Comment Set B9 – Science & Collaboration for Connected Wildlands

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November 13, 2020

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Submitted via e-mail: CEQA.comments@slc.ca.gov

Subject: Stagecoach Solar Project NOP Comments

Dear Ms. Mongano,

Thank you for the opportunity to comment on the Proposed Stagecoach Solar Project Notice of Preparation (NOP) to prepare an Environmental Impact Report (EIR). SC Wildlands was alerted to the Proposed Stagecoach Solar Project by Neil Nadler, a Lucerne Valley resident, because of the Proposed Project's impacts to wildlife movement corridors and habitat linkages. SC Wildlands' mission is to protect and restore systems of connected wildlands that support native species and the ecosystems upon which they rely. As such, our comments on the NOP largely focus on the potential impacts of the proposed project on habitat connectivity and wildlife movement corridors. B9-1

The NOP is supposed to identify potential environmental effects of the proposed project as identified through the initial study, which is largely based on the Environmental Checklist in Appendix G of the CEQA Guidelines. Under Biological Resources, the NOP stated that:

The EIR will examine proposed Project activities on federally or State-listed species or species proposed for listing; conflicts with any local policies on biological resources; and any conflicts with local, regional, or State habitat conservation plans.

Section IV of the Environmental Checklist under CEQA covers Biological Resources, which has six different questions project proponents must answer. The Anticipated Project Impacts on Biological Resources identified in the NOP address 3 of the 6 questions, a, e and f but neglected to include d – will the project:

> d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

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The EIR must address potential impacts of the proposed project on habitat connectivity and wildlife movement for ALL native resident or migratory wildlife species, not just listed and candidate species, and established wildlife corridors as called for in the CEQA guidelines. B9-1 cont.

Several connectivity models, reports, and plans highlight the importance of the Proposed Project Site to maintaining habitat connectivity and wildlife movement corridors. The includes several connectivity models used by the 2016 Desert Renewable Energy Conservation Plan (DRECP), including the Desert Linkage Network (Penrod et al. 2012), Bighorn Sheep Intermountain Habitat (California Department of Fish and Wildlife 2013), and Desert Tortoise TCA Habitat Linkages (Averill-Murray et al. 2013, Croft 2013). A range wide model of omnidirectional connectivity for the Mojave Desert tortoise (*Gopherus agassizii)* (Gray et al. 2019) also shows the Proposed Project Site provides high connectivity for desert tortoise movements. The State Wildlife Action Plan (CDFW 2015) also highlighted the importance of the Draft Apple Valley MSHCP/NCCP to maintaining wildlife movement and habitat connectivity.

The Desert Tortoise Habitat Linkages (Averill-Murray et al. in 2013) were delineated to identify areas important to the conservation of the desert tortoise (*Gopherus agassizii*) under the Desert Renewable Energy Conservation Plan (DRECP). The linkages were designed to connect desert tortoise conservation areas (TCAs) identified in the recovery plan (USFWS 2011), which include designated critical habitat, Bureau of Land Management Areas of Critical Environmental Concern (ACEC), and National Park Units (Figure 1). One of the primary goals for the Desert Tortoise TCA Linkages (Goal DETO2 of the DRECP) is to "Maintain functional linkages between Tortoise Conservation Areas to provide for long term genetic exchange, demographic stability, and population viability within Tortoise Conservation Areas." This is especially important for the Ord-Rodman TCA because it does not meet the minimum size threshold (2590 km^2) to support a viable tortoise population over the long term (Croft 2013). The proposed Stagecoach Solar Project, 9.1 km of transmission lines, and the proposed Calcite Substation are all within the Ord-Rodman to Fremont-Kramer linkage (Figure 1; Averill-Murray et al. 2013).

The U.S. Fish and Wildlife Service Desert Tortoise Recovery Office (DTRO) identified how different areas of the linkage conservation network for the tortoise would be treated relative to conservation reserve establishment and application of biological goals and objectives under the DRECP. The DTRO also conducted additional analyses and field work in two of the linkages, including Ord-Rodman to Fremont-Kramer linkage and Ord-Rodman to Joshua Tree National Park linkage, to more precisely identify primary and secondary reserve areas more accurately (Figure 1; Croft 2013). Croft (2013) described Upper Lucerne Valley as a large expanse of intact tortoise habitat that is contiguous with the Ord-Rodman TCA. Virtually all of the State Lands Commission land proposed for Stagecoach Solar and roughly 4 km of the associated transmission lines are identified as Primary Tortoise Reserve (Figure 1; Croft 2013).

The Desert Tortoise Habitat Linkages (Averill-Murray et al. 2013) were developed based on a habitat model developed for the tortoise (Figure 2) by U.S. Geological Survey (Nussear et al. 2009). Nussear et al. (2009) identifies virtually all of the Proposed Stagecoach Solar, associated transmission lines, and Calcite Substation as highly suitable habitat for desert tortoise (Figure 2).

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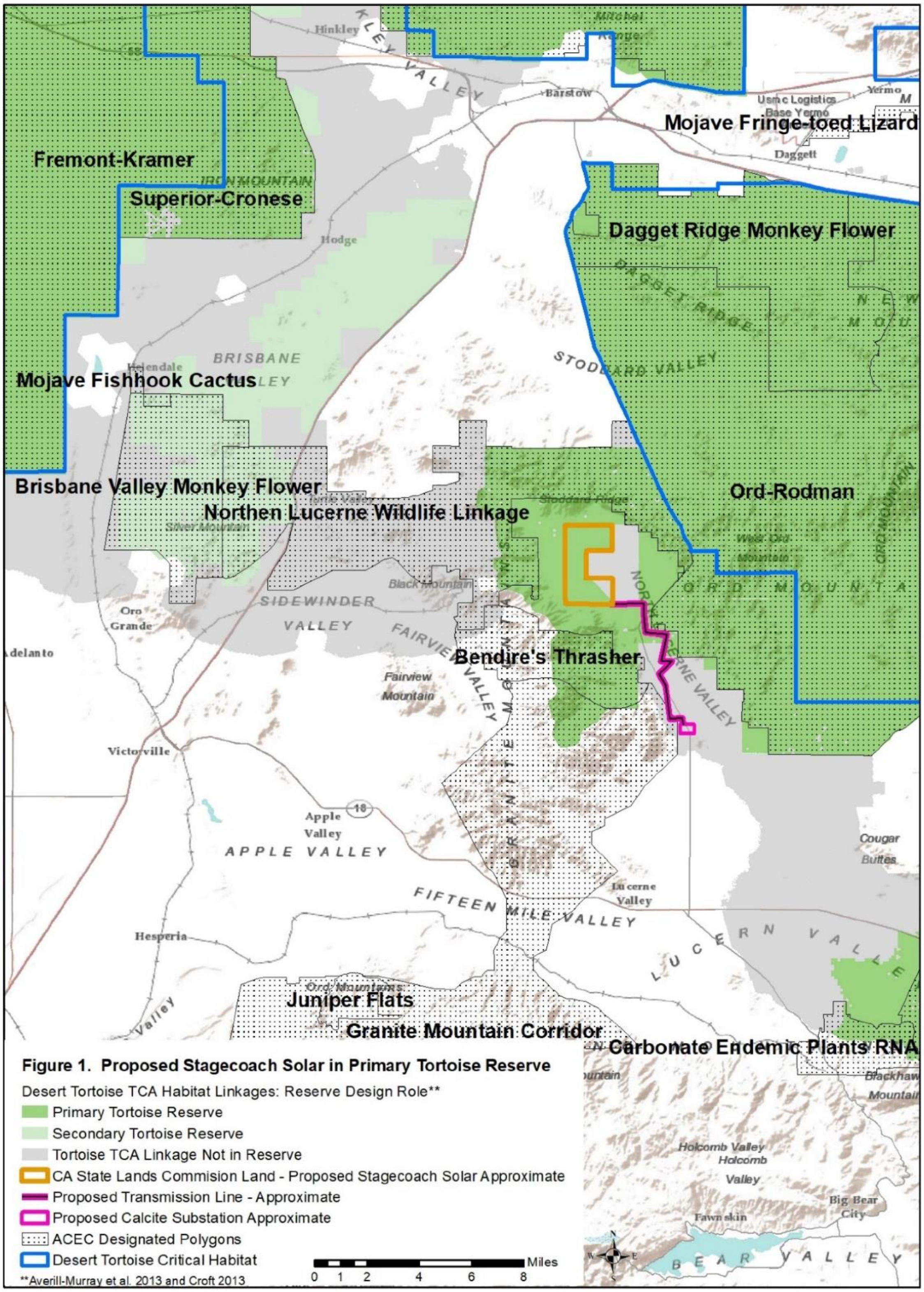

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B9-1 cont.

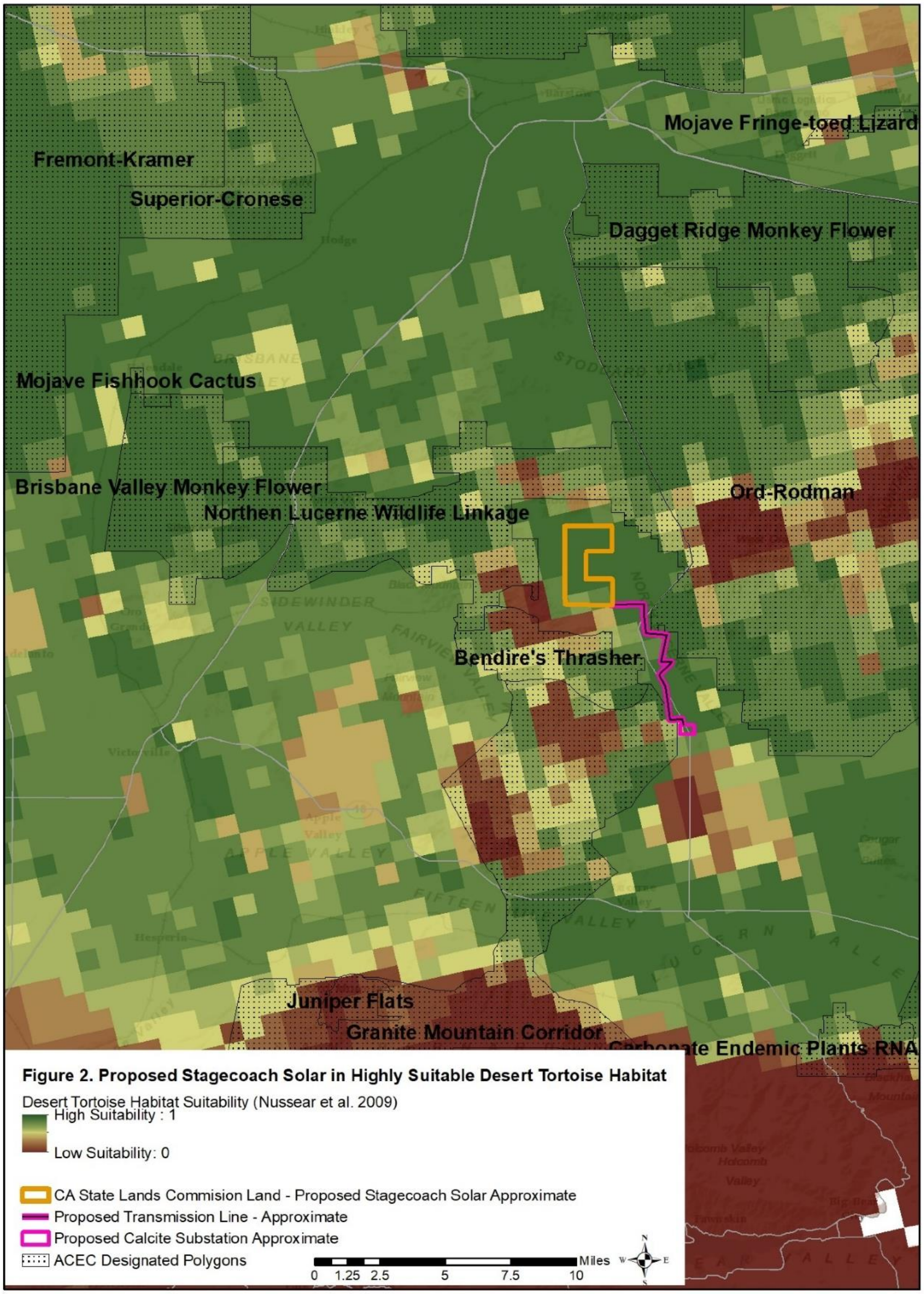

Figure 2. Proposed Stagecoach Solar in Highly Suitable Desert Tortoise Habitat

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Croft (2013) recommended the DRECP Reserve Design include "Preservation of the intact habitat in the valley bottom areas of Upper Lucerne Valley would provide a more suitable linkage for desert tortoise" than the Northern Lucerne Wildlife Linkage ACEC, which is not as suitable for desert tortoise because of the mountainous terrain. For any proposed renewable energy projects in Upper Lucerne Valley, Croft (2013) recommended "stringent conservation management actions and high mitigation ratios in this portion of the DFA. All projects considered in this location must perform an analysis of effects on connectivity and effects on population viability within the Ord-Rodman DWMA. Projects that cannot show sufficient mitigation of their impacts on these factors are prohibited." **B9-1 cont.**

According to the Desert Tortoise Modeled Future Distribution – developed by Davis and Soong for the DRECP (https://databasin.org/datasets/bdcf1adfefb74db28d7878d4c0e05c79), the proposed project site is especially important for the desert tortoise to have a chance of adapting to climate change. That model projected desert tortoise distribution for the period 2040-2069 based on statistically downscaled outputs of 5 different global climate models, and has recently been updated to symbolize Range Stability and Range Expansion (Figure 3). Range Stability

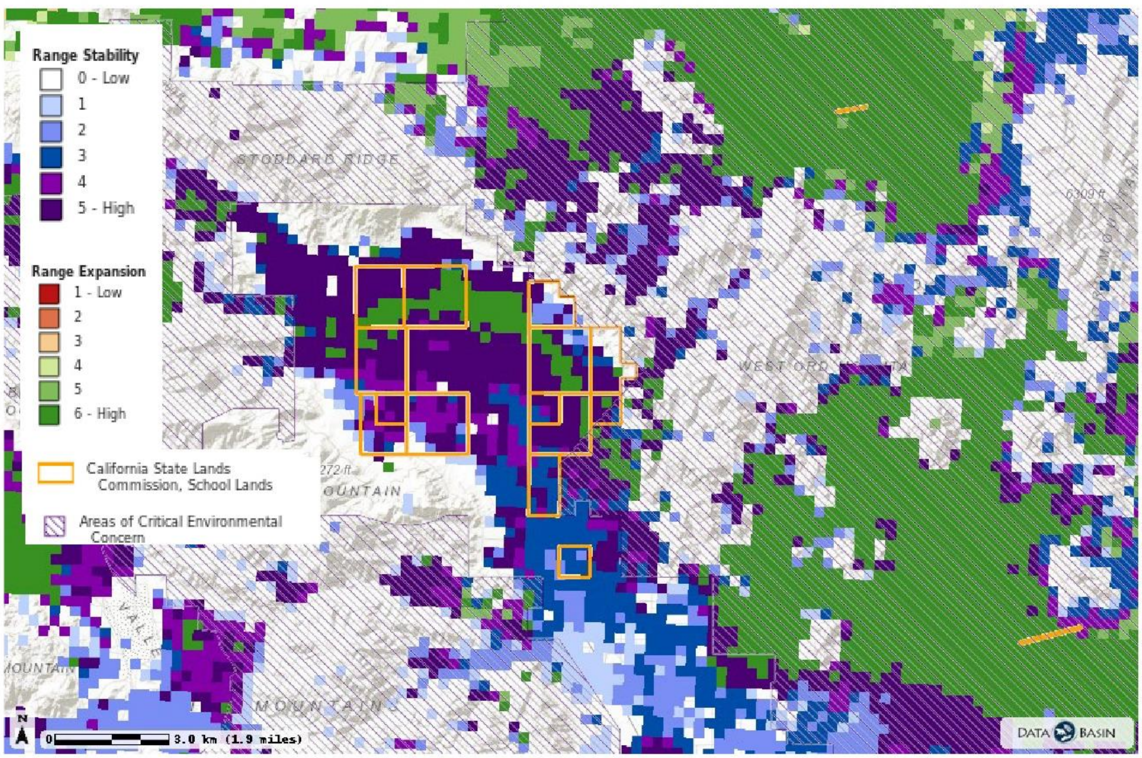

Figure 3. Desert tortoise modeled future distribution DRECP.

depicts the level of agreement between the current distribution and the predicted future distributions of the species colored light blue to dark purple. Light blue indicates areas that currently support tortoise habitat that is not predicted to be there in the future, while dark blue indicates areas that currently support tortoise habitat that will remain in the future (Figure 3).

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Range Expansion depicts areas that are likely to be suitable for tortoise in the future, colored from red to green, with green areas where four and five models predict range expansion (Figure 3). Highly suitable desert tortoise habitat throughout the proposed project site is expected to remain relatively stable and provide for range expansion under projected climate scenarios. **B9-1 cont.**

A recent USFWS Internal Discussion Draft, dated Sept 25, 2020, entitled, *Connectivity of Mojave Desert Tortoise Populations: Management Implications for Maintaining a Viable Recovery Network,* emphasized the importance of the State Land Commission land proposed for Stagecoach Solar to the desert tortoise. USFWS (2020) proclaimed, "tortoise populations adjacent to and contiguous with populations within TCAs are essential for long-term species viability and recovery." Desert TCAs and linkages in the DRECP (BLM 2016) also have surface-disturbance caps, with the Fremont-Kramer to Ord-Rodman Linkage having a disturbance cap of 0.5%. USFWS (2020) suggested, "To help maintain tortoise occupancy and permeability across all other non-conservation-designated tortoise habitat, surface disturbance could be limited to <5% development per square kilometer (Carter et al. 2020). This would be particularly useful in areas within the upper 5th percentile of connectivity values modeled by Gray et al. (2019)" Figure 4. The development proposed for Stagecoach Solar on just the State Lands Commission land is 1,950 acres = 7.89 km^2, far and above what is suggested by USFWS.

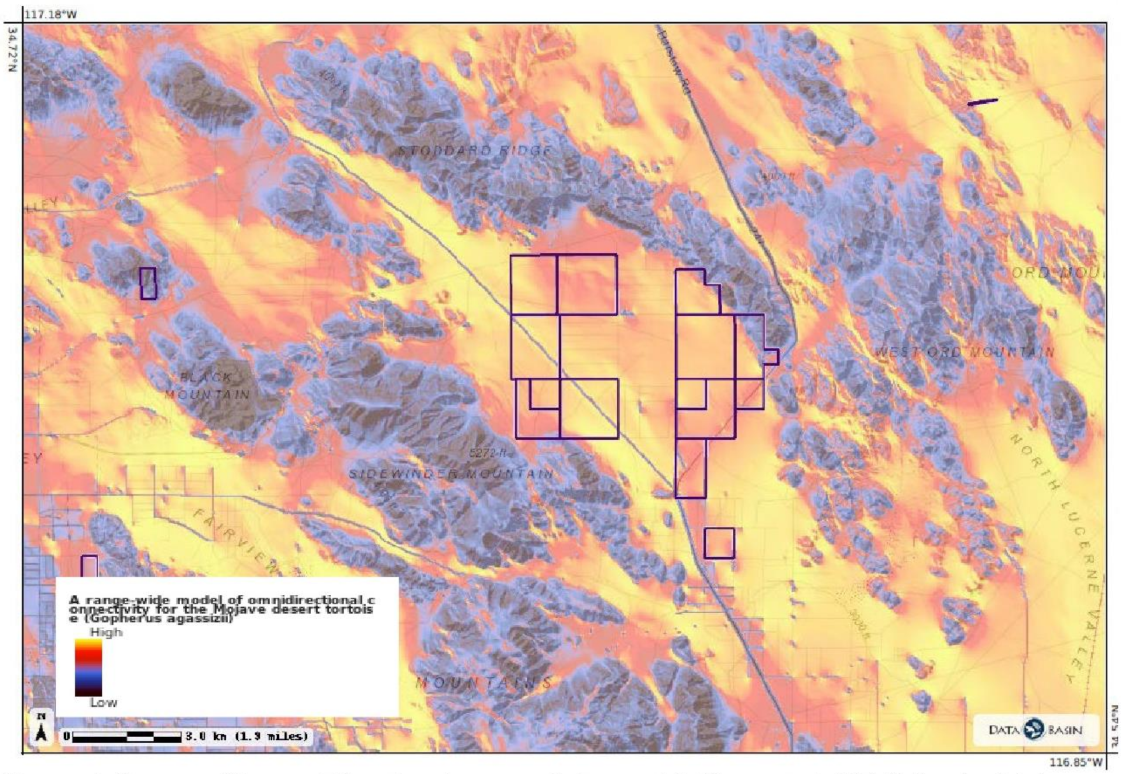

Figure 4. Range-wide omnidirectional connectivity model (Gray et al. 2019) for the Mojave Desert Tortoise

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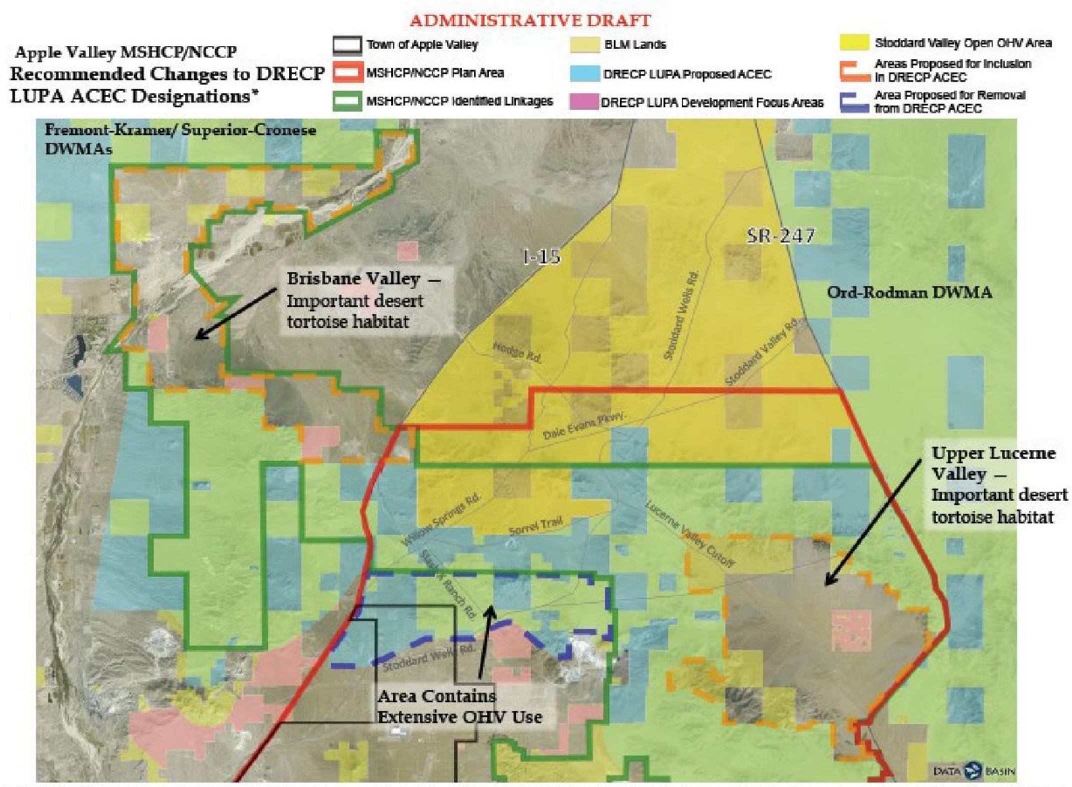
The desert tortoise is a corridor dweller that may take multiple generations to move between TCAs. In order to sustain desert tortoise populations, habitat linkages between TCAs must be wide enough to support multiple home ranges (Beier et al. 2008, USFWS 2020. Sazaki et al. (1995) estimated dispersal distance for pre-breeding male tortoises to be between 6.21-9.32 miles. Forcing desert tortoises to go around the fenced perimeter of the entire 1,950 acre proposed Stagecoach Solar project would create a significant barrier to movement of desert tortoises, especially dispersing juveniles. The Stagecoach Solar footprint measures roughly 3 miles north to south, stretching from the foothills of Stoddard Ridge to the foothills of Sidewinder Mountain (Figure 4), essentially severing desert tortoise habitat on either side of the proposed project, which could not be mitigated to a threshold that is less than significant. B9-1 cont.

