maintenance building will be located close to the existing Rasor Road service station, which experiences a high level of human activity on a regular basis. The addition of approximately 25 vehicles entering and leaving the area each day will be similar to the current pattern of use for the area due to the presence of the service station. Activity at the operations and maintenance facility is expected to be regular with workers entering and leaving the facility at the start and end of worker shifts each day. Bighorn sheep will likely become habituated to the operations and maintenance facility over time.

Certain operation and maintenance activities, such as washing the panels and human presence associated with those activities, may cause sheep to temporarily avoid areas in the vicinity of the project. Panel washing is expected to occur up to 60 days per year, and maintenance will be conducted on an as-needed basis throughout the operation of the project. Bighorn sheep are known to exhibit avoidance behavior in relation to human activities (Leslie and Douglas 1979). This impact will affect areas of suitable bighorn sheep habitat that have a direct sightline of the project area.

Noise

Noise associated with project operation will be similar to background levels. The solar arrays will not generate noise during operation of the project. The additional traffic generated by approximately 25 worker vehicles entering the operations and maintenance facility each day will be minimal compared to the existing traffic on I-15 or at the Rasor Road service station, which is adjacent to the proposed operations and maintenance facility. Maintenance activities and panel washing will periodically occur at the solar arrays close to bighorn sheep mountain and foraging habitat. Operational noise from panel washing will include temporary use of water trucks and use of vehicles and equipment on a temporary and as-needed basis. Operational noise is not expected to substantially affect bighorn sheep use of regional habitat.

Views of the Project

Bighorn may avoid the area because the sheep prefer to have an open view and be close to escape terrain (USFWS 2000). The solar panels will be up to 12 feet tall. A field of panels could obstruct open views from ground level close to the arrays. The presence of the solar panels will likely deter sheep from moving through or foraging in the parts of the project area that have obstructed views and are not close to escape terrain.

Bighorn sheep could become habituated to the views of the project area to some degree (Papouchis et al. 2001), thereby minimizing over time potential effects or avoidance of the area. The solar arrays are stationary objects that are unlikely be perceived as a threat. The project would not be visible from known bighorn sheep locations near Zzyzx Spring east of the project area (on the other side of the South Soda Mountains) or in the Cady or Cave Mountains south of the project.

5.3 EFFECTS TO EXISTING CONNECTIVITY

5.3.1 Construction

Project Valley

Construction noise, project fencing, and increased activity level from construction vehicles and equipment will deter or impede bighorn sheep movement through the project valley. Each array construction area will be fenced, precluding bighorn sheep movement within the fenced array area. It is also unlikely bighorn sheep will move through the unfenced portions of the construction area because of the substantial increase in noise, human activity, and hindered view of escape terrain. Bighorn sheep are diurnal and they are most active during the daytime when construction will occur (6 a.m. to 6 p.m.).

The project valley is not located within a connectivity corridor as discussed in Section 4.2. It is possible that bighorn sheep could cross the eastern half of the valley to use the box culverts and bridges to pass under the highway; however, there is no evidence after 12 months of monitoring that the two largest highway underpasses in the project vicinity are currently being used by bighorn sheep. The I-15 highway has deeply impaired bighorn sheep movement between the North and South Soda Mountains, and the project will not substantially change this condition. The most likely location for bighorn sheep to cross I-15 is in the mountains near Zzyzx due to the presence of bighorn sign and trails in the area, as well as steep habitat on both sides of the highway. This area is approximately 1 mile east of the project and the project will not impact bighorn sheep movement through this area. The impact of project construction on existing bighorn sheep connectivity within the project valley will, therefore, be minimal.

Cady Mountains to South Soda Mountains

Construction of the South Array could cause bighorn sheep to avoid part of the connectivity corridor between the Cady Mountains and the South Soda Mountains. The South Soda Mountains to Cady Mountains connectivity corridor passes through mountain habitat to the east and south of the project area. Construction of the South Array will involve increased heavy equipment use and associated noise and human activity north of the migration corridor. Bighorn sheep may be less likely to use the northern portion of this corridor where construction activities will be visible and construction noise may be heard. The area of suitable habitat in this connectivity corridor extends to approximately 2 miles south of the ROW, and the project construction activities will not be visible from the southern portion of this corridor. During construction, bighorn sheep may be more likely to use areas of mountain habitat that are farther from the areas of active construction when migrating between these populations. It is also possible that the migration rate could temporarily decrease during construction as a result of noise and increased activity near the migration corridor. The construction period is expected to be approximately 2 to 2.5 years. Project construction will not affect population genetics because of the short timeframe for construction relative to bighorn sheep lifespan and reproductive rates.