The Draft Apple Valley MSHCP/NCCP also identifies the State Lands Commission land as important desert tortoise habitat (Figure 5) in the Wild Wash linkage in their reserve design, which is part of the Fremont Kramer – Ord Rodman linkage for desert tortoise. Although Interstate 15 is a significant barrier to tortoise movement between these TCAs, Croft (2013) confirmed that "there are seven underpasses (Wild Wash Bridge and 6 passable culverts) under Interstate 15 that likely provide for some level of continued population connectivity."



*The Town has spent extensive time and resources evaluating and ground-truthing this area, and is making these recommendations based on existing land uses and ground conditions.

Figure 5. Draft Apple Valley MSHCP/NCCP stressed the importance of the State Land Commission lands in Upper Lucerne Valley to desert tortoise.

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The primary vegetation community on the State Lands Commission land proposed for Stagecoach Solar is creosote bush scrub. Creosote bush is often the dominant plant in desert tortoise habitat (USFWS 2011). Section 2.5 of the NOP on Closure and Decommissioning, stated "If, at the end of the CSLC lease and/or contract term to sell energy to the utility buyer, no contract extension is available or no other buyer of the energy emerges, the solar plant would be decommissioned and dismantled. After removal of all construction related on-site improvements, remediation and restoration of the area would be performed on the site to its pre-construction condition." Creosote bush scrub is the main vegetation community on the proposed project site. Of significance, there are several clusters of ancient creosote rings along washes on the proposed site. As Tim Thomas, former President of the Mojave Chapter of California Native Plant Society said, "Lots of rings indicate old, 3-4,000-year-old, intact habitat." As such, it would be impossible to restore habitat "on the site to its pre-construction condition." B9-2

The proposed Stagecoach Solar Project, including the transmission lines, and the Calcite Substation nearly touch the Final Granite Mountain Wildlife Linkage Area of Critical Environmental Concern (ACEC) (Figure 6). The DRECP's Relevance and Importance Criteria for this ACEC states, "the area is critical for bighorn sheep, golden eagles, desert tortoise and prairie falcons and several other species. Additionally, numerous rare and sensitive plants have major populations here, making the area regionally important". Goals: "Protect biological values including habitat quality, populations of sensitive species, and landscape connectivity while providing for compatible public uses" (BLM 2016). B9-3

Bighorn sheep have extensive spatial requirements, make pronounced seasonal movements, and require habitat connectivity between subpopulations. Bighorn sheep are extremely sensitive to habitat loss and fragmentation (Bleich et al. 1996, Rubin et al. 1998, Singer et al. 2000, USFWS 2000). Although typically associated with rugged mountainous terrain, bighorn sheep commonly use a variety of desert terrain types, including canyon bottoms, washes, alluvial fans, plateaus, and valley floors (Figure 6). These areas may be used both for movement between mountainous areas and as important foraging areas (Schwartz et al. 1986, Bleich et al. 1997). CDFW (2013) identifies the proposed project site as intermountain habitat known to support bighorn sheep movements between the Granite Mountains and the Ord and Newberry Mountains.

A Linkage Network for the California Deserts (Penrod et al. 2012), commissioned by the Bureau of Land Management and The Wildlands Conservancy, was intended to provide more information to natural resource agencies, environmental consulting firms, and the general public concerning where and how to maintain connectivity and sustain ecological functions in a changing climate. Penrod et al.'s (2012) study area encompassed the entire DRECP area with a buffer into the neighboring Sierra Nevada and South Coast Ecoregions, and was a key input to the reserve design of the DRECP. The Desert Linkage Network (Figure 7) was designed to help meet Goal L1 of the DRECP, "Create a Plan-wide reserve design consisting of a mosaic of natural communities with habitat linkages that is adaptive to changing conditions and includes temperature and precipitation gradients, elevation gradients, and a diversity of geological facets that provide for movement and gene flow and accommodate range shifts and expansions in response to climate change."

The Desert Linkage Network (Penrod et al. 2012) was developed in part based on the habitat

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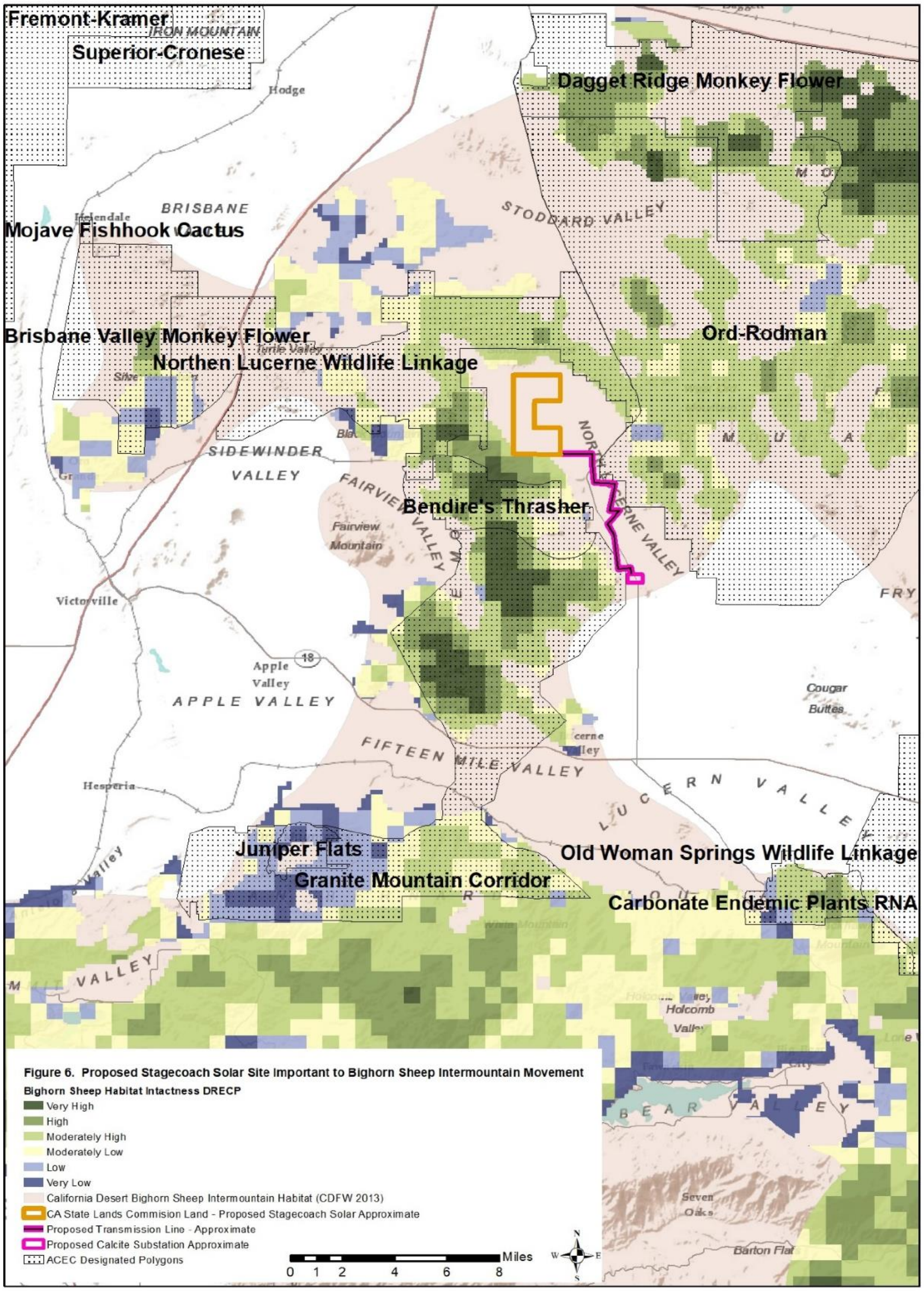

Figure 6. Proposed Stagecoach Solar Site Important to Bighorn Sheep Intermountain Movement

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B9-3 cont.

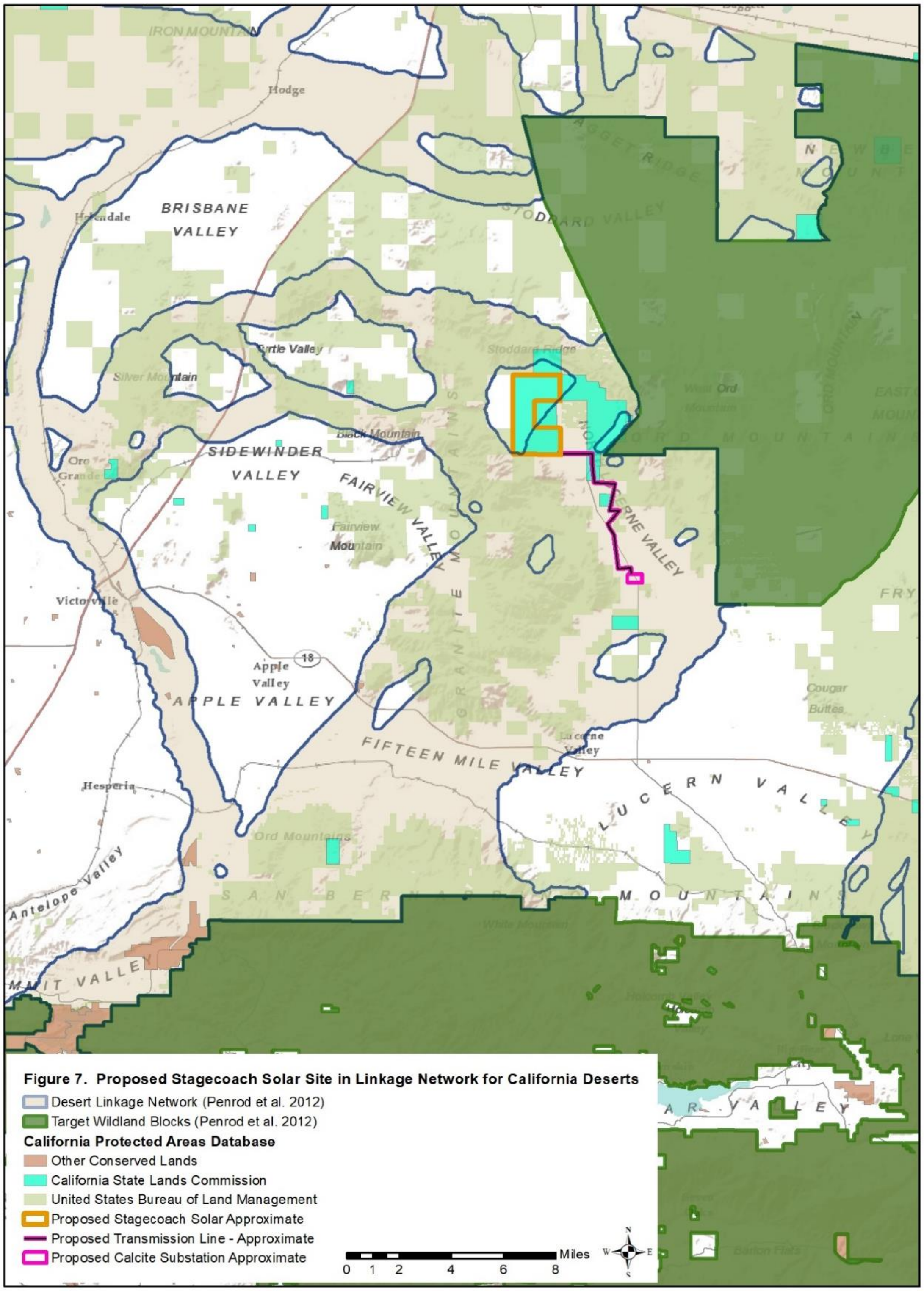

Figure 7. Proposed Stagecoach Solar Site in Linkage Network for California Deserts

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and movement requirements of 44 different focal species, including desert tortoise and bighorn sheep, that were selected to represent a diversity of ecological interactions and are intended to serve as an umbrella for all native species and ecological processes of interest in the region. These 44 focal species capture a diversity of movement needs and ecological requirements and include area-sensitive species, barrier-sensitive species, less mobile species or corridor-dwellers, habitat specialists, and ecological indicator species. Quite a few of these focal species, roughly 27 out of 44, have the potential to use habitat on the land proposed to be leased from the State Lands Commission for the Stagecoach Solar project, along the transmission line, or on the Calcite Substation. Potential adverse impacts of the proposed project on the habitat and movement needs of all of these focal species should be evaluated as part of the DEIR. **B9-3 cont.**

Maintaining habitat connectivity is one of the most important climate adaptation strategies. As such, in addition to evaluating impacts of the proposed project on current conditions of habitat connectivity and wildlife movement, the DEIR should also evaluate impacts to corridors designed to accommodate wildlife movements driven by climate change. Penrod et al. (2012) used a land facets approach (Beier and Brost 2010) to design climate-robust corridors. These corridors maximize continuity of the enduring features (topographic elements such as sunny lowland flats, or steep north-facing slopes) that will interact with future climate to support future biotic communities. Each land facet corridor was designed to maximize continuity of one of the major land facets that occurs within the two targeted areas. Each such corridor is intended to support occupancy and between-block movement by species associated with that land facet in periods of climate quasi-equilibrium. Each linkage design also includes one corridor with high local interspersion of facets intended to support short distance shifts, species turnover, and other ecological processes relying on interaction between species and environments. The proposed Stagecoach Solar project would impact several land facet corridors associated with three linkage designs in the California Desert Linkage Network (Figures 8, 9, and 10).

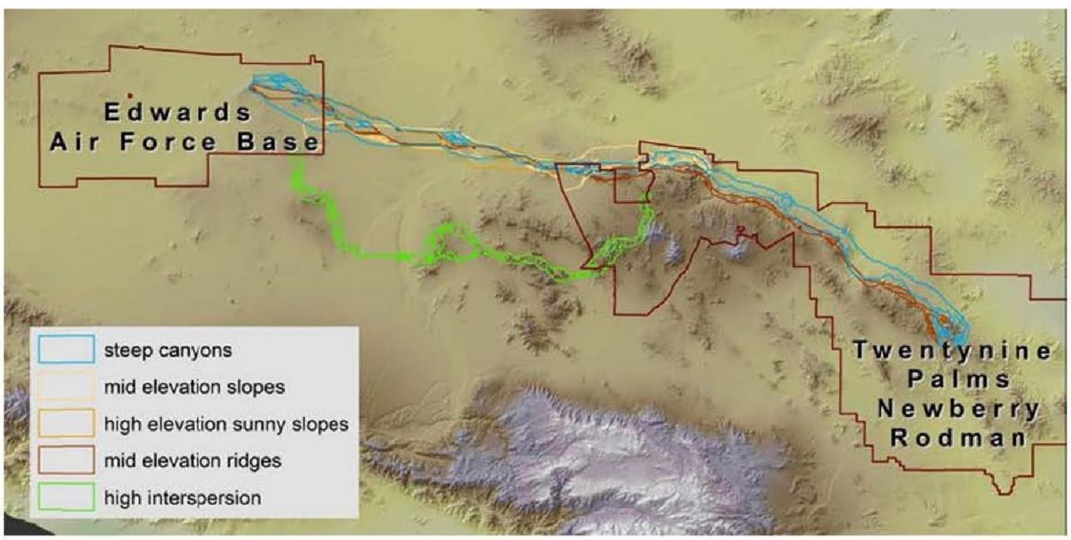

Figure 8. Edwards Air Force Base – Twentynine Palms & Newberry Rodman Land Facets. The southern strand is the corridor for high interspersion of land facets that passes through the footprint of the proposed Stagecoach Solar project.

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B9-3 cont.

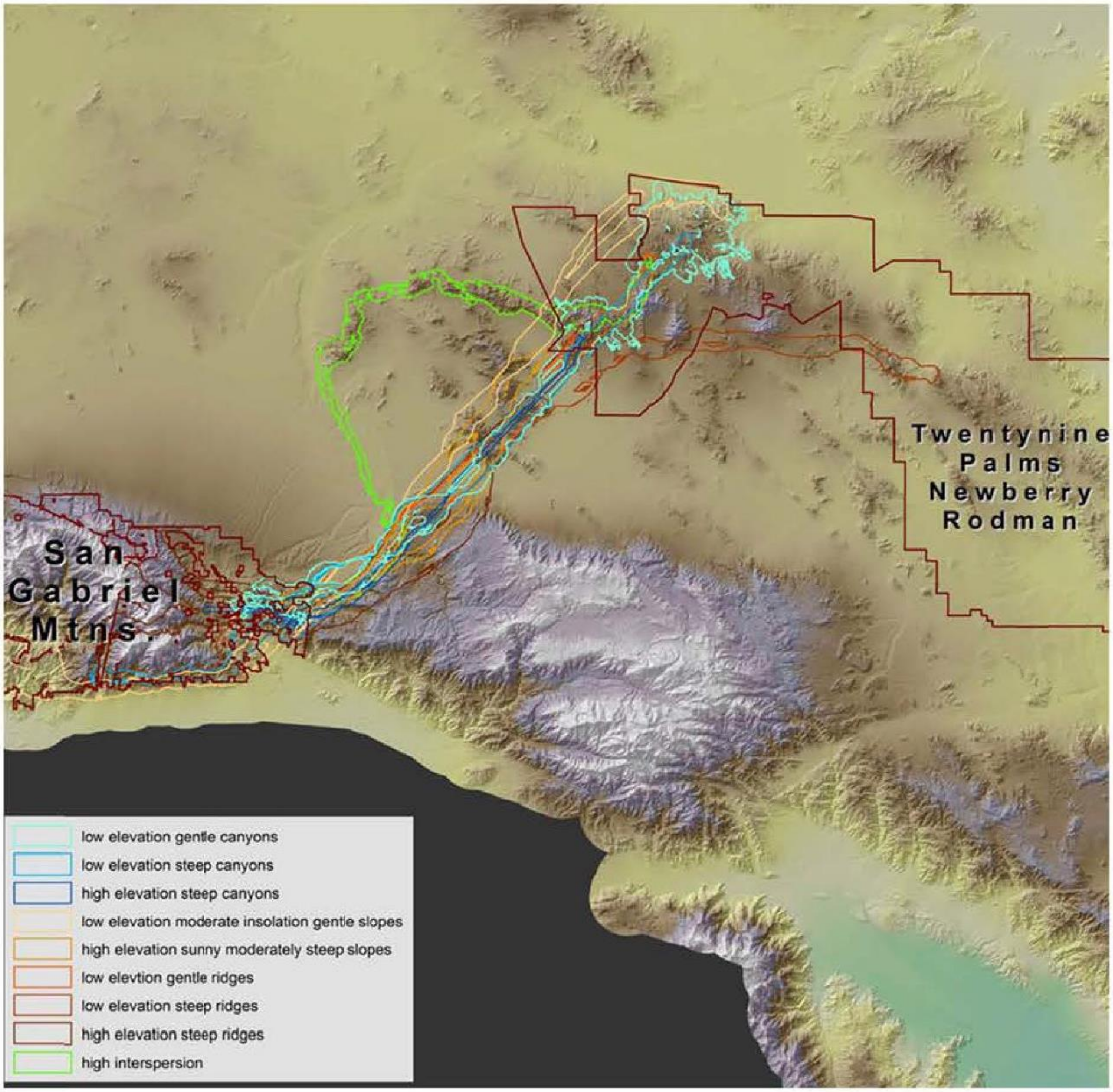

Figure 9. Twentynine Palms and Newberry Rodman – San Gabriel Mountains land facets. The westernmost, arcing strand is the corridor with high interspersion of land facets. All land facet corridors intermix in the south, but the corridors diverge as they approach the northern wildland block (29 Palms Newberry-Rodman ACEC). Here the western branch is the low elevation, gentle slope corridor, the middle branch includes 6 land facet corridors (high elevation, sunny, moderately steep slopes; low elevation, gentle ridges; high elevation, steep ridges; low elevation, steep canyon bottoms; low elevation, gentle canyon bottoms; and high elevation, steep canyon bottoms) and the eastern branch is the low elevation, steep ridges corridor. All of these land facet corridors pass through the footprint of the proposed Stagecoach Solar project.

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B9-3 cont.

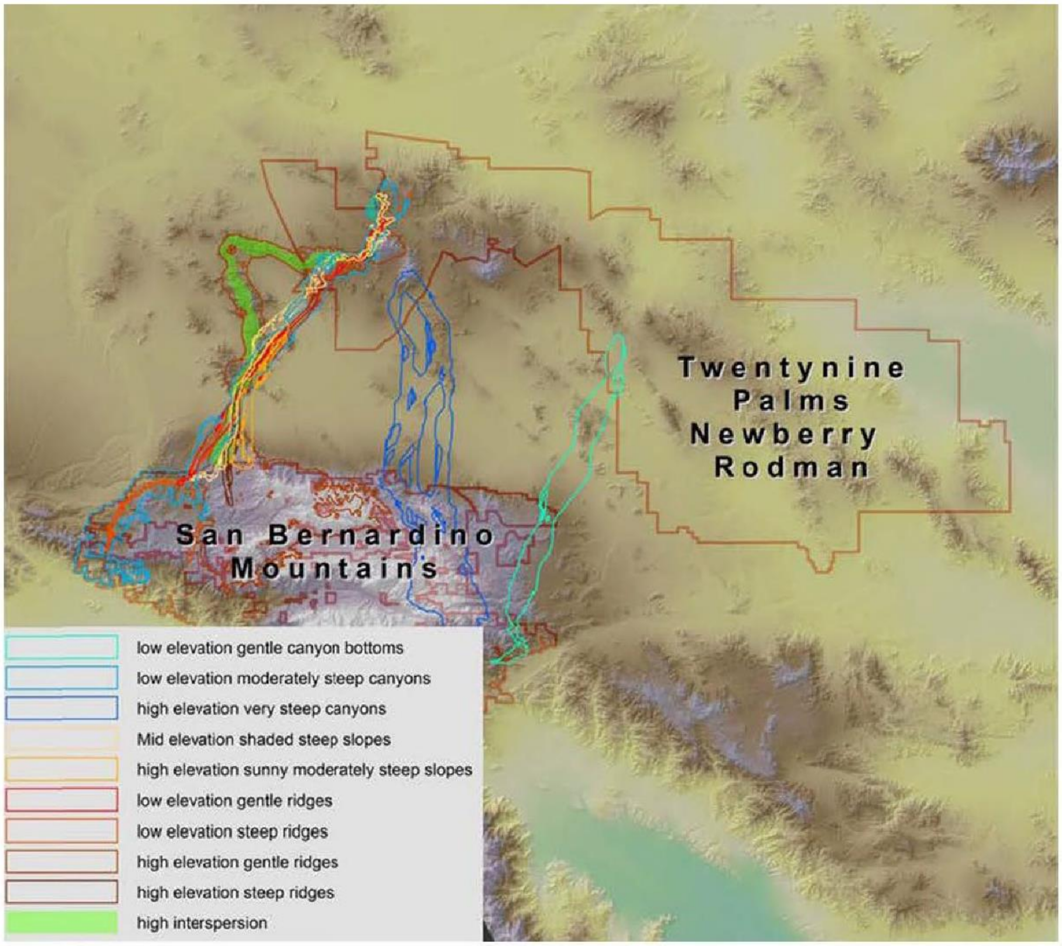

Figure 10. Twentynine Palms and Newberry Rodman – San Bernardino Mountains land facets. The northwesternmost arcing strand contains the corridor with high interspersion of land facets and the corridor for high elevation, gentle ridges. This strand also captures much of the headwaters of the Mohave River. This intertwines with a strand that includes 7 corridors (low elevation, moderately steep canyon bottoms; mid elevation, shaded, steep slopes; high elevation, sunny, moderately steep slopes; low elevation gentle ridges; low elevation, steep ridges, and high elevation, steep ridges). All but two of the land facet corridors pass through the footprint of the proposed Stagecoach Solar project.

The Planning Agreement for the Apple Valley Multispecies Habitat Conservation Plan/Natural Community Conservation Plan (MSHCP/NCCP) was signed in 2017 by the City of Apple Valley, San Bernardino County, CDFW, and USFWS. Section 5.6.3.4 of the California State Wildlife Action Plan (CDFW 2015) included the following on the Apple Valley MSHCP/NCCP:

> *The town of Apple Valley in San Bernardino County is currently preparing a Multispecies Habitat Conservation Plan/Natural Community Conservation Plan (MSHCP/NCCP). Much like SWAP 2015, the MSHCP/NCCP planning effort is focusing*

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on addressing landscape-scale conservation needs, climate change, and protection of species diversity while at the same time addressing local community needs to ensure ecological and economic resilience now and in the future.

B9-3 cont.

The Planning Area includes Apple Valley, surrounding San Bernardino County lands, Bureau of Land Management lands, ***and state lands****. The Plan Area is approximately 345.6 square miles. The Town's MSHCP/ NCCP planning effort focuses on landscape level conservation. Overall, the Plan will connect through its linkages over 2.1 million acres on conservation lands in the West Mojave Desert. Apple Valley's MSHCP/NCCP Plan Area is rich in natural resources and important to the West Mojave Desert. The area was recently identified by the U.S.* Geological *Survey as one of ten genetic divergence and diversity hotspots in the West Mojave Desert.*

These areas, due to the high degree of genetic diversity and divergence among species present, can be considered evolutionary hotspots (Vandergast 2013). Because of the variation in elevation, slope, and aspect, the Town's Plan Area is composed of 21 plant communities as recently mapped by the DRECP. These communities include, but are not limited to, forest and woodland communities, desert scrub communities, grasslands, and riparian/wetland areas. Due to the rich variation in community types, the Town is evaluating 50 listed and/or sensitive species that may occur within the Plan Area for inclusion in the MSHCP/NCCP.

The Town is situated at the intersection of three landscape-level linkages. These important features are critical for desert conservation. Their preservation will benefit the region by maintaining connectivity for plant and wildlife species and by helping mitigate impacts from climate change. The three linkages are:

… The San Bernardino-Granite Mountain Connection is a north-south linkage connecting the desert ranges to the coastal ranges via the Granite and San Bernardino Mountains. In 2005, South Coast Wildlands ranked this linkage as one of the top 12 southern California linkages for priority conservation. The linkage represents a landscape-level connection between the coastal and desert mountains. It facilitates the direct dispersal and multigenerational movement of over 14 focal species, including desert bighorn sheep, American badger, Pacific kangaroo rat, and Joshua tree. …

The Northern Lucerne Wildlife Linkage/Wild Wash Linkage is an east-west linkage created by a series of interconnected desert valleys that provides regional connectivity between three of the four Desert Wildlife Management Areas (DWMAs) in the West Mojave Desert. The Northern Lucerne Wildlife Linkage/Wild Wash Linkage incorporates the Wild Wash, the only natural and undeveloped I-15 undercrossing between Victorville and Barstow. This linkage has high quality tortoise habitat and is critical for mitigating the effects of climate change on desert tortoise populations. It is a multigenerational

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linkage between designated critical habitat units for desert tortoise. The linkage also benefits the movement of other desert plants and animals allowing them to adjust to climate change. … The Mojave River Corridor is a north-south linkage that is recognized as an important regional wildlife corridor in San Bernardino County. The Mojave River, specifically the Mojave Narrows, provides critical riparian habitat for a wide variety of resident and neotropical migrating birds. The portion of the Mojave River within the Town's MSHCP/NCCP Plan Area supports the highest number of special status species in the Plan Area and is designated critical habitat for southwestern willow flycatcher. B9-3 cont.

As stated previously, these linkages connect approximately 2.1 million acres of federal lands currently managed for conservation of species and habitats, and they are built upon a largely contiguous framework of federal land managed by BLM. The Apple Valley MSHCP/NCCP planning effort will aid the state in achieving many of the conservation strategies proposed for the Mojave Desert Ecoregion (Shadescale-Saltbush Scrub) because of the natural resource values found within the Planning Area.

Potential impacts to resident and migratory birds must be evaluated in the DEIR. Avian collisions with transmission lines are a significant impediment, particularly for large-bodied birds such as raptors. There are 40 golden eagle nests within an 11-mile radius of the project. A number of different bird species have been recorded crashing into solar power arrays or getting burned by the concentrated rays (Upton 2014). The Preliminary Solar Design for Stagecoach (Westwood 2020) also show plans for electrified fences around the majority of the property. The Bendire's thrasher ACEC is immediately west of the proposed project and the Mojave River Important Bird Area is also in the vicinity of the proposed project. There are a number of listed and sensitive birds that have the potential to occur on the proposed project site. B9-4

Cumulative Impacts as they relate to habitat connectivity and wildlife movement corridors must be evaluated in the DEIR. A list of proposed and approved solar projects and their associated acreages and dots on a map are not sufficient to evaluate cumulative impacts to wildlife movement. The boundaries for each approved and proposed project (e.g., Ord Mountain Solar, Calcite Substation) should be included on a map that clearly shows existing development and natural habitat and measurements should be taken and disclosed for how the proposed Stagecoach Solar project would further constrain wildlife movement corridors and habitat linkages. B9-5

We highly recommend that the proposed Stagecoach Solar project in Upper Lucerne Valley on California State Land Commission land not proceed with the environmental review process. As a state agency, the California State Lands Commission has a mandate to protect the environment and avoid land with significant environmental values. The proposed project site is important for habitat connectivity and wildlife movement, provides highly suitable habitat for federally and state listed species, is surrounded on all sides by ACECs, and is included in the Apple Valley MSHCP/NCCP. B9-6

Thank you for the opportunity to comment. Please feel free to contact me with any questions

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or requests for more data or information.

Respectfully submitted,

Kristeen Penrod

Kristeen Penrod, Director
SC Wildlands

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Comment Set B9 – Science & Collaboration for Connected Wildlands (cont.)

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Comment Set B10 – Morongo Basin Conservation Association

MBCA

morongo basin conservation association

November 13, 2020

Sarah Mongano
Senior Environmental Scientist
California State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825 Sent by E-Mail: CEQA/comments@slc.ca.gov

Subject: Stagecoach Solar Project NOP Comments

Dear Ms. Mongano:

The Morongo Basin Conservation Association (MBCA) is pleased to have this opportunity to provide comments and provide insights on the issues that must be addressed within an EIR for the above project.

This project comes at time where our future is at a tipping-point and provides an opportunity to consider and address the many issues highlighted by this proposed project. While the imperative to transition off fossil fuels is often provided as an imperative in addressing climate change, this transition must not be made at the expense of the natural and human communities that would be unavoidably and irreparably impacted by the construction of this project.

MBCA has joined with many other individuals and organizations to sign-on to a comprehensive coalition letter that identifies many of the issues that must be addressed within the DEIR for this ill-advised project. These issues include:

A. Project descriptions provided with the CSLC's "Environmental Justice Outreach Letter" and in the project application are inconsistent as to the gross area of the project. B10-1

B. The EIR must thoroughly consider the "Indirect and Secondary Effects," "Growth-Inducing Impacts" and overall "Cumulative Effects" of the proposed project that would validate the construction of the Calcite substation and hence the revival of the Coolwater-Lugo transmission project and the construction of further utility scale renewable energy projects in the area. B10-2

Comment Set B10 – Morongo Basin Conservation Association (cont.)

C. The EIR must thoroughly consider all of the substantial adverse effects that the proposed project and related development would have on natural communities and wildlife connectivity corridors. B10-3

D. The EIR must independently assess the amount of soil disturbance and vegetation destruction that would be caused by construction and operation of the proposed project and related development, the amount of dust and valley fever spores that they would emit and the extent to which human health would Be compromised by such emissions. B10-4

E. The EIR must independently assess the extent to which the proposed project and related development would have substantial adverse effects on visual aesthetics (SH247 as a Scenic Highway). B10-5

F. The EIR must include a complete and comprehensive assessment as to the extent to which the proposed project and related development would conflict with the planning goals and policies enunciated by San Bernardino County. In particular, the Renewable Energy and Conservation Element. B10-6

G. Reconcile the conflict with San Bernardino County Supervisors' February 17, 2016 Resolution and DRECP position paper. B10-7

H. The EIR must address the manner in which the proposed project, generation transmission line and Calcite substation would conflict with the MSHCP being jointly developed by the County and the Town of Apple Valley. B10-8

I. Reconcile the inherent conflict with The California Protected Areas Database (CPAD). B10-9

J. The EIR must thoroughly consider "Significant and Unavoidable Impacts." B10-10

K. The EIR cannot "Tier Off" the DRECP. B10-11

L. The EIR must thoroughly examine the amount of water required for the construction, operation and maintenance (including ongoing dust Suppression) of the proposed project and related development, as well as the impact such widespread and intense industrial activities would have on development on the County's finite and already-threatened groundwater resources. B10-12

M. The EIR must thoroughly examine the impacts on surface waters that the proposed project and related development would have by reducing and re-directing natural surface water flows. B10-13

N. The EIR must include an in-depth study of the effects that the proposed project and cumulative development would have on Lucerne Valley communities. B10-14

O. The EIR must analyze a broad array of environmental justiceimpacts that the proposed project and related development would have on the surrounding community (Additional comments on this topic are below). B10-15

Comment Set B10 – Morongo Basin Conservation Association (cont.)

P. The EIR's analysis must take proper account of the impossibility of restoring natural desert terrain and habitat. B10-16

Q. The EIR must contain a CEQA-mandated consideration of project alternatives. Especially, the no-project alternative. B10-17

R. The EIR must incorporate a thorough search for Native American artifacts, campsites and burial grounds in the general area of the proposed project and related development. B10-18

In addition to the above we present the following issues that must be addressed within the EIR:

Environmental Justice

B10-19

During the October 28, 3020 2:00 PM Scoping Meeting it was mentioned that CEQA does not require consideration of community socio-economic factors. I bring to your attention the 2012 Fact Sheet Environmental Justice at the Local and Regional Level, Legal Background presented by Kamala D. Harris, Attorney General. [1]

> California Environmental Quality Act (CEQA) Under CEQA, "public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects …." (Pub. Res. Code, § 21002.) **Human beings are an integral part of the "environment." An agency is required to find that a "project may have a 'significant effect on the environment'" if, among other things, "[t]he environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly**[.]" (Pub. Res. Code, § 21083, subd. (b)(3); see also CEQA Guidelines,2 § 15126.2 [noting that a project may cause a significant effect by bringing people to hazards].) CEQA does not use the terms "fair treatment" or "environmental justice." Rather, CEQA centers on whether a project may have a significant effect on the physical environment. Still, as set out below, by following well-established CEQA principles, local governments can further environmental justice. (Page 2 of 6) (Bold added)

The April 20 Environmental Justice Community letter to Mr. Randy Collins describes the location of the Stagecoach Solar Project (Project) within the Lucerne Valley CSA 29.

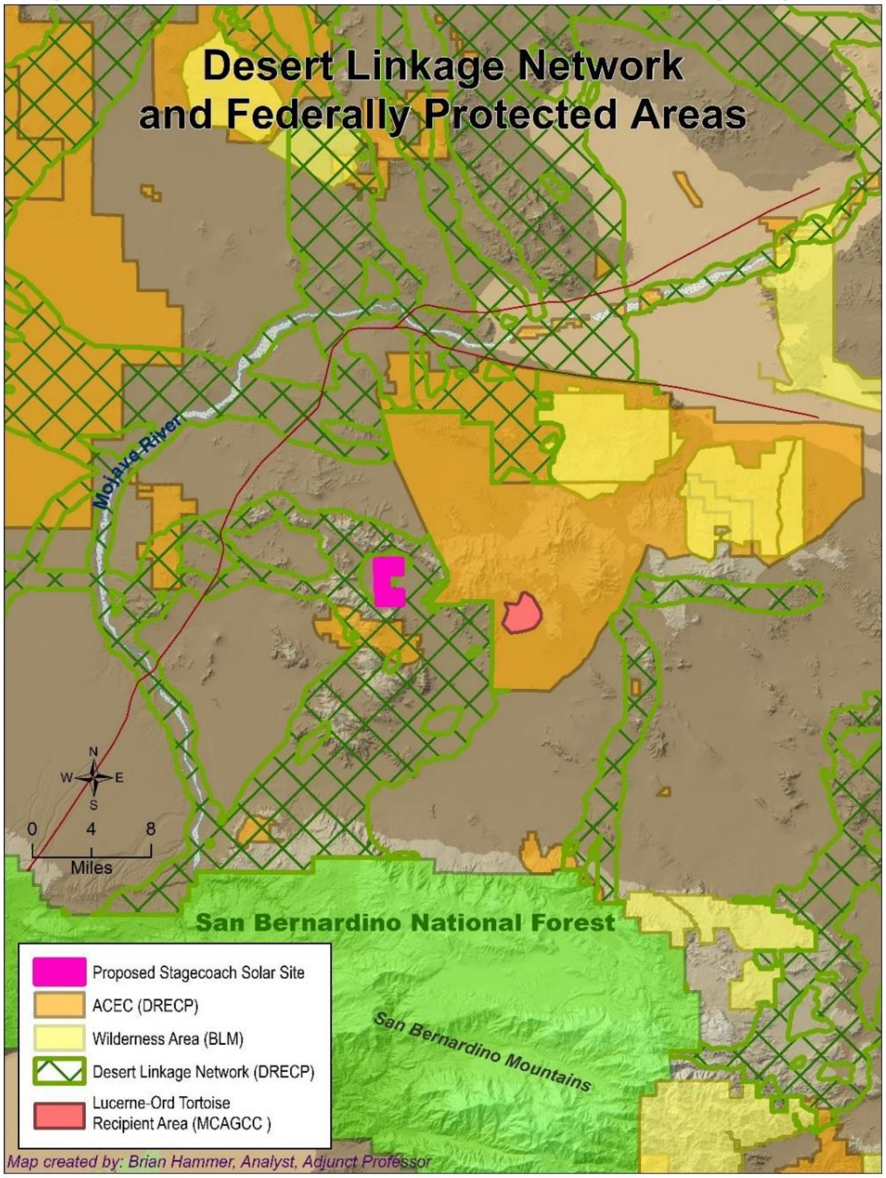
[1] https://oag.ca.gov/sites/all/files/agweb/pdfs/environment/ej_fact_sheet.pdf Attached

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Figures 1 and 2 map the extent of the Disadvantage and Severely Economically Disadvantaged Community areas in Lucerne Valley.[2] B10-19 cont.

Stagecoach NOP - Attachment 3.0: Permits and Agency Coordination

B10-20



The list of agencies to consult for Project coordination does not include the Marine Corps Air Ground Combat Center (MCAGCC). As part of their expansion into Johnson Valley MCAGCC was required to translocate almost 1,100 desert tortoises in the expansion area.[3] In 2017 the tortoises were released into the Ord-Rodman DWMA adjacent to the Desert Linkage Network where the Project is sited. See Figures 1 & 2.

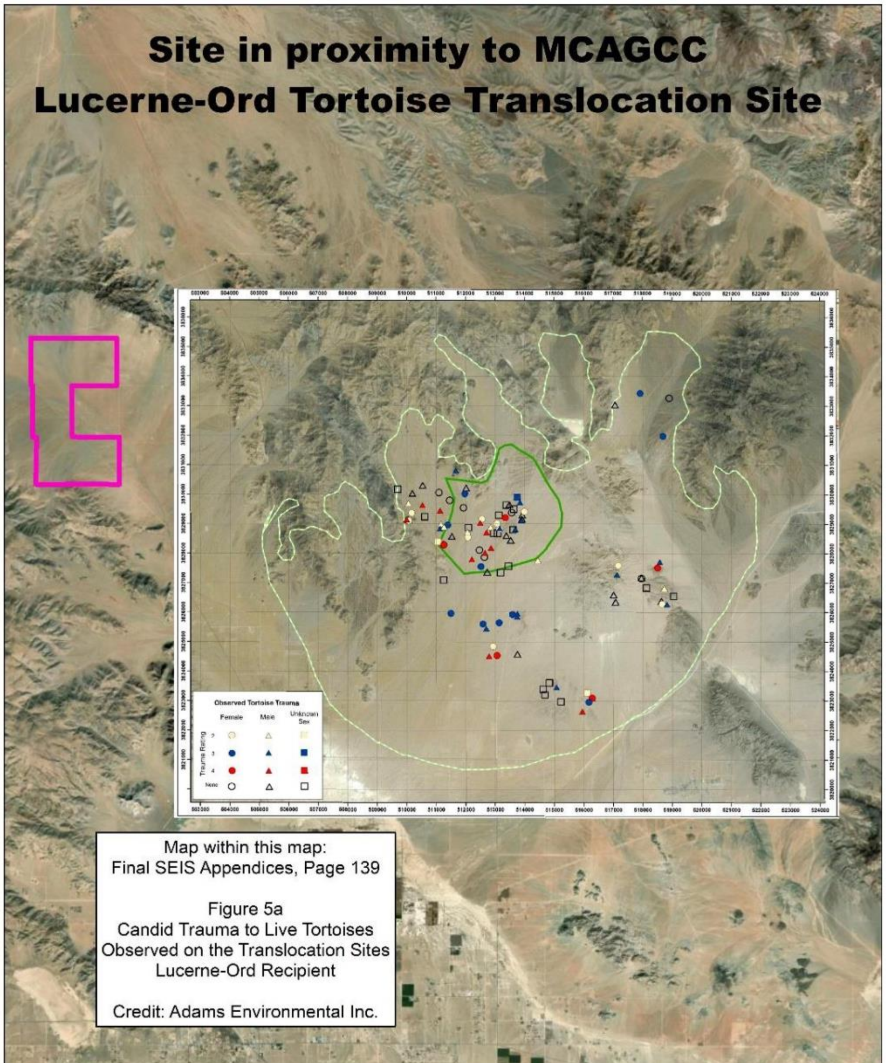
Figure 1 North Lucerne Valley showing Wildlife Linkage Network, ACECs, and DWMA with Stagecoach Solar and the MCAGCC Desert Tortoise release area.