5.3.2 Operation and Maintenance

Project Valley

The security fencing around project arrays will be approximately 6 to 7 feet high and will prevent sheep access to the solar array area for migration. The area between a known location of bighorn sheep in the South Soda Mountains and the Opah Ditch underpass will remain unfenced and open to bighorn sheep movement, allowing sheep access under the I-15 highway at the underpass. The Opah Ditch underpass is more suitable for bighorn use than the existing culverts within the valley due to a width that is more than three times that of the individual culverts (Table 4.2-2). The corridor from the South Soda Mountains to the Opah Ditch underpass will be approximately 0.32 to 0.45 mile wide and 1.2 miles long with 12-foot-high panels on either side. The presence of panels at these heights may deter bighorn sheep use of areas immediately adjacent to the panels due to decreased visibility of predators, but this effect may be mitigated by the width of the corridor. It is unlikely that the project valley and Opah Ditch are currently being used for intermountain movement. CDFW has analyzed data from game cameras installed at Opah Ditch in August 2012. There have been no occurrences of bighorn sheep use. This potential operational impact to connectivity is, therefore, considered minimal.

Cady Mountains to South Soda Mountains

Operation of the South Array and associated facilities could cause bighorn sheep to avoid using the northern portion of the potential connectivity corridor that connects the Cady Mountains and the South Soda Mountains. The area of suitable mountain habitat in this area extends to approximately 2 miles south of the ROW, where the project will not be visible. Operation of the project is not likely to affect bighorn sheep movement through the southern portion of this corridor due to the distance between the corridor and the project and because project operation and maintenance will not result in a substantial increase in human activity in the project valley.

5.3.3 Cumulative Impacts

Connectivity within the project valley is currently impacted by the presence of I-15, which has blocked bighorn sheep movement between the North and South Soda Mountains. The existing and reasonably foreseeable projects in the area have substantially impacted bighorn sheep movement between the North and South Soda Mountains in the absence of the project. However, the project's contribution to cumulative impacts to bighorn sheep connectivity will be inconsiderable because the project is not located in an existing or former connectivity corridor for bighorn sheep (the solar array area has a slope of less than 10 percent).

5.4 EFFECTS TO CONNECTIVITY RESTORATION

There are two potential connectivity corridors in the vicinity of the project that may be restored in the future:

- Cady Mountains to Avawatz Mountains
- South Soda Mountains to Avawatz Mountains

This section analyzes the potential effects of the project on restoration of connectivity within these corridors.

5.4.1 Cady Mountains to Avawatz Mountains

The project is unlikely to affect migration between bighorn sheep populations in the Cady Mountains and the Avawatz Mountains. The most likely corridor for restoration of population connectivity between the Cady Mountains and the Avawatz Mountains is across I-15 between the Cave and Cronese Mountains (Davenport 2013b). This crossing is approximately 8 miles west of the project and project construction activities will not be perceptible to sheep at a distance of 8 miles. Bighorn sheep traveling between the Cronese Mountains and the Avawatz Mountains will likely travel through the North Soda Mountains. Movement through the North Soda Mountains portion of the corridor could bring sheep within 1 to 4 miles of the project area. It is unlikely that sheep traveling between these populations would venture into the project valley due to the greater traveling distance to access the project valley and the absence of a perennial water source in the valley. Travel between these populations will most likely be through suitable mountain habitat in the West Soda Mountains (Figure 4.2-4). Project construction is unlikely to affect bighorn sheep movement between the Cady and Avawatz Mountains if this corridor is restored because the project is not located close to this potential migration corridor.

5.4.2 South Soda Mountains to Avawatz Mountains

There are two potential locations for restoration of bighorn sheep connectivity between the South Soda Mountains and the North Soda Mountains: Zzyzx Road and Rasor Road. Population connectivity along these corridors has been deeply impacted by I-15, which has blocked bighorn sheep movement (Epps et al. 2013).