[2] April 20, 2020 Environmental Justice letter to Mr. Randy Collins from Lucerne Valley Community Associations, Businesses, organizations, and individuals

[3] https://www.marinecorpstimes.com/news/your-marine-corps/2017/04/17/desert-tortoises-relocated-for-expansion-of-marine-combat-center-at-twentynine-palms/

Comment Set B10 – Morongo Basin Conservation Association (cont.)

B10-20 cont.



Map within this map was prepared for the:
Supplemental Environmental Impact Statement (SEIS) for Land Acquisition and Airspace Establishment to Support Large-Scale Marine Air Ground Task Force Live-Fire and Maneuver Training at Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms, California (Combat Center)

Figure 2: Stagecoach Solar (pink outline) in proximity to the MCAGCC release site for desert tortoise in the Ord-Rodman Desert Wildlife Management Area (DWMA).

Carbon Sequestration in the Desert Underground and Climate Change

B10-21

The 3000-acre Stagecoach project is sited on intact functioning creosote scrub habitat. The plants in this mature creosote scrub are connected underground by a jungle of mycorrhizae which absorbs and stores carbon dioxide. This complex biological web is described and illustrated in a recently published book by Robin Kobaly.[4] Kobaly's book as well as her article in the March 2019 Desert Report[5], synthesizes the work of numerous

[4] https://summertree.org/the-desert-underground-book/

[5] Robin Kobaly. The Desert Under Our Feet: An Extraordinary Biological Web. The Desert Report March 2019. Pages 1, 14-15.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

scientists over several decades. Carbon sequestration and storage happens. But how much? B10-21 cont.

Over a ten-year timeframe, researchers at the University of Nevada, Los Vegas exposed study plots to elevated carbon dioxide levels similar to those expected in 2050.[6] R.D. Evans, the project lead, has stated that "overall, rising CO2 levels may increase the uptake by arid lands enough to account for 4 to 8 percent of current emissions". [7]

This research provided the data USGS used in 2014 when calculating **Terrestrial Carbon Sequestration in National Parks**.[8] This report gives the metric tons of carbon per hectare being sequestered as well as the Ecosystem Service Value in millions of dollars. This dollar amount considers the land area covered and reveals that within the top 15 parks are the 4 desert parks - Death Valley NP, Mojave Preserve, Joshua Tree NP, and Lake Mead NRA.[9] The desert lands have relatively low sequestration per hectare but lots of undisturbed hectares sequestering C.

For the sake of this discussion let us assume that the project site is similar to the Mojave National Preserve to the east of the Project. Annually the Preserve stores approximately 1.0 metric ton of carbon/hectare/year. The Stagecoach Project's 3,000 acres equal 1,214 hectares so the Site could sequester 1,214 metric tons of carbon/year. This does not account for the carbon permanently stored in cliché layers at depth. Research indicates for the site to be restored at the end of use, returning to its full functioning capacity, could take from several hundred to 3,000 years. So, conservatively, if you account for the loss of carbon sequestration over 300 years you get 364,200 metric tons of carbon not sequestered. This amount is conservative and does not account for the footprint of the project which will kill the mycorrhizae for some distance outside of the project perimeter or the carbon stored in the buried caliche.

Dr. Michael Allen, Center for Conservation Biology, University of California, Riverside prepared a report in 2014 for the California Energy Commission Energy Research and

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[6] RD Evans, A Koyama, DL Sonderegger. Greater ecosystem carbon in the Mojave Desert after ten years exposure to elevated CO2. Nature Climate Change Letters, 2014. Google Scholar pdf

[7] https://news.wsu.edu/2014/04/06/research-arid-areas-absorb-unexpected-amounts-of-carbon/#:~:text=PULLMAN%2C%20Wash.,dioxide%20increase%20in%20the%20atmosphere.

[8] Leslie Richardson, et.al, Terrestrial Carbon Sequestration in National Parks. Natural Resource Report NPS/NRSS/EQD/NRR—2014/880
https://d3n8a8pro7vhmx.cloudfront.net/mbca/pages/1440/attachments/original/1566607565/NPS_Carbon_Sequestration.pdf?1566607565

[9] Ibid. Figure 2, Page 9

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Development Division on Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation.[10] He concludes: B10-21 cont.

> **5.1 Carbon in Desert Ecosystems and Vegetation Removal**
> Large-scale solar development in desert ecosystems has the potential to generate electricity, thereby reducing fossil carbon (C) accumulation in the atmosphere, and in turn, lessening the rates of global warming (e.g., Hernandez et al. 2014). However, both caliche and organic matter losses compromise the value of solar energy as an alternative to fossil C burning by releasing stored inorganic C into the atmosphere and destroying the ability of the deserts to sequester C. A number of concerns, including loss of inorganic C cycling have been raised with solar development, but the majority of concerns can be addressed with careful attention to siting the facilities and roads (e.g., Hernandez et al. 2014).

Carbon sequestration in the intact creosote scrub proposed for siting the Stagecoach Solar Project must be evaluated under Greenhouse Gas Emission and Climate Change.

EIR Alternative Analysis – Executive Order N-82-20 B10-22

On October 7, 2020 Governor Newsom issued executive order N-82-20 enlisting California's vast networking of natural and working lands – forest, rangelands, farms, wetlands, coast, deserts, and urban greenspaces – in the fight against climate change. [11]
The California Natural Resources Agency is directed to establish the California Biodiversity Collaborative (Collaborative) to bring together governmental partners, Native American Tribes, experts, business and community leaders and other stakeholders from across California to protect and restore the State's biodiversity. The CSLC has thousand of acres of pristine desert lands, which if just left alone, will continue sequestering and storing carbon in perpetuity. Management actions such as protecting wildlife linkage designs from encroachment will help to protect and restore the State's biodiversity.
The press release for this Executive Order points out that California is one of the world's 36 biodiversity hotspots with an estimated 5,500 plant species of which 40 percent are endemic, found nowhere else on earth.[12]

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[10] Allen, Michael F., G. Darrel Jenerette, Louis S. Santiago. (University of California, Riverside). 2013. ***Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation.*** California Energy Commission. Publication number: CEC-500-2014-063.
[11] https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-.pdf
[12] https://www.gov.ca.gov/2020/10/07/governor-newsom-launches-innovative-strategies-to-use-california-land-to-fight-climate-change-conserve-biodiversity-and-boost-climate-resilience/

Comment Set B10 – Morongo Basin Conservation Association (cont.)

The three desert areas in California – Sonoran, Mojave, and Great Basin – make up 28% of the state but contain 38% of the native plant species. Of the 2,450 native plant species (with numbers growing) 25% are endemic to the desert. [13] B10-22 cont.

Of course, the plants need pollinators. As a point of reference, Joshua tree National Park hosts 500-600 species representing 40 genera in 6 (or 7 total) families.[14]

All three deserts are climatologically, topographically, and geologically diverse. Across the skin of the desert there are "more than 100 major mountain ranges, myriad canyons, playas, alkali meadows, badlands, and sprawling dune complexes."[15]

Figure 3 shows a concentration of California State Lands spread throughout the California Deserts. Much of the land is pristine and diverse. The CSLC must be a member of the Collaborative. **The land parcels must be studied and evaluated for the dollar amount of nature's services they provide. That estimated dollar amount should be provided to the Commission to support schools. The best alternative to developing pristine desert land is not to develop them at all.**

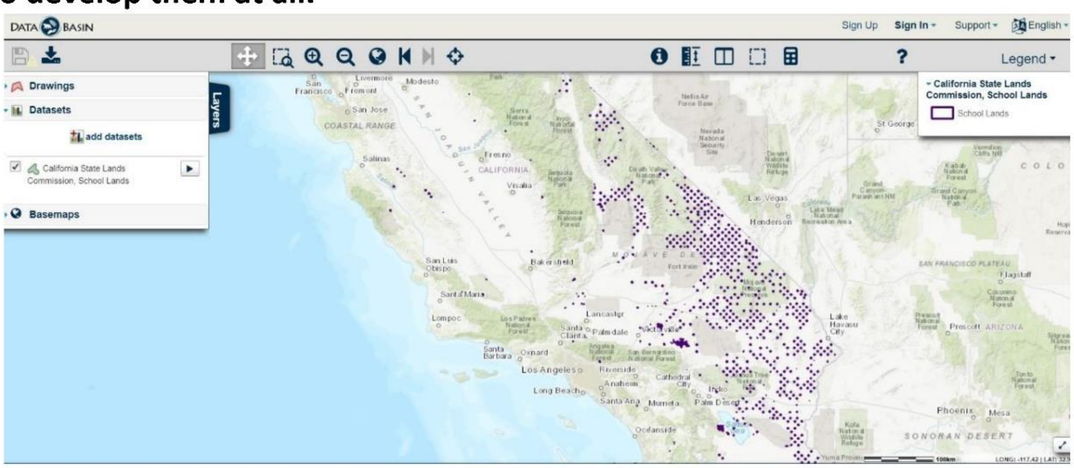

Figure 3: California State Lands Commission holdings throughout the California deserts.

Please also include by reference the Homestead Valley Hwy 247 comments and the comments of Brian and Sue Hammer, Lucerne Valley homeowners. Thank you for your consideration. B10-23

Steve Bardwell, president
Morongo Basin Conservation Association

[13] James M. Andre, and Kara A. Moore. California Deserts, Part 1 Biology and Ecology. Fremontia Vol. 42 No.1, January 2014.
[14] Michael Orr, PhD candidate University of California Riverside, 8/2/2016 presentation at the Black Rock Visitor Center, Joshua Tree National Park.
[15] Andre, Ibid

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Energy Research and Development Division
FINAL PROJECT REPORT

B10-24
(for entire attachment)

CARBON BALANCE IN CALIFORNIA DESERTS: IMPACTS OF WIDESPREAD SOLAR POWER GENERATION

Prepared for: California Energy Commission
Prepared by: Center for Conservation Biology, University of California, Riverside.

NOVEMBER 2013
CEC-500-2014-063

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Prepared by:

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DISCLAIMER

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

ACKNOWLEDGEMENTS

The Investigators acknowledge the following for helping with the project:

Graduate Students: Amanda Swanson (UCR), Mark DeGuzeman (UCR), Rebecca Hernandez (Stanford)

Research and Support Staff: Al Muth (Deep Canyon NRS), Vince Samos (CVARS Station), Kuni Kitajima (UCR), Steve Bates (UCR), Dee Lucero (UCR)

Faculty at UCR: Edith Allen (Botany and Plant Sciences), James Sickman (Environmental Sciences), Tim Lyons (Earth Sciences)

Collaborations: Daniel Hirmas, University of Kansas for his code and help with the caliche modeling.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

PREFACE

The California Energy Commission Energy Research and Development Division supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

The Energy Research and Development Division conducts public interest research, development, and demonstration (RD&D) projects to benefit California.

The Energy Research and Development Division strives to conduct the most promising public interest energy research by partnering with RD&D entities, including individuals, businesses, utilities, and public or private research institutions.

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- Buildings End-Use Energy Efficiency
- Energy Innovations Small Grants
- Energy-Related Environmental Research
- Energy Systems Integration
- Environmentally Preferred Advanced Generation
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy Technologies
- Transportation

Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation is the final report for the Multiple Campus Award project CIEE Subaward (500-11-033) conducted by the Center for Conservation Biology, University of California, Riverside. The information from this project contributes to the Energy Research and Development Division's Energy-Related Environmental Research Program.

For more information about the Energy Research and Development Division, please visit the Energy Commission's website at www.energy.ca.gov/research/ or contact the Energy Commission at 916-327-1551.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

ABSTRACT

Large-scale solar development in desert ecosystems has the potential to generate electricity thereby reducing fossil carbon accumulation in the atmosphere. Large stores of carbon are buried as caliche, or calcium carbonate that is fragmented and exposed upon disturbance.

In this project, the researchers focused on developing techniques to measure baseline caliche carbon in areas proposed for development, developing models to assess organic and inorganic carbon sequestration, and to determine if stripping native vegetation can affect carbon exchange and create a loss of inorganic carbon.

To measure the amount of baseline caliche carbon, the researchers found that the complex soil layering makes ground penetrating radar of limited value to detecting caliche layers in southern California deserts.

The isotopic ratios of carbon and oxygen were measured to assess dynamics of inorganic carbon; these stable isotope ratios showed that in the surface layers of soil, caliche is dynamic as fractionation and exchange with modern ions are occurring. Finally, using sensors and flux towers, flux rates of carbon in soil and the atmosphere of an undisturbed desert vegetation setting were measured and then compared with those from a site with the vegetation removed. Using the actual concentration and flux values, caliche formation and weathering were modeled. It was determined that carbon is being cycled in complex ways including between organic and inorganic forms in desert shrublands, and that inorganic carbon may be lost from areas stripped of desert vegetation.

The authors concluded that protecting native riparian woodlands and vegetation types that have deep roots is important to guard buried inorganic soil carbon stocks and carbon sequestration capacity. Planting short-statured shrubs or sucullents in areas with solar panels to reduce erosion and protect soil carbon is also recommended. The researchers also recommend that solar developments be revegetated.

Keywords: Soil carbon, caliche, calcium carbonate, solar power, soil respiration, desert ecosystem, delta 13C, delta 18O, root dynamics, fungal dynamics, ground penetrating radar, soil isotopes, soil disturbance, soil ecology

Please use the following citation for this report:

Allen, Michael F., G. Darrel Jenerette, Louis S. Santiago. (University of California, Riverside). 2013. ***Carbon Balance in California Deserts: Impacts of Widespread Solar Power Generation.*** California Energy Commission. Publication number: CEC-500-2014-063.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

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EXECUTIVE SUMMARY

Introduction

Large-scale solar development in desert ecosystems has the potential to generate electricity, reducing fossil carbon accumulation in the atmosphere, and in turn, lowering global warming rates. There remain, however, environmental concerns regarding this technology, including the associated disturbance of soil and vegetation covering square miles.

A concern not fully understood is the amount of carbon that a large-scale solar technology can mitigate versus release by disturbing the land. Underneath desert ecosystems in the California deserts, vast amounts of carbon are stored as inorganic caliche, or calcium carbonate ($CaCO_3$). Both caliche and organic matter losses from land disturbance can compromise the value of solar energy as an alternative to fossil carbon burning by destroying the ability of these deserts to sequester (capture) carbon and potentially release stored inorganic carbon into the atmosphere.

This research project compared carbon fluxes and natural sequestration of organic and inorganic carbon measurements in deserts that are proposed for solar electrical power development. The authors focused on developing techniques to measure baseline caliche carbon in areas proposed for development, developing newer assessment models which can be used to model organic and inorganic carbon sequestration, and determining if stripping native vegetation can affect carbon exchange and create a loss of inorganic carbon.

Measure Caliche Using Ground Penetrating Radar

One of the challenges is measuring the amount of caliche and how much carbon might be lost by removing vegetation and surface soil layers. Recent studies have used ground penetrating radar to distinguish depth and layering of caliche below the soil surface.

Test areas used a SIR-3000 system (Geophysical Survey Systems, Inc.), a DC-3000/1100 controller, and a 3101 (900 KHz) and a 5100 (1.2MHz) antenna that was manually moved across the soil surface. The researchers first tested the system to see if they could detect the shifting soil structure under desert ecosystems using a sand dune ecosystem. Then the unit was tested to detect caliche rocks buried in sand, and against road cuts with known caliche layers.

The researchers were able to detect shifting soil layers under sand, however, were unable to detect patches of caliche that were buried. The researchers were also unable to differentiate caliche from other soil/rock layering at field sites. This approach can provide a description of layering and differential moisture retention, but the complex layering of California desert soils make this approach problematic.

Isotopic Analysis of Organic and Inorganic Carbon

$CaCO_3$ formation has been modeled on a largely equilibrium geochemical basis using atmospheric carbon dioxide (CO_2) levels and precipitation as calcite saturation and the partial pressure of CO_2. But, several soil chemical and biological factors may affect caliche stability.

1

Comment Set B10 – Morongo Basin Conservation Association (cont.)

The goal in this project determined if the carbon and $\delta^{18}O$ in the near surface caliche layers and desert soils showed stable or if the ratios suggested that the exchange of carbon and oxygen is more dynamic than predicted by equilibrium models. To test this idea, the authors took caliche and soil and vegetation samples from multiple vegetation types, regions, and soil depths to determine the exchange rates of ^{13}C-^{12}C (from respired CO_2) and ^{18}O-^{16}O (from water) from the original deposition. These ratios are indicated as $\delta^{13}C$, and $\delta^{18}O$, respectively.

Soil carbon isotopic composition ($\delta^{13}C$, $\delta^{18}O$) was analyzed both as bulk fractions, and after fumigation with concentrated HCl to eliminate organic fractions.

Isotopic analyses are still being completed. But samples analyzed to date show distinct differences between $\delta^{13}C$ and $\delta^{18}O$ from patterns expected based on existing analyses (Table 1). Plant and soil organic matter tissue followed expected patterns, in that plants using a C3 photosynthetic pathway discriminated against ^{13}C and the soil reflected that discrimination. The individual plants with Crassulacean acid metabolism (CAM) photosynthesis showed less discrimination, as expected. The soil organic C under CAM plants was significantly less negative than under C3 plants, as expected.

The interesting result is that the caliche $\delta^{13}C$ varied between plants with different photosynthetic systems reflecting varied origins of C. The $\delta^{13}C$ also showed that fractionation beyond a physical fractionation had occurred. Both were still slightly negative, indicating that the ultimate source was plant-derived C. The different sites have different $\delta^{18}O$ signatures. The fragmented material shows modern signatures indicating that exchange has occurred, that fractionation has occurred, and that these layers are dynamic. If these are subject to exchange, then the CO_2 in $CaCO_3$ is potentially sensitive to loss.

Inorganic and Organic Carbon Fluxes in Desert Ecosystems

Data and models measuring estimating weathering and accumulation are inconclusive as to the impacts of vegetation disturbance on caliche stocks. Many models use atmospheric C (currently between 390 and 400ppm). But $\delta^{13}C$ data show that $CaCO_3$ is more dependent upon rhizosphere-respired CO_2 than atmospheric accumulation. In using rhizosphere-levels of CO_2, $CaCO_3$ precipitation should be significantly greater than atmospheric CO_2 levels. Thus, it is essential to get more accurate estimates of rhizosphere activity to accurately model soil C exchanges.

The goal was to provide a comparative measure of C fluxes and natural sequestration of organic and inorganic C in deserts that are proposed for solar electrical power development. Networked environmental observatories provide new approaches for understanding ecological dynamics through the dual capabilities of high temporal resolution and continuous observation. The researchers used CO_2 soil sensor networks and flux towers at Boyd Deep Canyon, part of the University of California Natural Reserve System (NRS), in a native desert shrubland, and a disturbed site where all vegetation was removed at the Coachella Valley Agricultural Experiment Station (CVARS). Coincident with continuous measurement of soil temperature, soil moisture, and soil CO_2, researchers modeled $CaCO_3$ concentrations. Finally, the researchers

2

Comment Set B10 – Morongo Basin Conservation Association (cont.)

looked for $CaCO_3$ or CaC_2O_4 crystal formation and dissolution using their soil observation systems with automated high-resolution minirhizotrons.

$CaCO_3$ is highly dynamic in response to root and mycorrhizosphere dynamics in the native ecosystem. $CaCO_3$ is also highly dynamic in the disturbed site, but the cycle is a largely inorganic one. Both are subject to CO_2 loss through respiration (Deep Canyon) or inorganic dissolution and diffusion. However, plants fix CO_2 in the vegetated desert, whereas any CO_2 lost in a flush with rainfall, is likely lost from the disturbed ecosystem. The researchers do not yet know the ultimate fate of the carbon in caliche, but these data show that the process is dynamic, and there is a potential for significant loss.

Conclusions

This research shows that caliche in the surface soil layers is not in equilibrium, but is dynamic. Caliche and organic matter losses compromise the value of solar energy as an alternative to fossil carbon burning by releasing stored inorganic carbon into the atmosphere and destroying the ability of the deserts to sequester carbon. The researchers recommend siting solar developments on previously disturbed lands. Desert riparian woodlands should especially be avoided for the protection of sequestered carbon, and their ability to increase that carbon sequestration. Their deep roots and microbial associations continue to sequester both organic and inorganic carbon. The researchers also recommend that solar developments be revegetated. Short-statured plants, such as cacti and shrubs continue to produce organic carbon, and also release CO_2 that increases the soil CO_2 concentrations, maintaining and increasing inorganic soil carbon sequestration.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

CHAPTER 1: Introduction

Large-scale solar development in desert ecosystems has the potential to generate electricity, thereby reducing fossil carbon (C) accumulation in the atmosphere, and in turn, lessening the rates of global warming. But there remain environmental concerns around the technology applied and the siting evaluations remain. Careful decisions about the choice of technology used can make a solar installation an important tool in fighting climate change, or compromise the environmental goals for which these technologies are being supported (e.g., Hernandez et al. 2014).

One concern that is not understood is the carbon budget that a large-scale solar technology can mitigate versus release as a result of the altered land-use management. Underneath many desert ecosystems in California deserts, vast stores of carbon (C) are stored as inorganic caliche, or calcium carbonate ($CaCO_3$), of up to 8kg C/m^2 (Schlesinger 1985). Globally, there is nearly twice as much C in soils as the atmosphere, with a large fraction of that in inorganic forms, largely $CaCO_3$. Both caliche and organic matter losses can compromise the value of solar energy as an alternative to fossil C burning by destroying the ability of these deserts to sequester C and potentially releasing stored inorganic C into the atmosphere.

Most of the caliche in California deserts appears to have been formed in desert playas below weathering limestone or metamorphic limestone (marble, dolomite) mountains high in Ca. In deserts, during wet periods, likely mostly during the Pleistocene, there was more water, leaching the Ca and fixing $CaCO_3$ deep in the soil creating solid layers of caliche. Data and models measuring estimating weathering and accumulation are inconclusive as to the impacts of vegetation disturbance on existing caliche stocks. Many models use atmospheric C (currently approximately 400ppm). But $\delta^{13}C$ data show that $CaCO_3$ formation was more dependent upon rhizosphere-respired CO_2 than atmospheric accumulation (Schlesinger 1985) and in forest and agricultural ecosystems, rhizosphere CO_2 is far higher than atmospheric CO_2, making it essential to get more accurate estimates of rhizosphere activity to accurately model soil C exchanges (e.g., Allen et al., 2007). More recent data suggest that caliche is more dynamic than older modeling efforts reported. Caliche is known to degrade, especially on disturbed lands (Hirmas and Allen 2007) and $\delta^{13}C$ of caliche shows re-equilibration through time as vegetation changes (Knauth et al. 2003).

1.1 Electricity Generation Environmental Challenges: Carbon and Vegetation Removal

Deployment of solar installations in California deserts currently strips vegetation to eliminate shading and allow for building of either solar reflectors or solar photovoltaic cells. This results in a denuded site, the size of the deployment. Vegetation is removed and surface soils disturbed (Fig 1) In all California installations researchers observed "clean" sites with no vegetation is

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maintained. The key question is: what are the impacts of removal of vegetation on the "stable" inorganic fraction, mostly CaCO3 in California deserts?

The research team proposes developing measurements and adapting models to measure stored inorganic C, organic C balances of differing vegetation types and changing soil temperature (T), moisture **(Ψ),** and atmospheric CO_2 levels to determine of there are particular vegetation types that should be protected from disturbance, or others that, from a perspective of C balance, are less sensitive.

1.2 Background State of Knowledge

Desert soil carbon (C) is comprised of stored inorganic C (as caliche), vegetation and soil organic C (as buried organic matter). But, little is known of C sequestration and release, especially under conditions of global and regional temperature increase. Solar power has the potential to dramatically reduce C release to the atmosphere by reducing fossil fuel burning for electrical generation. Understanding how different vegetation types turn both organic and inorganic C over, in the context of regional C budgets and CO_2 savings from solar power is the largest unknown question facing solar development in California.

Soil is the largest global terrestrial pool of Carbon (C) at 1500Gt compared with the atmosphere at 800Gt and plants at 600Gt, but is extremely dynamic and variable spatially. In contrast to the $50g/m^2/y$ anthropogenic source of C and the sinks in desert soils range from 39 to 622g/m2/y. Even year-to-year variation is high, ranging from sequestration during wet periods to weathering and mineralization during dry. For all biomes there is little understanding of the longer-term allocation of net primary production (NPP) to and retention (sequestration) of soil C (e.g., Treseder et al. 2005, U.S. DOE 2010).

California's deserts have large amounts of CO_2, stored as caliche ($CaCO_3$). The amount of C in caliche, when accounted globally, may be equal to the entire C as CO_2 in the atmosphere and as much as 30 percent of global soil C. But the dynamics of inorganic C remains a huge gap in understanding stored C pools (e.g., Schlesinger 1985, Mielnick et al. 2005, Serrano-Ortiz et al. 2010). Most of the caliche in the state's deserts was formed during the ice ages, averaging 20,000 years ago, when vegetation was more productive. These deposits may have been stable since (Schlesinger 1985). Being stable, though, means that inputs equal exports. But $\delta^{13}C$ of caliche in Arizona can shift around indicating continuous exchange and equilibration through time (Knauth et al. 2003).

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Figure 1: An example of a solar development showing the stripped vegetation to build and maintain the solar power unit.

1.3 Goals

This project provided a comparative measure of C fluxes and natural sequestration of organic and inorganic C in deserts that are proposed for solar electrical power development. Researchers focused on developing techniques to measure baseline caliche C as areas for development are proposed, developing newer assessment models which can be used to model organic C and inorganic C sequestration, and to determine if removal of native vegetation will alter the exchanges and lead to a loss of stored inorganic C.

Three goals were envisioned to explore developing carbon budgets for desert ecosystems likely to be impacted by placement of solar power generation systems.

1. Assess if caliche and root distribution can be determined using soil pits and ground-penetrating radar (GPR) to survey vegetation. This will provide a tool for an immediate assessment of the potential C lost to the atmosphere with perturbation.
2. Analyze $\delta^{13}C$ and $\delta^{18}O$ of inorganic C (caliche) and organic C (SOM) to determine the relationships between climate, vegetation, and soil C balance. These more accurate models can then be used to rapidly assess different vegetation types in different regions and their roles in C sequestration and weathering.
3. Measure C fixation, respiration and allocation for undisturbed native vegetation and a site where the vegetation has been removed, under variable climates. This will include determining the relationships between aboveground vegetation, climate, and rhizosphere CO_2 levels. From these relationships, model directionality and rates of caliche formation and weathering and C sequestration within soil organic matter can more accurately determined.

Together this information can be used to rapidly assess the impacts of solar electricity generation on different communities and ecosystems.

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CHAPTER 2: Measuring Caliche Using Ground Penetration Radar (GPR)

One of the difficult issues is measuring the amount of caliche and how much C might be lost with removal of vegetation and surface soil layers. However, recent studies have used GPR to distinguish depth and layering of caliche below the soil surface. Wilson et al. (2005) used GPR to characterize caliche depth and fractures as a means to study CO_2 leakage through soil. GPR was previously used in the Yucatan to describe fractures and soil layers within limestone $CaCO_3$ (Estrada-Medina et al. 2010). A number of locations in different vegetation types were tested to determine the distribution of caliche depths, roots, and soil of soil pits. It is believe that this approach provided a rapid means of assessing potential C balance.

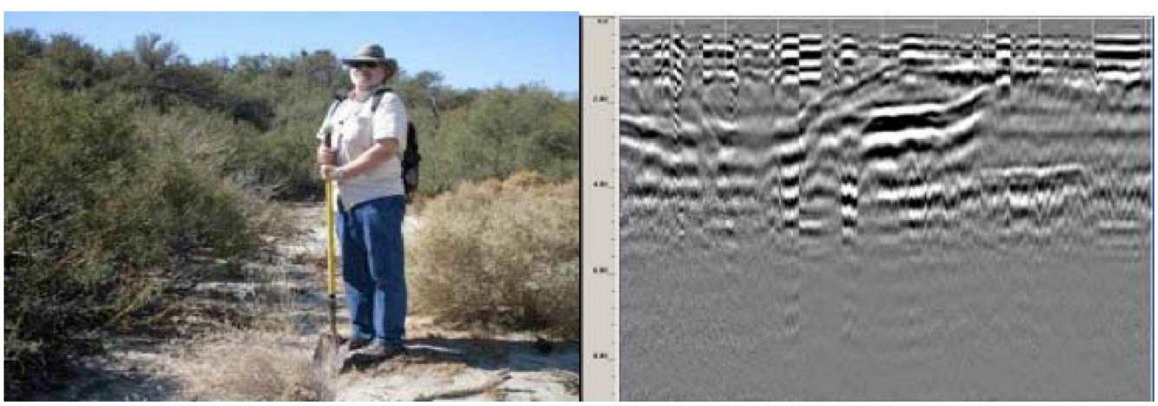
2.1 Methods

Evaluating test areas was undertaken using a SIR-3000 system (Geophysical Survey Systems, Inc.), a DC-3000/1100 controller, and a 3101 (900KHz) and a 5100 (1.2MHz) antenna that was manually moved across the soil surface. This approach is described in greater detail in Estrada-Medina et al. (2010). The system was tested first to see if the shifting soil structure under desert ecosystems using a sand dune ecosystem could be detected. The unit was then tested to detect caliche rocks within sand buried in sand, and against road cuts with known caliche layers.

2.2 Results

Researchers were able to detect shifting soil layers under sand (Figure 2), however, were unable to detect patches of caliche that they had buried. Researchers were also unable to differentiate caliche from other soil/rock layering at field sites.

Figure 2: A ground penetrating radar profile under a sand dune in the Coachella Valley.



2.3 Discussion

Ground Penetrating Radar is a useful tool for identifying coarse roots, pipes, and soil layers that are characterized by differential water content. The research team was able to differentiate

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layers in the soil, but not buried caliche rocks. Nor could they differentiate caliche layers from other soil layering.

GPR has been used to identify gaps dissolving in limestone rock (Wilson et al. 2005, Estrada Medina et al. 2010). But those were in locations where the rock formations were limestone, and the silicaceous material and organic matter accumulated as the $CaCO_3$ in the limestone dissolved. The caliche layers in California deserts studied were all embedded in a complex layered matrix of other consolidated and unconsolidated rock and soil layers. As such, while layers could be seen, the caliche from other layers, such as silicaceous or clay layers could not be differentiated. It might be that further work, especially under varying soil moisture conditions, might allow identification of these layers. Work will continue in this area.

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CHAPTER 3:
Isotopic Analysis of Organic and Inorganic Carbon

$CaCO_3$ formation has been modeled on a largely equilibrium geochemical basis using atmospheric CO_2 levels (e.g., Hirmas et al 2010) and precipitation as a function of calcite saturation and the partial pressure of CO_2. But, organic matter can alter the calcite formation (e.g., LeBron and Suarez (1998), and $CaCO_3$ as well as other Ca-organic acids such as Ca-oxalate is also a biological process, forming along roots and hyphae (e.g., Jurinak et al. 1986). To add complexity, recent papers posit that CO_2 loss and gain from calcite soils can occur on a diurnal basis with wetting and drying of soil (Roland et al. 2013). These numbers are not trivial. Roland et al. (2013) reported peak ventilation of 0.5 to 6.4◎mol $CO_2 \cdot m^{-2}s^{-1}$ from karst vegetation during the dry summers, and Mielnick et al. (2005) reported losses of up to 145g $C/m^2/y$.

Contrary to many modeling efforts, soil CO_2 levels are not in equilibrium with atmospheric levels, but are a result of respiration, and may be far higher than atmospheric CO_2. The researchers postulated that carbon in caliche is therefore dynamic. High soil CO_2 from plant and microbial respiration may drive CaCO3 under moist soil conditions enhancing C sequestration. As soil dries, that added $CaCO_3$ crystalizes and is deposited. Additional research is necessary to understand and quantify these exchanges (Serrano-Ortiz et al. 2010), as there are C exchanges in desert ecosystems that are not understood.

^{14}C data show that the caliche below the desert playas was formed more than 20,000 years ago (e.g., Schlesinger 1985). An analysis of $\delta^{18}O$ of those same buried layers shows that the caliche came from water from Pleistocene climates. Further, analysis of $\delta^{13}C$ shows that the C came from root and microbial respiration from C_3 vegetation that dominated during that period. Just as importantly, $\delta^{13}C$ of caliche in Arizona can shift around indicating continuous exchange and equilibration through time (Knauth et al. 2003).

The goal in this experiment was to determine if the $\delta^{13}C$ and $\delta^{18}O$ in the near surface caliche layers and desert soils were stable, or if the ratios suggested that the exchange of C and O is dynamic. To test this idea, researchers took caliche and soil and vegetation samples from multiple vegetation types, regions, and soil depths to determine the exchange rates of ^{13}C-^{12}C (from respired CO_2) and ^{18}O-^{16}O (from water) from the original deposition.

3.1 Methods

Soil carbon isotopic composition ($\delta^{13}C$) was determined by drying soils at 65°C until constant mass, followed by sieving and grinding in a ball mill (8000D, Spex Sample Prep, Stanmore, UK). To distinguish soil organic carbon from pedogeneic carbonates (caliche), soils were analyzed both as bulk fractions, and after fumigation with concentrated HCl for six hours (Harris et al. 2001). All samples were measured for $\delta^{13}C$ and $\delta^{18}O$ with a continuous flow isotope ratio mass spectrometer (Delta *V* Advantage, Thermo Scientific, Bremen, Germany) equipped with a Gas Bench (Thermo Scientific) in the Department of Earth Sciences, University of California, Riverside.

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Plant carbon isotopic composition ($\delta^{13}C$) was measured on leaf and root samples that had been dried at 65°C until constant mass, and ground to a fine powder in a ball mill (8000D, Spex Sample Prep, Stanmore, UK). Samples were analyzed with a an elemental analyzer (ECS 4010, Costech Inc., Valencia, CA) interfaced with an isotope ratio mass spectrometer (Delta *V* Advantage; Thermo Scientific) at the University of California Facility for Isotope Ratio Mass Spectrometry (FIRMS), Riverside, California.

Plant oxygen isotopic composition ($\delta^{18}O$) was measured on the cellulose fraction, extracted from bulk plant samples through micro digestion with a mixture of acetic and nitric acid, based on the original method of Brendel et al. (2000), as modified for small samples by Evans and Schrag (2004) and Gaudinski et al. (2005). Samples were analyzed with a temperature conversion elemental analyzer (TC/EA, Thermo Scientific) interfaced with an isotope ratio mass spectrometer (Delta *V* Advantage; Thermo Scientific) at the University of California Facility for Isotope Ratio Mass Spectrometry (FIRMS), Riverside, California.

3.2 Results

Isotopic analyses are still being completed. But samples analyzed to date show distinct differences between $\delta^{13}C$ and $\delta^{18}O$ from patterns expected based on existing analyses (Table 1). Plant and soil organic matter tissue followed expected patterns, in that plants using a C3 photosynthetic pathway discriminated against ^{13}C and the soil reflected that discrimination. The individual plants with CAM photosynthesis showed less discrimination, as expected. The soil organic C under CAM plants was significantly less negative than under C3 plants, as expected.

The interesting result is that the caliche ◎^{13}C was significantly less negative under C3 than CAM plants. Both were still slightly negative, indicating that the ultimate source was plant-derived C.

Table 1: $\delta^{13}C$ from C3 versus CAM plant tissue, soil organic matter, and caliche fragments
(mean standard deviation (SD), sample number analyzed to date, and p-value for a t-test comparing C3 and CAM-associated material)

parameter	C3	CAM	P value
Plant	-23.9 ‰, SD=1.16, n=24	-15.2 ‰, SD=2.1, n=32	$1.2X10^{-13}$
Soil	-24.1 ‰, SD=1.51, n=14	-21.7 ‰, SD=2.1, n=25	0.0007
Inorganic (caliche)	-2.8 ‰, SD=1.6, n=12	-5.7 ‰, SD=1.5, n=12	0.00013

The $\delta^{18}O$ samples for the plant tissue and soil organic matter, as well as some of the caliche samples are still being analyzed. Initial results are very interesting. The preliminary analyses suggest that different sites have different $\delta^{18}O$ signatures. Imperial Valley samples show an average $\delta^{18}O$ signature of -6.4 ‰ (SD1.3) with the western Coachella Valley of -5.1 ‰ (SD1.6). The Chuckwalla Valley averaged (-7.1 ‰ (SD 1.7) and the San Raphael site -8.2 ‰ (SD=0.5). In pairing the samples, larger caliche fragments had a $\delta^{18}O$ value of -6.8 ‰ (SD 1.1) whereas the

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smaller fragments were -5.9 ‰ (SD 2.2). While not significantly different overall, a paired t-test showed a trend toward the smaller fragments having a less negative value ($p=0.15$). Additional samples are being analyzed.

3.3 Discussion

Because deserts have low precipitation inputs, cations such as Ca are rarely leached out of the soils. High cation levels tend to bind nutrients, such as HPO_4^- and NO_3^-, creating $CaPO_4$ and $Ca(NO_3)_2$ making those nutrients unavailable to plants. But, roots and associated microorganisms respire CO_2, acidifying the soil in the presence of water (forming $HCO_3^-+H^+$) weathering $CaPO_4$, and increasing HPO_4^- availability. But, with time, that Ca would re-bind new anions, except that roots and mycorrhizal fungi produce organic acids (oxalic, citric) that bind the Ca allowing for plant uptake of HPO_4^-.

Rhizosphere-respired CO_2 is dependent upon the vegetation composition and activity. Further, a large, but relatively unknown amount of CO_2 is fixed and stored as organic C in deserts, with estimates ranging from 60 to 600g/m^2/y, but dependent upon the particular ecosystem. Desert plants have microbial associations including mycorrhizal fungi that respire CO_2, weathering $CaPO_4$ allowing uptake of P and increasing soil CO_2 as respiration (Jurinak et al. 1986, Knight et al. 1989). These organisms also produce organic acids that bind Ca sustaining P availability (Jurinak et al. 1986, Allen et al. 1996).

Atmospheric or respired CO_2 in the presence of water (H_2O) is converted to $HCO_3^- + H^+$ acidifying the soil. The HCO_3^- binds with Ca to form $CaCO_3 + H^+$. Under equilibrium conditions, the thermodynamics strongly favor $CaCO_3$ compared to CO_2 and Ca, but some CO_2 is continuously released under wetting and drying cycles. Moreover biological processes push ecosystems outside of equilibrium conditions. Some of the $CaCO_3$ is utilized by microorganisms making more CO_2. Some of this CO_2 can be re-fixed, but some is lost as soil respiration, potentially losing some of the C bound in $CaCO_3$. The amount lost is regulated by the amount of CO_2, Ca, and soil pH.

Researchers postulated that as caliche fragments in the upper layers are exposed to water and biological activity, the isotopic values ($\delta^{13}C$ and $\delta^{18}O$) will show exchange, indicating that the caliche itself is dynamic. If it is dynamic, CO_2 could be lost or gained depending upon the conditions of exposure. Thus, a first step is to look at the isotopic ratios of C and O.

A large number of samples were prepared and results still coming in. However, examination of the data completed show that the caliche in the exposed layers is dynamic. Several lines of evidence support this conclusion.

First, the difference between the soil organic matter and the caliche $\delta^{13}C$ is greater than that predicted simply by exposing caliche to water. If the atmosphere were the source of C, the $\delta^{13}C$ ratio should be highly positive. But all samples were negative, demonstrating a plant-derived source of C. The expected fractionation of ^{13}C in carbonate from CO_2 respired by plants or decomposers is +9.6 ‰ (Friedman and O'Neil 1977). If the caliche were derived from atmospheric C, a value greater than +9 ‰ would be expected. The caliche $\delta^{13}C$ was -2.8,

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suggesting a source $\delta^{13}C$ of <-12.4 ‰ under C3 plants and -5.7 ‰ under CAM plants, or a $\delta^{13}C$ source of <-15.3 ‰. Some additional fractionation has occurred under C3 compared with under CAM plants, possibly more recycling, or the formation of different compounds in the source vegetation.

Second, the root systems of the C3 plants studied tend to be deep, supporting greater annual photosynthesis and more microbial biomass and activity per unit land surface than the CAM plants. The difference in $\delta^{13}C$ between C3 plant and caliche was 21.1 ‰ and 21.3 ‰ between the soils under C3 plants and caliche. The difference in $\delta^{13}C$ between CAM plant and caliche was 9.5 ‰. The soil organic matter under the CAM plants was more negative than the plant tissue, but the difference between soil organic C and caliche C was 16 ‰, still less than that between C3 soil organic C and caliche C.

Finally, the $\delta^{18}O$ data suggest that as caliche fragments into smaller fractions, the $\delta^{18}O$ becomes less negative, showing either some loss of ^{16}O or exchange of H_2O with local inputs. The $\delta^{18}O$ data also show that the caliche in the upper layers is representative of the current water samples. The southern regions and Deep Canyon have signatures that represent warmer water input (more summer rains) whereas the areas bordering the Mojave have cooler precipitation input signature. The San Raphael site has water from the Laguana Mountains, also showing a somewhat more negative signal.

This is also supported by a lack of relationship between $\delta^{13}C$ and $\delta^{18}O$. Schlesinger (1985) noted that in his Chuckwalla Valley samples, there was a significant relationship between the $\delta^{13}C$ and $\delta^{18}O$ indicating a seasonal pattern regulating pCO_2 and soil water, and $CaCO_3$ precipitation. However, no relationship between $\delta^{13}C$ and $\delta^{18}O$ was found. In the samples, $\delta^{18}O=0.08\ (\delta^{13}C) + 4.35$, $r=0.07$, $r^2=0.005$. These data show either no seasonal pattern of precipitation, or that subsequent exchange has occurred.

Together, the $\delta^{13}C$ and $\delta^{18}O$ signatures indicate that the exposed and fragmented caliche is subject to exchange with modern C and O. If these are subject to exchange, then the CO_2 in $CaCO_3$ is potentially sensitive to loss. Understanding the larger exchanges is the subject of Chapter 4.