Zzyzx Road

The increased traffic on Blue Bell Mine Road during construction will not impact future restoration of the Zzyzx Road migration corridor. Project construction will be completed prior to any potential construction of a bighorn sheep overpass or enhancement of any existing overpass. The project construction will, therefore, not conflict with potential bighorn sheep use of a restored migration corridor.

Once bighorn sheep have crossed the highway, the likely route of travel will be through the North Soda Mountains north of the North Array area. The eastern edge of the North Array is approximately 1,570 feet from the base of the North Soda Mountains (Table 5.2-1). Bighorn sheep may be more likely to travel through the Soda Mountains farther east of the North Array to avoid areas of human activity.

Project operation and maintenance is unlikely to affect bighorn sheep movement between the South Soda Mountains and the North Soda Mountains in the vicinity of Zzyzx Road. Zzyzx Road and the underpass are approximately 1 mile and 1.25 miles, respectively, from the nearest portion of the North Array. The project proposes single-axis tracker solar arrays that move slowly during the day to follow the sun. The noise and movement is not likely to be noticeable and will be unlikely to scare bighorn sheep. It is unlikely that project operation and maintenance will affect bighorn sheep movement because of the distance between the CDFW-proposed Zzyzx Road wildlife bridge and the North Array.

The future wildlife bridge locations proposed by Epps et al. (2013) will be approximately 0.8 mile or more from the North Array and separated from the North Array by a hill adjacent to the north side of the I-15 highway. This separation from the North Array will prevent the project from interfering with bighorn sheep use of a potential future wildlife bridge.

Rasor Road

Construction of the project and increased vehicle activity on Rasor Road will not affect future restoration of the Rasor Road migration corridor. Project construction will be completed prior to construction of any potential bighorn sheep overpass. Project construction will, therefore, not conflict with potential bighorn sheep use of the restored migration corridor.

Operations and maintenance activities and facilities near the Rasor Road area could affect bighorn sheep movement between the South Soda Mountains and the North Soda Mountains near Rasor Road (Davenport 2013b). The presence of the operations and maintenance building and any associated security fencing would physically preclude the use of approximately 6 acres of mountain habitat for potential bighorn sheep migration. These facilities will be located within a potential movement corridor between the South Soda Mountains and the Avawatz Mountains. CDFW has identified a second possible location for a future wildlife bridge near the location of the proposed operations and maintenance building (Figure 4.2-6). The presence of the operations and maintenance building could reduce the likelihood that bighorn sheep will use a wildlife bridge at the proposed location. However, as discussed in Section 4.2.3, bighorn sheep are more likely to cross the highway near Zzyzx Road due to the presence of sign and trails (current and historical) in the area and the presence of steep terrain near the proposed crossing structure (Epps et al. 2013). The Zzyzx Road area, therefore, provides a better location for a possible future wildlife bridge than does the Rasor Road area. Even if the project were not constructed, bighorn sheep may not use a wildlife bridge at Rasor Road due to existing uses (OHV and gas station) and the absence of trails and escape terrain near the potential bridge location.

6 MITIGATION

6.1 RECOMMENDED MEASURES

This section describes possible mitigation strategies for potential impacts to bighorn sheep. Measures were developed based on consultation with experts (Kerr 2010; Wehausen 2012; Davenport 2013a), comments from CDFW (Hawk 2013), and consideration of impacts.

Table 6-1: Potential Mitigation

Mitigation Measure	Purpose	Impact to be Mitigated
Measure BHS-1: Worker environmental awareness training	Train workers to recognize and avoid bighorn sheep that enter the project area	Construction and operation direct impacts to individuals
Measure BHS-2: Biological monitor during construction	Ensure no direct impacts to bighorn sheep during construction	Construction direct impacts to individuals
Measure BHS-3: No pets will be allowed on site	Reduce deterrence of bighorn sheep, as other animals can deter bighorn sheep	Potential spread of disease to individuals
Measure BHS-4: Create two water sources in the North Soda Mountains	Encourage bighorn sheep to cross I-15 and recolonize North Soda Mountains	Incremental cumulative impacts to connectivity
Measure BHS-5: Wildlife fencing	Use wildlife fencing to direct bighorn sheep towards underpasses for safe crossing of I-15	Incremental cumulative impact to connectivity
Measure BHS-6: Locate O&M building in close proximity to the Rasor Road service station	Grouping human activity on the site will reduce the impact to bighorn sheep habitat use	Habitat
Measure BHS-7: Compensatory habitat mitigation	Conserve suitable bighorn sheep habitat to compensate for the loss of foraging habitat in the project valley	Habitat