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CHAPTER 4: Inorganic and Organic Carbon Fluxes in Desert Ecosystems

California deserts have vast stores of carbon (C) stored as inorganic caliche, or $CaCO_3$, of up to 8kg C/m^2 in some locations (Schlesinger 1985). Data and models measuring estimated weathering and accumulation are inconclusive as to the impacts of vegetation disturbance on caliche stocks. Many models use atmospheric C (currently between 390 and 400ppm). But initial $\delta^{13}C$ data show that $CaCO_3$ is more dependent upon rhizosphere-respired CO_2 than atmospheric accumulation (Schlesinger 1985) and even desert rhizosphere CO_2 is far higher than atmospheric CO_2. In using rhizosphere-levels of CO_2, $CaCO_3$ precipitation is significantly greater than atmospheric CO2 levels (LeBron and Suarez 1998). Thus, it is essential to get more accurate estimates of rhizosphere activity to accurately model soil C exchanges. More recent data suggest that caliche may be more dynamic than older equilibrium-based modeling efforts reported. Caliche is known to degrade, especially on disturbed lands (Hirmas and Allen 2007) and $\delta^{13}C$ of caliche shows re-equilibration may occur through time as vegetation changes (Knauth et al. 2003).

$CaCO_3$ formation has been modeled largely on an equilibrium geochemical basis using atmospheric CO_2 levels (e.g., Hirmas et al 2010) and precipitation as a function of calcite saturation and the partial pressure of CO_2. In its simplest form, under aqueous conditions, $CaCO_3$ precipitation is formed as:

$$2H_2O + 2CO_2 <-> 2H^+ + 2HCO_3^-$$

$$\mathbf{Ca_2^+ + 2HCO_3^- <-> CaCO_3 + H_2O + CO_2}$$

As water evaporates, the $CaCO_3$ crystallizes, and at the depth to water penetration, these crystals accumulate forming caliche layers.

As the soil erodes, these layers become exposed. Isotopic ratios (Cpt 3) show that exchange occurs. But, as Ca weathers out, re-precipitation occurs in the presence of HCO_3^-, under equilibrium conditions. However, equilibrium conditions rarely exist in nature. CO_2 levels and organic matter can alter the calcite formation (e.g., LeBron and Suarez 1998), and $CaCO_3$ as well as other Ca-organic acids such as Ca-oxalate is also a biological process, forming along roots and hyphae (e.g., Jurinak et al. 1986). The researchers postulated that carbon in caliche is therefore dynamic. High soil CO_2 from plant and microbial respiration may drive $CaCO_3$ supersaturation under moist soil conditions enhancing C sequestration. But with vegetation loss, the soil CO_2 levels drop, H_2O is no longer transpired, and $CaCO_3$ weathered. To add complexity, recent papers posit that CO_2 loss and gain from calcite soils can occur on a diurnal basis with wetting and drying of soil (Roland et al. 2013). These numbers are not trivial. Roland et al. (2013) reported peak ventilation of 6.4δmol $CO_2 \cdot m^{-2}s^{-1}$ from karst vegetation during the dry summers, and Mielnick et al. (2005) reported losses of up to 145g C/m^2/y. Additional research is needed to understand and quantify these exchanges (Serrano-Ortiz et al. 2010), as there are C exchanges in desert ecosystems that are not fully understood.

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Rhizosphere-respired CO_2 is dependent upon the vegetation composition and activity. A large, but relatively unknown amount of CO_2 is fixed and stored as organic C in deserts, with estimates ranging from 60 to 600g/m^2/y, but dependent upon the particular ecosystem perturbed. Woody legumes, in particular, have roots and associated microbes more than 3m deep (Virginia et al. 1986), sequestering organic C where it is only slowly respired back to the atmosphere. Respired CO_2 in the presence of water (H_2O) and calcium (Ca) produces $CaCO_3$.

The goal was to provide a comparative measure of C fluxes and natural sequestration of organic and inorganic C in deserts that are proposed for solar electrical power development. Researchers focused on developing techniques to measure caliche C dynamics, and as areas for development are proposed, develop newer assessment models which can be used to model organic C and inorganic C sequestration, and determine if sites with vegetation removed have different exchanges and potential loss rates of inorganic C compared with undisturbed wildland desert ecosystems.

4.1 Methods: A Networked Environmental Observatory – Continuous Sensors, Manual Measurements, Experiments, and Soil Surveys

Networked environmental observatories provide new approaches for understanding ecological dynamics through the dual capabilities of high temporal resolution and continuous observations (Allen et al. 2007). The research team are currently running CO_2 sensor networks at Boyd Deep Canyon, part of the University of California Natural Reserve System (NRS), in a native desert shrubland, and the Coachella Valley Agricultural Experiment Station (CVARS). The goal was to compare the dynamics at Deep Canyon with a site where the vegetation was removed for the developing solar PV projects in the Salton Sea, led by Dr. Alfredo Martinez-Morales. The unique combination of natural resources and challenging environmental conditions at the Salton Sea require that a feasibility study be conducted to truly determine the potential of developing utility scale energy projects in the area. The Martinez-Morales project was not funded, and the disturbed lands have not yet been deployed. But, the environmental conditions of the PV deployment are mimicked nearby at the CVARS. The undisturbed vegetation is the same as Boyd Deep Canyon, and the soils of all three sites are Entisols consisting of alluvium derived from granite. The CVARS site has been cleared of vegetation for more than four years and is the same soil type as exists at Deep Canyon, the Martinez-Morales location, and across most of the Coachella and Imperial Valleys and provides comparable data to that of Salton Sea projects.

Each location is instrumented with replicated solid-state CO_2, soil temperature, and soil moisture sensors at 2, 8 and 16 cm soil depths. The CO_2 sensors are calibrated every six months after deployment to ensure the quality of the measurements. Soil CO_2 was measured using Vaisala soil CO_2 sensors (Vargas and Allen 2008, Kitajima et al. 2010). These provided accurate CO_2 inputs to caliche modeling in comparison with simply using atmospheric CO_2 values (Hirmas et al. 2010). From these data, soil respiration from the soil using a CO_2 gradient flux method based on concentrations of CO_2 in the soil profile (Vargas and Allen 2008) was calculated. Eddy Covariance (EC) was used for monitoring the fluxes of CO_2, H_2O, and energy

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of whole ecosystems (Baldocchi 2003). A closed path eddy covariance model CPEC200 (Campbell Scientific, Logan Utah) was used to analyze CO_2 and H_2O vapor fluxes from the CVARS site. The eddy covariance data from Deep Canyon NRS are available from M. Goulden, UC Irvine.

Coincident with continuous measurement of soil temperature (T), soil moisture, and soil CO_2, we modeled $CaCO_3$ concentrations using the model of Hirmas et al. (2010).

Finally, the researchers looked for $CaCO_3$ or CaC_2O_4 crystal formation and dissolution using the soil observation systems using an automated high-resolution minirhizotrons (Allen et al. 2007, Hernandez and Allen 2013, Allen and Kitajima 2013). These *in situ* microscopy systems allow us to track the fates of roots and fungal hyphae, and identify $CaCO_3$ crystals forming or disappearing in soil on hyphae or on soil particles.

4.2 Results

Soil ecosystems in undisturbed deserts are highly dynamic. With each precipitation event, there is rapid new root growth and fungal hyphal production. Hyphal growth of up to 2mm per day was observed, during spring warming following a precipitation event. Just as importantly, hyphal mortality can equal growth as the soil dries out.

Shortly following those precipitation events, soil CO_2 production can be very high and distributed well into the soil profile (Fig 3). The resulting soil CO_2 concentrations can be more than an order of magnitude higher than atmospheric CO_2 and the soil CO_2 concentrations measured during the dry period.

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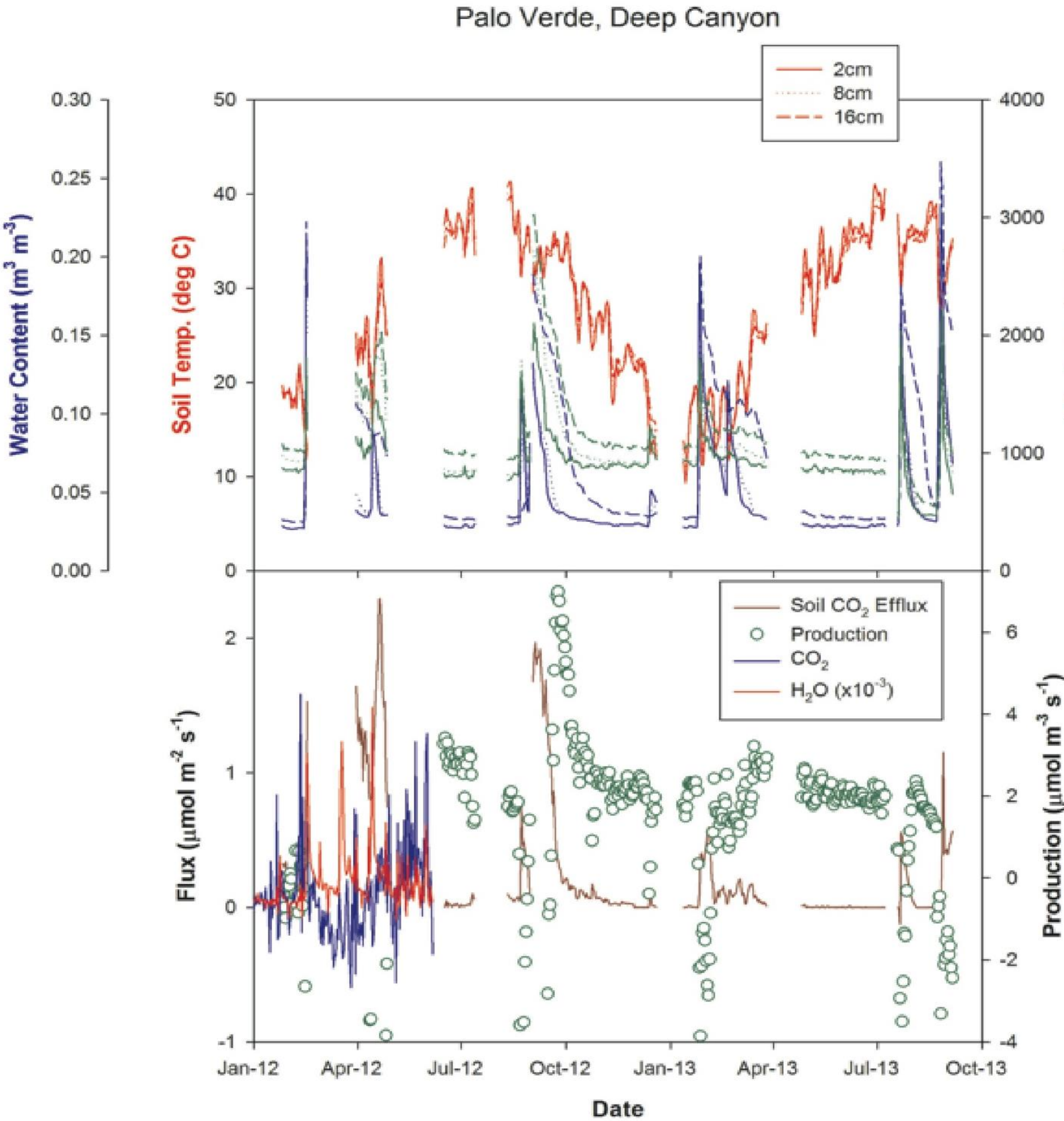
Figure 3: Soil CO2 dynamics in response to changing soil temperature and moisture under a Palo Verde (Cercidium microphyllum) tree at the Deep Canyon NRS



Similar patterns were observed under other vegetation units, including creosote bush (Larrea tridentata), fishhook barrel cactus (Ferocactus cylindraceus), and brittlebush (Encelia farinosa).

The modeled values (from Hirmas et al. 2010) for estimating soil CO_2 directly from atmosphere showed that the values ranged from 400ppm CO_2 to 600 ppm CO_2 at 16cm, and 1,100ppm CO_2

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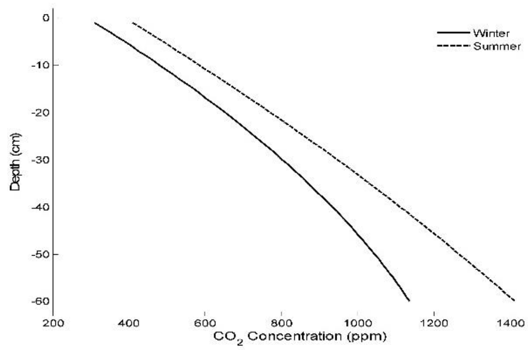
at 60cm during the winter, and 500ppm CO_2 (2cm) to 1,400ppm CO_2 at 60cm (Figure 4). These values are below the values that were measured at the undisturbed site (Figure 3). Current model projects the equilibrium $CaCO_3$ levels for measured CO_2, based on the measured Ca concentrations and other relevant parameters.

Figure 4: Modeled soil CO2 Using the model of Hirmas et al. (2010).



Additional soil analyses are underway for Deep Canyon, but the Ca concentrations in soil exceed 10 meq/l and organic C from to 30g/kg in shrub islands. This means that there is Ca available such that when soil moisture is high; respiration is also high, forming HCO_3^- and precipitating $CaCO_3$ from some of the high CO_2 concentrations. Indeed, with the high levels of CO_2, researchers saw the concentration of solution $CaCO_3$ dramatically increase (Figures 3, 5).

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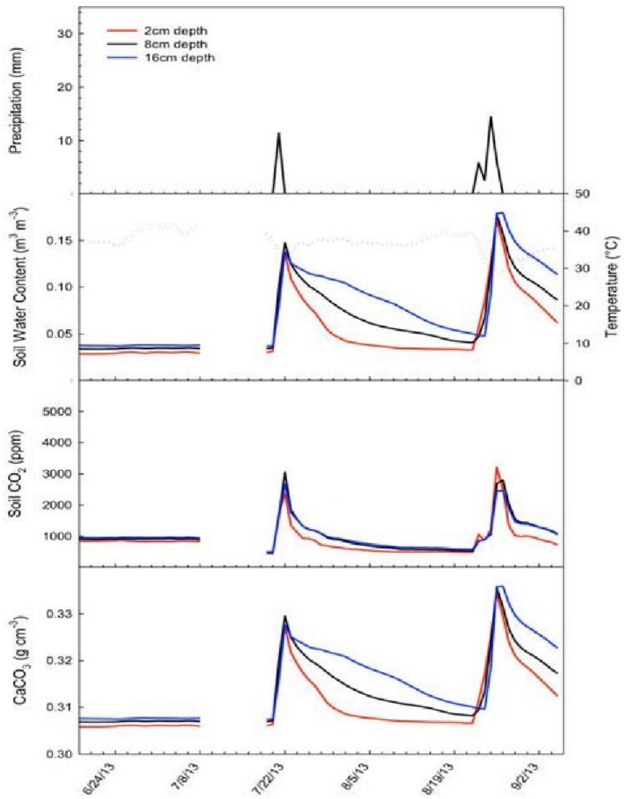
Figure 5: Solution $CaCO_3$ in response to precipitation events at the Boyd Deep Canyon NRS, under a Palo Verde tree. The high levels of Ca in soil coupled with the high soil moisture and high rate or respiration results in a high $CaCO_3$ formation. Subsequently, as the soil moisture declines, and respiration due to reduced fungal and root activity declines the $CaCO_3$ in solution declines.



As arbuscular mycorrhizal fungal hyphae grow in response to soil water inputs, they respire CO_2 and provide nucleation centers, which attracts the Ca and resulting in $CaCO_3$ crystals along the hyphae (Fig 6) on the soil particles (Fig 7).

The soils from CVARS, devoid of vegetation, showed much different patterns. Importantly, organic carbon had largely decomposed, with only a small amount of recalcitrant C remaining. The total soil C was 3.2g/kg. The organic C was only 1.5g/kg where as the C as $CaCO_3$ was 2.4g/kg. (The 0.9g/kg difference is due to the different methods for determining organic and inorganic C). Thus, the percent of total C as $CaCO_3$ averaged 73 percent. This contrasts with the percent of Ca bound with CO_3 of less than one percent (0.78+/-0.08 SEM).

The dynamics of the CVARS-solar deployment simulation site soils is also different. Importantly, higher than atmospheric levels of soil CO_2 still occurred, even without organic C or plant root/microbial respiration following precipitation events (Figure 8).

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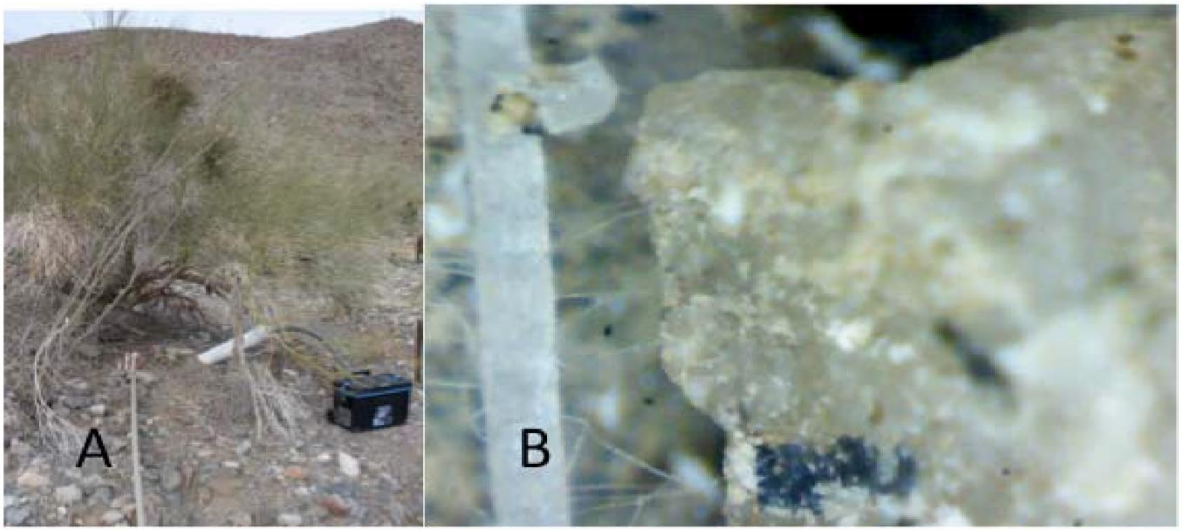
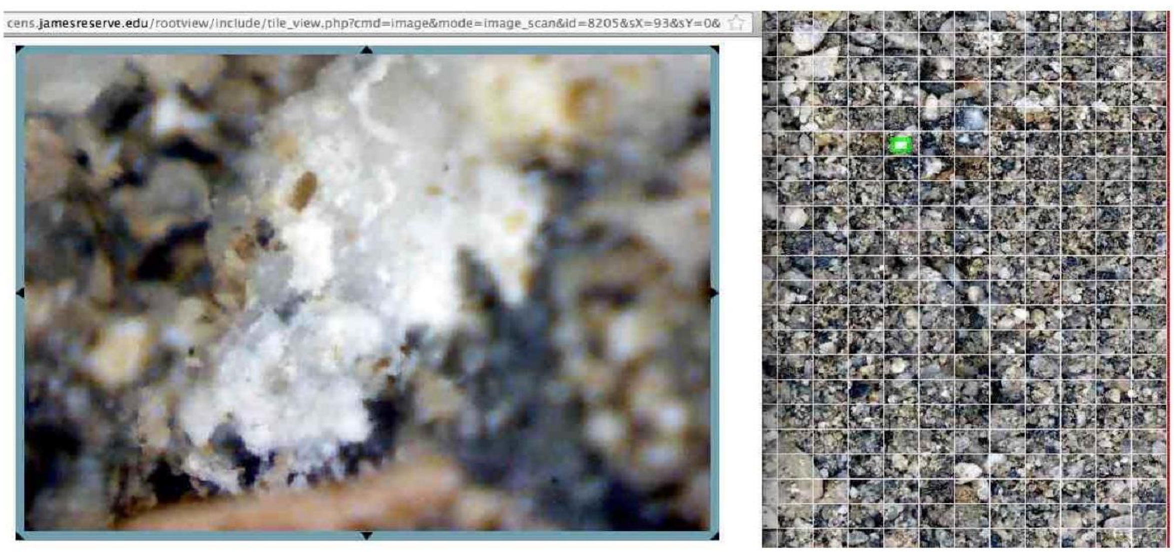
Figure 6: Palo Verde tree with AMR unit (A) and *In situ* arbuscular mycorrhizal fungal hyphae with $CaCO_3$ crystals forming at the hyphal-soil particle interface (B).