6.2 POTENTIAL EFFECTS OF MEASURES

6.2.1 Measure BHS-4

Construction of water developments, such as guzzlers, could increase suitable bighorn sheep habitat by increasing water availability in otherwise arid regions. Habitat use is positively correlated with water availability (Rosenstock et al. 1999). Installing a water source in otherwise suitable habitat may thus encourage the sheep to use new habitat areas during migration. Bighorn sheep populations may also benefit from the new water source because the water source would increase interaction between sheep. Waterholes have been documented as primary sites for social interactions (agonistic exchanges, courtship, mating, etc.) and may serve as locations for important dominance and mating interactions between sheep, ultimately leading to higher recruitment (Olech 1979). Water sources can have potential adverse impacts on wildlife, such as by creating a subsidy for ravens. Such impacts could be addressed through proper siting and other precautionary measures developed in coordination with CDFW and USFWS.

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EXHIBIT C

SEZ Screening Criteria Applied to Soda Mountain Solar

Criteria	Yes	No
SEZ Restrictions		
Lands with slopes greater than or equal to 5%		X
Lands with solar insolation levels less than 6.5 kWh/m2/day.		X
All Areas of Critical Environmental Concern (ACECs), including Desert Wildlife Management Areas (DWMAs) in the California Desert District.		X
All critical habitat areas (designated and proposed) for listed species under the Endangered Species Act of 1973 (as amended).		X
All areas where the applicable land use plan designates no surface occupancy (NSO).		X
All Special Recreation Management Areas (SRMAs), developed recreational facilities, and special-use permit recreation sites (e.g., ski resorts and camps).		X
All areas where solar energy development proposals are not demonstrated to be consistent with the land use management prescriptions for or where the BLM has made a commitment to take certain actions with respect to sensitive species habitat, including but not limited to sage-grouse core areas, nesting habitat, and winter habitat; Mohave ground squirrel habitat; and flat-tailed horned lizard habitat.		X
All ROW exclusion areas designated in applicable plans.		X
All ROW avoidance areas designated in applicable plans.		X
All areas where the land use plan designates seasonal restrictions.		X
All Desert Tortoise translocation sites identified in applicable land use plans.		X
Big Game Migratory Corridors identified in applicable land use plans.		X
Big Game Winter Ranges identified in applicable land use plans.		X

SEZ Screening Criteria Applied to Soda Mountain Solar		
Criteria	**Yes**	**No**
Research Natural Areas,		X
Lands categorized as Visual Resource Management Class I or II (and, in Utah, Class III[b]).		X
National Recreation Trails and National Back Country Byways.		X
National Historical and Scenic Trails, including a corridor of 0.25 mi (0.4 km) from the centerline of the trail, except where a corridor of a different width has been established.		X
National Historic and Natural Landmarks.		X
Within the boundary of properties listed in the *National Register of Historic Places* and additional lands outside the designated boundaries to the extent necessary to protect values where the setting and integrity is critical to their designation or eligibility.		X
Areas with important cultural and archaeological resources, such as traditional cultural properties and Native American sacred sites, as identified through consultation.		X
Wild, Scenic, and Recreational Rivers, including a corridor of 0.25 mi (0.4 km) from the ordinary high-water mark on both sides of the river, except where a corridor of a different width has been established.		X
Segments of rivers determined to be eligible or suitable for Wild or Scenic River status, including a corridor of 0.25 mi (0.4 km) from the ordinary high-water mark on either side of the river.		X
Old Growth Forest.		X
Lands within a solar energy development application found to be inappropriate for solar energy development through an environmental review process that occurred prior to finalization of the PEIS.		X
Within National Landscape Conservation System Lands		X

SEZ Screening Criteria Applied to Soda Mountain Solar

Criteria	Yes	No
SEZ Requirements		
Near existing or designated transmission corridors	X	
Near existing roads	X	
Slope of 1 or 2% or less		X
Minimum of 2,500 acres	X	