(From Deep Canyon NRS. The image is 3.01mm X 2.26mm, 100x)

Figure 7: *In situ* $CaCO_3$ crystals formed along hyphae and on the surfaces of soil particles under Palo Verde trees at the Deep Canyon NRS



(These crystals were formed as soils dried out and persisted until the next rainfall event wherein most dissolved into solution. The image is 3.01mm X 2.26mm, 100x)

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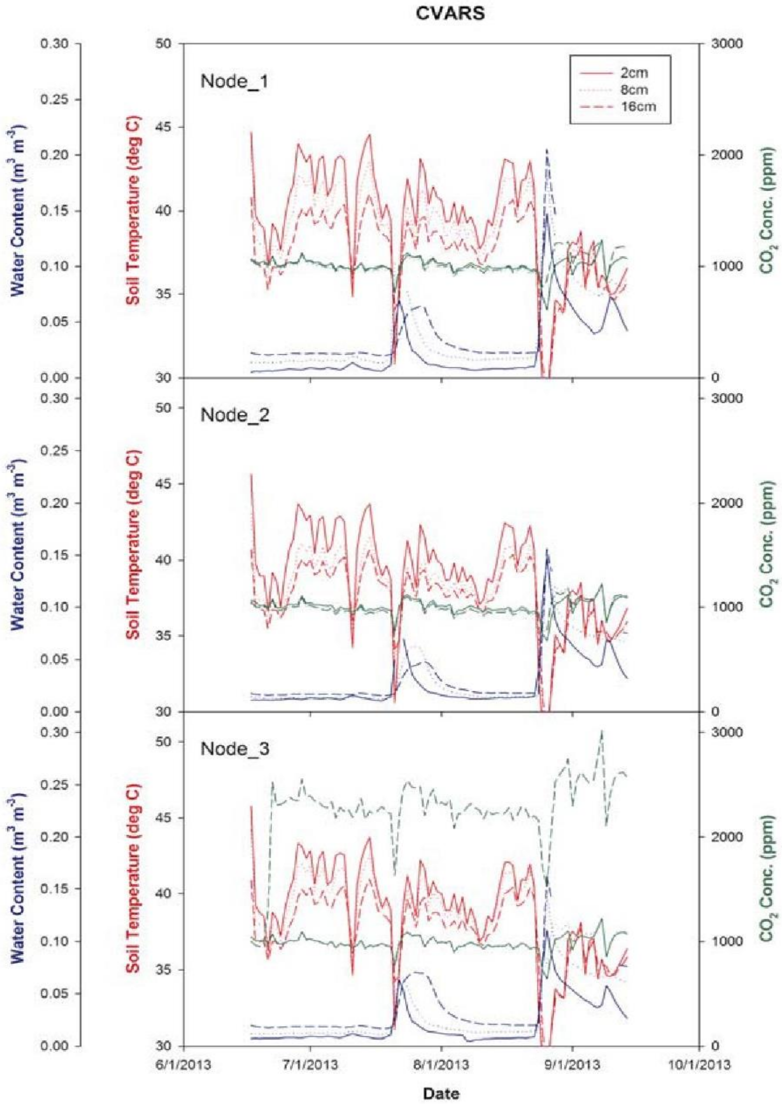
Figure 8: Concentration of CO2 in response to temperature and moisture inputs at the CVARS/Solar Installation simulation site.



Note that as soil moisture jumps in response to a rainfall event, CO_2 concentration initially drops then increases above the dry baseline.

The fluxes of CO_2 also vary with rainfall events (Fig 9). Generally the fluxes oscillate around 0, to a generally slight uptake of CO_2 (negative flux) by these soils. As there are no plants, most of this uptake is likely a chemical reaction of soil moisture taking up atmospheric CO_2, forming HCO_3^- and potentially, even $CaCO_3$. However, with the rainfall events, there is a net drop in the CO_2 production rates, as CO_2 diffuses and is lost to the atmosphere (positive flux).

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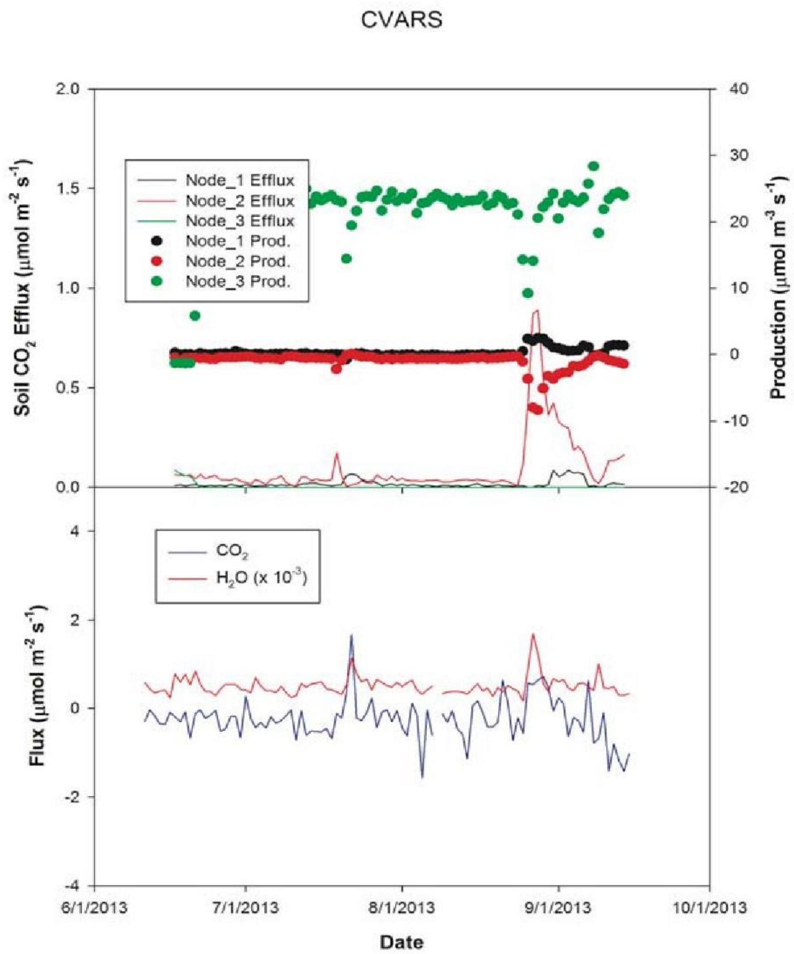
Figure 9: Fluxes of CO_2 and water vapor in response to rainfall events and production of CO_2 by soils with no vegetation (simulated solar installation).



Soil CO_2 production and efflux are calculated from changes across concentration boundaries in soil (production) and soil-atmosphere (efflux). Flux is derived from the eddy covariance measurements for water and CO_2. Note, the sign is gain or loss from the atmosphere, where positive number represents from soil to atmosphere, and negative from atmosphere to soil.

When the soils were examined using the Soil Observatory Network, automated minirhizotron observations showed a nearly sterile soil without particles of soil organic matter, or roots or fungal hyphae (Figure 10).

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Figure 10: The CVARS solar-simulation site (A) and a hi-resolution in situ AMR image of the soil (3.01mm X 2.26mm, 100x image) showing soil particles.

Few pieces of organic matter, or fungi or roots were observed in the CVARS soil. No CaCO3 crystals were observed.

Based on the soil CO_2 and soil moisture data, $CaCO_3$ was formed with the rainfall event (Figure 11), but nearly equal to those from the Deep Canyon native vegetation site (Figure 5). However, no crystals were observed.

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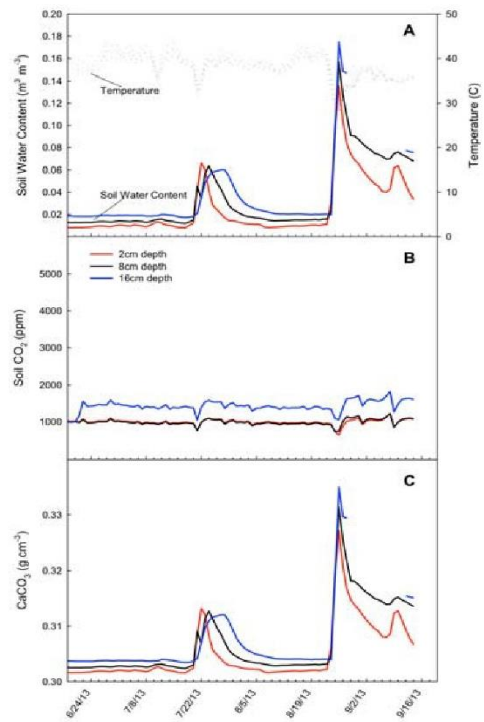
Figure 11: CaCO3 concentrations in response to rainfall events from the CVARS solar installation simulation site with no vegetation present.



Soil CO2 remained low in response to rainfall in contrast with Boyd Deep Canyon (Figure 5) but CaCO3 responses resemble those found at Boyd Deep Canyon.

4.3 Discussion

The data from the soil respiration, flux, soils, and $CaCO_3$ modeling all point to a suite of dynamic processes and one that, because of the large fluxes, is rarely if ever in equilibrium. At the natural area site (Boyd Deep Canyon NRS), Ca that is weathered from the dolomite outcroppings is abundant in the soil. It is cycled as $CaPO_4$ or $CaNO_3$, weathered by the respiration of plant roots and associated rhizosphere microorganisms. These organisms also produce organic acids that bind the Ca, such as CaC_2O_4, facilitating nutrient uptake. Other microorganisms then utilize the CaC_2O_4 (Morris and Allen 1994), thereby additionally increasing HCO_3^- and freeing Ca_2^+. During dry periods, found little root or microbial growth or respiration was found. With little H_2O, there is little respiration, or $CaCO_3$ in solution. However, crystals of $CaCO_3$ that precipitated on the surface of hyphae or other nucleation centers are seen.

With a large rainfall event, the $CaCO_3$ crystals dissolved and were solubilized. Organic C is mineralized and inorganic CO_2 released. There is a spike in aqueous $CaCO_3$, some of which is

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leached deeper into the profile, and some of which forms a supersaturated solution, re-precipitating as the soil dries out.

The CVARS site chosen as a model for a solar installation site, as there has been no vegetation for greater than four years shows a different, albeit also dynamic pattern. Presumably, the processes reflect soil geochemistry with little or no input by biological processes. There, CO_2 is produced and lost to the atmosphere or fixed by Ca into $CaCO_3$ in small amounts based on day-night vapor pressure change. With a large event, $CaCO_3$ rapidly increases. But CO_2 is also released spiking soil respiration and loss of CO_2 to the atmosphere was measured. Some $CaCO_3$ was likely leached to deeper soil layers, but researchers observed no crystal formation, such as we found at Deep Canyon. However, $CaCO_3$ remains relatively high in the soils at CVARS, binding the majority of soil C.

The key point here is that $CaCO_3$ is highly dynamic in response to root and mycorrhizosphere dynamics in the native ecosystem. $CaCO_3$ is also highly dynamic in the disturbed site, but the cycle is a largely inorganic one. Both are subject to CO_2 loss through respiration (Deep Canyon) or inorganic dissolution and diffusion. However, plants fix CO_2 in the desert, whereas any CO_2 lost in a flush with rainfall, is likely lost from the system.

It is not yet known the ultimate fate of the C in caliche, but these data show that the process is dynamic, and there is a potential for significant loss.

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CHAPTER 5: Conclusions

The research shows that caliche in the surface soil layers is not in equilibrium, but is dynamic. The isotopic ratios indicate that fractionation of $^{13}C/^{12}C$ has occurred, especially as the caliche in the upper soils weathers, and that $\delta^{18}O$ reflects local water sources. Carbon flux measurements show that high levels of CO_2 are generated within soil where native vegetation remains following rainfall during periods of maximum root and rhizosphere peaks. Arbuscular mycorrhizal fungi are particularly active, providing crystal seeds for $CaCO_3$ as soil dries out. Organic matter from plant and microbial residues is decomposed, mineralizing CO_2 along with Ca and nutrients from the plant tissue. With the next rainfall, the $CaCO_3$ dissolves. By repeated wetting, drying, root and microbial growth, caliche forms dissolves, and reforms.

However, in disturbed soils, there is little or no CO_2 from plant or microbial respiration. This is reflected in the lack of soil CO_2 response to a rainfall event. Nevertheless, CO_2 is generated and lost from the soil to the atmosphere, especially following a rainfall. With little organic matter, from aeolian deposition or recalcitrant C, much of the CO_2 likely comes from inorganic C, predominantly $CaCO_3$. With a rainfall, the modeling suggests that $CaCO_3$ is solubilized and CO_2 released to the atmosphere.

Researchers are not yet successful in distinguishing caliche layers in soil with ground penetrating radar (GPR). Researchers can distinguish layering, however in the California deserts, there are many depositional layers that, at this point, can only be distinguished by direct observation coupled with understanding the underlying and surrounding geology of a site.

5.1 Carbon in Desert Ecosystems and Vegetation Removal

Large-scale solar development in desert ecosystems has the potential to generate electricity, thereby reducing fossil carbon (C) accumulation in the atmosphere, and in turn, lessening the rates of global warming (e.g., Hernandez et al. 2014). However, both caliche and organic matter losses compromise the value of solar energy as an alternative to fossil C burning by releasing stored inorganic C into the atmosphere and destroying the ability of the deserts to sequester C. A number of concerns, including loss of inorganic C cycling have been raised with solar development, but the majority of concerns can be addressed with careful attention to siting the facilities and roads (e.g., Hernandez et al. 2014).

5.2 Research Needs

Three key study areas have been identified from this one-year study to better understand the dynamics of inorganic C in our desert ecosystems.

First, the pathways were characterized, however a longer-term study is required on multiple sites across the entire range of solar deployment area, to characterize the rates and time scales of C dynamics. The preliminary results indicate that caliche can weather at 5 percent per year. During a 20-year lifetime of a plant, that caliche exposed might well degrade, however, the

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actual field rates would be expected to be highly variable based on the specific weather of each individual year and the fragmentation of the caliche material. Averages mean little in the desert.

Second, the vertical redistribution of Ca in the field is needed. Modeling studies suggest that caliche is formed and weathered rapidly. Is the Ca released eroded or leached reforming deeper caliche, or does it remain in the soil, subject to repeated cycles and a net loss of CO_2?

Third, the impacts of multiple interacting changes on caliche weathering and formation are needed. Sites with little nitrogen (N) deposition were specifically chosen. N deposition as nitrate, and especially ammonium, will acidify the soils. N deposition is a product of transportation corridors, development, and industrial activity. These are all collateral impacts of desert development, whether for solar power or other human activity.

All of these areas need additional research. These should be undertaken by continued monitoring of sites that were established, continued modeling work, and incorporate newer field-based isotope measurement capacity.

5.3 Siting of Solar Power Plants and Power Corridors

Data shows that caliche is dynamic, and the processes of formation and weathering can occur within the time scales of solar unit deployments. Undisturbed vegetation produces $CaCO_3$ as long as Ca is present or coming in by wind or water erosion. But, CO_2 appears to be lost from $CaCO_3$ where the vegetation has been removed.

Siting solar developments on previously disturbed lands are recommended. Desert riparian woodlands should especially be avoided for the protection of sequestered, and their ability to increase that C sequestration. Their deep roots and microbial associations continue to sequester both organic and inorganic carbon.

It is also recommended that solar developments be revegetated. Short-statured plants, such as cacti and shrubs such as *Encelia farinosa* also respire CO_2, but continue to produce organic C and build up both organic and inorganic soil C. The modeling work under these shrubs is continuing, but these steps alone should provide the critical information to allow solar developments to produce needed, "green" energy and simultaneously reduce C loss and sustain buried inorganic and organic C.

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B10-25 (for entire attachment)

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DEPARTMENT OF JUSTICE

Environmental Justice at the Local and Regional Level
Legal Background

Cities, counties, and other local governmental entities have an important role to play in ensuring environmental justice for all of California's residents. Under state law:

> "[E]nvironmental justice" means the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.

(Gov. Code, § 65040.12, subd. (e).) Fairness in this context means that the *benefits* of a healthy environment should be available to everyone, and the *burdens* of pollution should not be focused on sensitive populations or on communities that already are experiencing its adverse effects.

Many local governments recognize the advantages of environmental justice; these include healthier children, fewer school days lost to illness and asthma, a more productive workforce, and a cleaner and more sustainable environment. Environmental justice cannot be achieved, however, simply by adopting generalized policies and goals. Instead, environmental justice requires an ongoing commitment to identifying existing and potential problems, and to finding and applying solutions, both in approving specific projects and planning for future development.

There are a number of state laws and programs relating to environmental justice. This document explains two sources of environmental justice-related responsibilities for local governments, which are contained in the Government Code and in the California Environmental Quality Act (CEQA).

Government Code

Government Code section 11135, subdivision (a) provides in relevant part:

> No person in the State of California shall, on the basis of race, national origin, ethnic group identification, religion, age, sex, sexual orientation, color, or disability, be unlawfully denied full and equal access to the benefits of, or be unlawfully subjected to discrimination under, any program or activity that is conducted, operated, or administered by the state or by any state agency, is funded directly by the state, or receives any financial assistance from the state....

While this provision does not include the words "environmental justice," in certain circumstances, it can require local agencies to undertake the same consideration of fairness in the distribution of environmental benefits and burdens discussed above. Where, for example, a general plan update is funded by or receives financial assistance from the state or a state agency,

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and implementation measures (a) foster equal access to a clean environment and public health benefits (such as parks, sidewalks, and public transportation); and (b) do not result in the unmitigated concentration of polluting activities near communities that fall into the categories defined in Government Code section 11135.[1] In addition, in formulating its public outreach for the general plan update, the local agency should evaluate whether regulations governing equal "opportunity to participate" and requiring "alternative communication services" (*e.g.*, translations) apply. (See Cal. Code Regs., tit. 22, §§ 98101, 98211.)

Government Code section 11136 provides for an administrative hearing by a state agency to decide whether a violation of Government Code section 11135 has occurred. If the state agency determines that the local government has violated the statute, it is required to take action to "curtail" state funding in whole or in part to the local agency. (Gov. Code, § 11137.) In addition, a civil action may be brought in state court to enforce section 11135. (Gov. Code, § 11139.)

California Environmental Quality Act (CEQA)

Under CEQA, "public agencies should not approve projects as proposed if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects …." (Pub. Res. Code, § 21002.) Human beings are an integral part of the "environment." An agency is required to find that a "project may have a 'significant effect on the environment'" if, among other things, "[t]he environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly[.]" (Pub. Res. Code, § 21083, subd. (b)(3); see also CEQA Guidelines,[2] § 15126.2 [noting that a project may cause a significant effect by bringing people to hazards].)

CEQA does not use the terms "fair treatment" or "environmental justice." Rather, CEQA centers on whether a project may have a significant effect on the physical environment. Still, as set out below, by following well-established CEQA principles, local governments can further environmental justice.

CEQA's Purposes

The importance of a healthy environment for all of California's residents is reflected in CEQA's purposes. In passing CEQA, the Legislature determined:

- "The maintenance of a quality environment for the people of this state now and in the future is a matter of statewide concern." (Pub. Res. Code, § 21000, subd. (a).)

- We must "identify any critical thresholds for the health and safety of the people of the state and take all coordinated actions necessary to prevent such thresholds from being reached." (*Id.* at subd. (d).)

[1] To support a finding that such concentration will not occur, the local government likely will need to identity candidate communities and assess their current burdens.
[2] The CEQA Guidelines (Cal. Code Regs., tit. 14, §§ 15000, et seq.) are available at http://ceres.ca.gov/ceqa/.

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- "[M]ajor consideration [must be] given to preventing environmental damage, while providing a decent home and satisfying living environment for every Californian." (*Id.* at subd. (g).)
- We must "[t]ake all action necessary to provide the people of this state with clean air and water, enjoyment of aesthetic, natural, scenic, and historic environmental qualities, and freedom from excessive noise." (Pub. Res. Code, § 21001, subd. (b).)

Specific provisions of CEQA and its Guidelines require that local lead agencies consider how the environmental and public health burdens of a project might specially affect certain communities. Several examples follow.

<u>Environmental Setting and Cumulative Impacts</u>

There are a number of different types of projects that have the potential to cause physical impacts to low-income communities and communities of color. One example is a project that will emit pollution. Where a project will cause pollution, the relevant question under CEQA is whether the environmental effect of the pollution is significant. In making this determination, two long-standing CEQA considerations that may relate to environmental justice are relevant – setting and cumulative impacts.

It is well established that "[t]he significance of an activity depends upon the setting." (*Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 718 [citing CEQA Guidelines, § 15064, subd. (b)]; see also *id.* at 721; CEQA Guidelines, § 15300.2, subd. (a) [noting that availability of listed CEQA exceptions "are qualified by consideration of where the project is to be located – a project that is ordinarily insignificant in its impact on the environment may in a particularly sensitive environment be significant."]) For example, a proposed project's particulate emissions might not be significant if the project will be located far from populated areas, but may be significant if the project will be located in the air shed of a community whose residents may be particularly sensitive to this type of pollution, or already are experiencing higher-than-average asthma rates. A lead agency therefore should take special care to determine whether the project will expose "sensitive receptors" to pollution (see, e.g., CEQA Guidelines, App. G); if it will, the impacts of that pollution are more likely to be significant.[3]

In addition, CEQA requires a lead agency to consider whether a project's effects, while they might appear limited on their own, are "cumulatively considerable" and therefore significant. (Pub. Res. Code, § 21083, subd. (b)(3).) "'[C]umulatively considerable' means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future

[3] "[A] number of studies have reported increased sensitivity to pollution, for communities with low income levels, low education levels, and other biological and social factors. This combination of multiple pollutants and increased sensitivity in these communities can result in a higher cumulative pollution impact." Office of Environmental Health Hazard Assessment, *Cumulative Impacts: Building a Scientific Foundation* (Dec. 2010), Exec. Summary, p. ix, available at http://oehha.ca.gov/ej/cipa123110.html.

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projects." (*Id.*) This requires a local lead agency to determine whether pollution from a proposed project will have significant effects on any nearby communities, when considered together with any pollution burdens those communities already are bearing, or may bear from probable future projects. Accordingly, the fact that an area already is polluted makes it *more likely* that any additional, unmitigated pollution will be significant. Where there already is a high pollution burden on a community, the "relevant question" is "whether any additional amount" of pollution "should be considered significant in light of the serious nature" of the existing problem. (*Hanford, supra*, 221 Cal.App.3d at 661; see also *Los Angeles Unified School Dist. v. City of Los Angeles* (1997) 58 Cal.App.4th 1019, 1025 [holding that "the relevant issue … is not the relative amount of traffic noise resulting from the project when compared to existing traffic noise, but whether any additional amount of traffic noise should be considered significant in light of the serious nature of the traffic noise problem already existing around the schools."])

The Role of Social and Economic Impacts Under CEQA

Although CEQA focuses on impacts to the physical environment, economic and social effects may be relevant in determining significance under CEQA in two ways. (See CEQA Guidelines, §§ 15064, subd. (e), 15131.) First, as the CEQA Guidelines note, social or economic impacts may lead to physical changes to the environment that are significant. (*Id.* at §§ 15064, subd. (e), 15131, subd. (a).) To illustrate, if a proposed development project may cause economic harm to a community's existing businesses, and if that could in turn "result in business closures and physical deterioration" of that community, then the agency "should consider these problems to the extent that potential is demonstrated to be an indirect environmental effect of the proposed project." (See *Citizens for Quality Growth v. City of Mt. Shasta* (1988) 198 Cal.App.3d 433, 446.)

Second, the economic and social effects of a physical change to the environment may be considered in determining whether that physical change is significant. (*Id.* at §§ 15064, subd. (e), 15131, subd. (b).) The CEQA Guidelines illustrate: "For example, if the construction of a new freeway or rail line divides an existing community, the construction would be the physical change, but the social effect on the community would be the basis for determining that the effect would be significant." (*Id.* at § 15131, subd. (b); see also *id.* at § 15382 ["A social or economic change related to a physical change may be considered in determining whether the physical change is significant."])

Alternatives and Mitigation

CEQA's "substantive mandate" prohibits agencies from approving projects with significant environmental effects if there are feasible alternatives or mitigation measures that would substantially lessen or avoid those effects. (*Mountain Lion Foundation v. Fish and Game Commission* (1997) 16 Cal.4th 105, 134.) Where a local agency has determined that a project may cause significant impacts to a particular community or sensitive subgroup, the alternative and mitigation analyses should address ways to reduce or eliminate the project's impacts to that community or subgroup. (See CEQA Guidelines, § 15041, subd. (a) [noting need for "nexus" between required changes and project's impacts].)

Depending on the circumstances of the project, the local agency may be required to consider alternative project locations (see *Laurel Heights Improvement Assn. v. Regents of University of*

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California (1988) 47 Cal.3d 376, 404) or alternative project designs (see *Citizens of Goleta Valley v. Board of Supervisors* (1988) 197 Cal.App.3d 1167, 1183) that could reduce or eliminate the effects of the project on the affected community.

The lead agency should discuss and develop mitigation in a process that is accessible to the public and the affected community. "Fundamentally, the development of mitigation measures, as envisioned by CEQA, is not meant to be a bilateral negotiation between a project proponent and the lead agency after project approval; but rather, an open process that also involves other interested agencies and the public." (*Communities for a Better Environment v. City of Richmond* (2010) 184 Cal.App.4th 70, 93.) Further, "[m]itigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments." (CEQA Guidelines, § 15126.4, subd. (a)(2).)

As part of the enforcement process, "[i]n order to ensure that the mitigation measures and project revisions identified in the EIR or negative declaration are implemented," the local agency must also adopt a program for mitigation monitoring or reporting. (CEQA Guidelines, § 15097, subd. (a).) "The purpose of these [monitoring and reporting] requirements is to ensure that feasible mitigation measures will actually be implemented as a condition of development, and not merely adopted and then neglected or disregarded." (*Federation of Hillside and Canyon Assns. v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1261.) Where a local agency adopts a monitoring or reporting program related to the mitigation of impacts to a particular community or sensitive subgroup, its monitoring and reporting necessarily should focus on data from that community or subgroup.

<u>Transparency in Statements of Overriding Consideration</u>

Under CEQA, a local government is charged with the important task of "determining whether and how a project should be approved," and must exercise its own best judgment to "balance a variety of public objectives, including economic, environmental, and social factors and in particular the goal of providing a decent home and satisfying living environment for every Californian." (CEQA Guidelines, § 15021, subd. (d).) A local agency has discretion to approve a project even where, after application of all feasible mitigation, the project will have unavoidable adverse environmental impacts. (*Id.* at § 15093.) When the agency does so, however, it must be clear and transparent about the balance it has struck.

To satisfy CEQA's public information and informed decision making purposes, in making a statement of overriding considerations, the agency should clearly state not only the "specific economic, legal, social, technological, or other benefits, including region-wide or statewide environmental benefits" that, in its view, warrant approval of the project, but also the project's "unavoidable adverse environmental effects[.]" (*Id.* at subd. (a).) If, for example, the benefits of the project will be enjoyed widely, but the environmental burdens of a project will be felt particularly by the neighboring communities, this should be set out plainly in the statement of overriding considerations.

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* * * *

The Attorney General's Office appreciates the leadership role that local governments have played, and will continue to play, in ensuring that environmental justice is achieved for all of California's residents. Additional information about environmental justice may be found on the Attorney General's website at http://oag.ca.gov/environment.

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B10-26 (for entire attachment)

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PUBLISHED ONLINE: 6 APRIL 2014 | DOI: 10.1038/NCLIMATE2184

Greater ecosystem carbon in the Mojave Desert after ten years exposure to elevated CO_2

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Carbon dioxide is the main greenhouse gas inducing climate change. Increased global CO_2 emissions, estimated at 8.4 Pg C yr^{-1} at present, have accelerated from 1% yr^{-1} during 1990–1999 to 2.5% yr^{-1} during 2000–2009 (ref. 1). The carbon balance of terrestrial ecosystems is the greatest unknown in the global C budget because the actual magnitude, location and causes of terrestrial sinks are uncertain[2]; estimates of terrestrial C uptake, therefore, are often based on the residuals between direct measurements of the atmospheric sink and well-constrained models of ocean uptake of CO_2 (ref. 3). Here we report significant terrestrial C accumulation caused by CO_2 enhancement to net ecosystem productivity in an intact, undisturbed arid ecosystem[4–8] following ten years of exposure to elevated atmospheric CO_2. Results provide direct evidence that CO_2 fertilization substantially increases ecosystem C storage and that arid ecosystems are significant, previously unrecognized, sinks for atmospheric CO_2 that must be accounted for in efforts to constrain terrestrial and global C cycles.

Arid and semiarid ecosystems are significant components of the terrestrial C budget; they cover 47% of the terrestrial surface[9], represent the fifth largest pool of soil organic C (208–241 Pg; ref. 10) and exhibit large increases in net primary productivity (NPP) in response to small changes in water availability[11]. The Nevada Desert Free-Air CO_2 Enrichment Facility (NDFF) was established in 1997 to better understand the sensitivity of arid ecosystems to increasing atmospheric CO_2 ($[CO_2]$). Soil organic C and nitrogen are concentrated in the top 0.1 m and no significant differences in soil C and N were observed between CO_2 treatments in 1999 (ref. 4). Above- and belowground biomass and soils to 1 m were harvested by plant-cover type after ten years of continuous treatment. Soils were the dominant pool of C and N and contents were significantly greater under elevated $[CO_2]$ across all cover types (Fig. 1 and Supplementary Tables 1–5). Mean total ecosystem organic C under elevated CO_2 was 1,170 g C m^{-2} with a 90% credible interval of 1,062–1,285 g C m^{-2}, compared with 1,030 g C m^{-2} (credible interval of 937–1,130 g C m^{-2}) under ambient conditions. Differences were owing solely to soil organic C; no differences were observed in plant pools. This contrasts with more mesic grassland and forested ecosystems that observed increases in plant biomass after two to nine years of exposure to elevated $[CO_2]$ (ref. 12). Mass balance analysis of the carbon isotope composition ($\delta^{13}C$) of C entering the soil after a change in CO_2 sources in 2003 was −26.2‰ (Fig. 2), indicating ~70% of accrued soil organic C originated from aboveground (−27.1‰) compared with belowground (−24.0‰) sources. Comparisons of the relative contribution of different C sources to accrued soil organic C between elevated and ambient $[CO_2]$ treatments are not possible, however, as the $\delta^{13}C$ of CO_2 for ambient CO_2 treatments remained constant throughout the experiment.

Flux estimates of net ecosystem productivity (NEP) are problematic in aridlands[13], thus our harvest provides the first direct measure of long-term enhancements to NEP stimulated by elevated $[CO_2]$. Estimates of the spatial extent of aridlands range from 2.65×10^9 ha (ref. 10) to 4.89×10^9 ha (ref. 9) and plant cover in arid biomes has increased 11% as atmospheric CO_2 increased from 1982 to 2010 (ref. 14). Assuming that responses observed over this ten-year study are representative of other arid ecosystems, then enhancements to NEP in arid and semiarid lands caused by elevated CO_2 could range from 0.37 to 0.68 Pg C yr^{-1}. This enhancement of NEP is equivalent to 4–8% of current global CO_2 emissions of 8.4 Pg C yr^{-1} and 15–28% of current terrestrial uptake estimates of 2.4 Pg C yr^{-1} (ref. 1). The recent generation of representative concentration pathways (RCPs) for climate simulations predict that atmospheric $[CO_2]$ will reach levels used in this experiment (513 μmol mol^{-1}) between 2045 (RCP8.5) and 2063 (RCP4.5; ref. 15) and CO_2 enhancement of NEP reported here could account for 4–8% and 2–4% of predicted total emissions for RCP4.5 (9.0 Pg C yr^{-1}) and RCP8.5 (19.0 Pg C yr^{-1}), respectively, at that time. Although extrapolations such as this can be problematic, as evidenced by the range in atmospheric $[CO_2]$ trajectories proposed in the RCPs and possible interactions between elevated $[CO_2]$ and other global change factors beyond the goals of this experiment, such as increased atmospheric N deposition, changes in precipitation regimes and warming, they do point out the potential for CO_2 stimulation of NEP in arid regions to impact global $[CO_2]$.

Increases in total ecosystem C at the NDFF under elevated $[CO_2]$ are the direct result of CO_2 fertilization effects on photosynthesis. Plants grown under elevated $[CO_2]$ had photosynthetic rates 1.3–2.0 times greater than those grown under ambient $[CO_2]$ (ref. 5). Further, integrated leaf-level C gain for the dominant shrub *Larrea tridentata* was 170 g C m^{-2} yr^{-1} and 118 g C m^{-2} yr^{-1} greater in wet and dry years under elevated $[CO_2]$, respectively[5]. Increased

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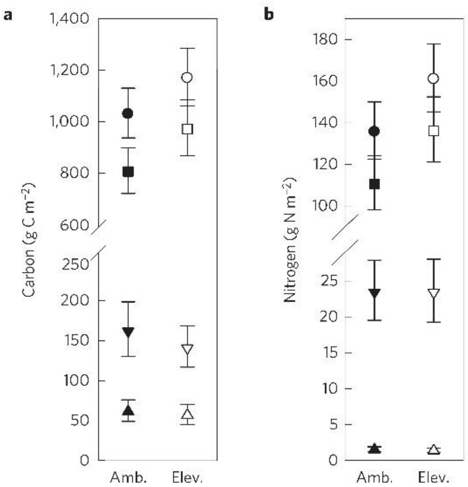

Figure 1 | Ecosystem C and N under ambient and elevated CO_2. **a**,**b**, Posterior means and 90% credible intervals (error bars) for aboveground (filled uptriangle, open uptriangle) and belowground (filled downtriangle, open downtriangle) plant biomass, soils (filled square, open square) and total (filled circle, open circle) ecosystem C (**a**) and N (**b**) under ambient (Amb.) and elevated [CO_2] (Elev.). Estimates are derived by summing cover-weighted values for individual cover types (Supplementary Information). Mean soil (Bayesian p-value = 0.002, 0.002) and total ecosystem ($p = 0.021, 0.004$) were significantly different between CO_2 treatments for C and N, respectively.

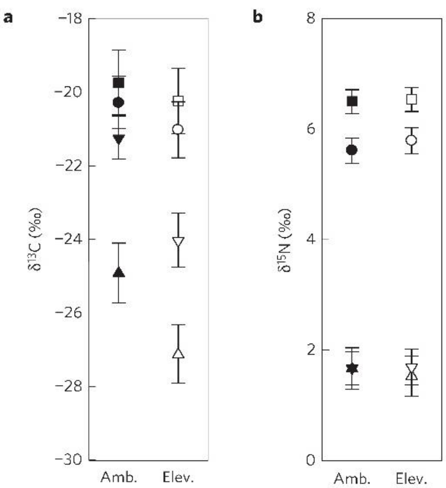

Figure 2 | Ecosystem C and N isotope composition under ambient and elevated CO_2. **a**,**b**, Posterior means and 90% credible intervals (error bars) for aboveground (filled uptriangle, open uptriangle) and belowground (filled downtriangle, open downtriangle) plant biomass, soils (filled square, open square) and total (filled circle, open circle) ecosystem $\delta^{13}C$ (**a**) and $\delta^{15}N$ (**b**) under ambient (Amb.) and elevated [CO_2] (Elev.). Estimates are derived by summing cover-weighted values for individual cover types (Supplementary Information). Mean $\delta^{13}C$ was significantly different between treatments for above- and belowground biomass (Bayesian p-value <0.0001) and total carbon ($p = 0.066$). No significant differences were observed between treatments for $\delta^{15}N$.

photosynthesis and leaf-level C gain in all years, however, translated to increases in aboveground NPP in only wet, but not dry, years[11,13].

The absence of [CO_2] treatment differences in plant C and N pools at final harvest seems to contradict the measured increases in photosynthesis and NPP under elevated [CO_2]. This observation, in fact, highlights a primary mechanism for the observed increase in soil organic C, as well as a fundamental difference in the response between arid and more mesic ecosystems. Arid ecosystems are characterized by rapid increases in NPP and biomass in response to stochastic increases in water availability[11]. The greatest enhancement in NPP and growth of plants under elevated [CO_2] at the NDFF occurred when moisture was most available. The final harvest at NDFF occurred during a dry year, indicating that peaks in production that occur under elevated [CO_2] when moisture is readily available cannot be sustained during intervening drought. Hence, additional biomass senesced, increasing C inputs into soil as litter. High rates of above- and belowground plant biomass turn-over are common in arid ecosystems; turnover of aboveground biomass at NDFF may occur every two to six years based on measurements of aboveground NPP of 10–30 $g\,C\,m^{-2}\,s^{-1}$ at a nearby site[13] and total aboveground biomass can turn over every 1.5 yr based on NPP and standing biomass estimates in the Chihuahuan Desert[16].

The 118–170 $g\,C\,m^{-2}\,yr^{-1}$ increase in leaf-level C gain observed here under elevated [CO_2] without consistent, concurrent increases in aboveground NPP suggests a second mechanism for the observed increases in soil organic C; significant increases in belowground allocation of C. Belowground biological activity beneath shrubs, as estimated by soil respiration, can be 60% greater under elevated compared with ambient [CO_2], but this increase is occurring without significant differences in fine-root standing crop, turnover rates[6], or root respiration[17]. Thus, this increase in belowground biological activity is probably due to increases in soil microbial activity or population size, and that increased rhizodeposition and subsequent assimilation and stabilization by the soil microbial community is a significant mechanism for increased C inputs to the soil under elevated [CO_2]. Rates of rhizosphere C deposition have been shown to increase 56–74% under elevated [CO_2] in diverse ecosystems[18,19] and labile compounds immobilized into microbial residues can be a major source of stable C and N in soils[20]. A previous study[8] demonstrated that plant photosynthates are assimilated by rhizosphere microbial communities within 1 h of exposing *L. tridentata* to ^{13}C-labelled CO_2, highlighting the tight linkage between plants, rhizodeposition and microbes in this arid ecosystem as well as the ability of C to rapidly transfer from the site of photosynthesis to the soil without increases in plant biomass or turnover rates. The C:N ratio of accumulated C and N observed here (5.5, total soil C:N = 7.3) is consistent with accumulation of bacterial and fungal residues (C:N from 4:1 to 10:1), an observation supported by increased amounts of fungal and bacterial biomarkers under elevated [CO_2] (A.K. and R.D.E., manuscript in preparation). Thus, root exudation and microbial stabilization may be more important determinants of belowground C balance in arid ecosystems than the input of fine-root litter found in more mesic ecosystems[12]. The patterns observed at the NDFF are congruent with observations from the semiarid shortgrass steppe[21], where elevated [CO_2] stimulated aboveground production of only 33% over five years but caused a doubling of rhizodeposition over the same time period.

Mean organic N was 161 $g\,N\,m^{-2}$ (credible interval of 145–178 $g\,N\,m^{-2}$) under elevated [CO_2] in contrast to 136 $g\,N\,m^{-2}$ (credible interval of 122–150 $g\,N\,m^{-2}$) for controls (Fig. 1). The N cycle in arid ecosystems is open with relatively high rates of N input that are balanced by similar rates of loss from soil emissions, thus small changes in either inputs or losses can significantly alter ecosystem N storage. The observed differences in N can therefore result from increased N_2 fixation or atmospheric deposition,

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greater retention of N through decreased gas emissions from volatilization, nitrification and denitrification, or transfer of N from below our sampling zone into the top 1 m of soil. Rates of atmospheric deposition in this region are 0.5–1.0 g N m^{-2} yr^{-1}, whereas another study[22] recently determined the mean rate of N_2 fixation in aridlands is 1 g N m^{-2} yr^{-1}, strongly suggesting that the differences in accumulation rates observed here are at the lower region of the credible interval. Increased rates of heterotrophic N_2 fixation were observed under elevated [CO_2] (ref. 23), but rates are not great enough to solely account for the observed treatment differences. Changes in rooting dynamics and plant N acquisition below the 1 m depth examined in this experiment may have also contributed to the observed differences. Nitrate readily leaches in coarse soils and the greatest concentrations are often observed at depths of 1 m or greater[24]. Nutrient acquisition by dominant shrubs can occur to 5 m (ref. 25) and seasonal patterns and observed treatment differences in leaf $\delta^{15}N$ of *L. tridentata*[7] are consistent with patterns observed with plant use of nitrate at depth[26]; effectively transferring N from depth to the top 1 m of soil. Finally, elevated [CO_2] may increase total ecosystem N over time by increasing rates of N retention by plants and microbes, thereby decreasing rates of gaseous loss[27]. This hypothesis is supported by experimentation; volatilization is the primary source of N loss at the NDFF (refs 4,28) and experimental addition of C (ref. 27) or elevated [CO_2] (ref. 28) greatly decreased gaseous N emissions, thus facilitating retention of N in the soil. Reliable estimates of annual N fluxes in arid ecosystems are problematic due to their episodic occurrence. The observed differences in ecosystem N content observed here are probably due to a combination of each of the above factors, and separating their relative roles requires further experimentation beyond the goals of this study.

The progressive N-limitation hypothesis predicts increased N limitations to NPP as ecosystems accumulate C, but this has not yet been observed at the NDFF. [CO_2] enhancement and direct C-addition studies demonstrate that microbial activity at the NDFF is limited by available C (refs 23,27) and increased C inputs accelerate rates of soil N transformations, thus increasing N mineralization and inorganic N availability[7,29]. Soil organic matter in arid ecosystems is largely recalcitrant[7], but increased litter and rhizodeposition under elevated [CO_2] have caused an increase in microbial biomass and diversity, especially for fungi[8] that are more efficient at using recalcitrant substrates. This is accompanied by an increase in the diversity of substrates used by the microbial community as well as the activities of enzymes involved in N and C cycling[29].

Assessing the location and magnitude of terrestrial C sinks is challenging because of their spatial and temporal complexity. Previous efforts to estimate C uptake by the terrestrial surface often focused on easily identified sinks such as forest regrowth and typically did not consider non-forested ecosystems or physiological enhancements to photosynthesis and growth caused by increasing [CO_2]. Despite suggestions that the strength of global C sinks has recently declined or remained static, recent mass balance analyses of global C indicate that uptake of CO_2 by oceans and the land surface has accelerated over the past 50 yr (ref. 2), highlighting the uncertainties present in our knowledge of the global C cycle. Results from this ten-year experiment clearly demonstrate two critical areas that must be considered to develop a more comprehensive understanding of the fates of atmospheric CO_2. First, non-forested ecosystems must be accounted for in studies of terrestrial sinks; arid and semiarid lands are the most widespread terrestrial biomes and the enhancements in NEP in response to elevated [CO_2] observed here indicate their importance as a significant C sink. Second, increases in C storage observed here were the result of [CO_2] enhancements to photosynthesis, subsequent increases in plant biomass during wet years followed by greater senescence in dry years and increased rhizodeposition. Thus, more mechanistic detail is necessary in models predicting plant, rhizodeposition and NEP responses to elevated [CO_2] (ref. 30). Consideration of both factors will in turn allow us to better constrain terrestrial C dynamics and ultimately the global C cycle.

Methods

Free-air-CO_2-enrichment (FACE) experiments allow investigators to quantify whole-ecosystem responses to elevated [CO_2] in coupled plant–soil systems. The NDFF was the only FACE experiment located in an intact arid ecosystem. The NDFF was located 15 km north of Mercury, (36° 49′ N, 115° 55′ W; elevation 965–970 m) in the northern Mojave Desert. The site consisted of nine 23-m-diameter experimental plots exposed to three fumigation treatments. Three plots were fumigated at ambient atmospheric [CO_2] (~380 μmol CO_2 mol^{-1}) as a blower control (ambient), three at ~550 μmol CO_2 mol^{-1} (elevated) and three received no fumigation (non-blower control). Treatments began in April 1997 and continued until June 2007. Fumigations were maintained continuously throughout the experiment except when air temperatures were below 4 °C or when wind speeds >7 m s^{-1} for more than 5 min. Mean [CO_2] concentrations were 513 μmol mol^{-1} and 375 μmol mol^{-1} for elevated and ambient treatments, respectively, over the life of the experiment. The $\delta^{13}C$ of supplemental CO_2 was −5.4‰ until 10 February 2003 when the source CO_2 was switched to −32.0‰ for the remainder of the experiment. Dilution with ambient air resulted in $\delta^{13}C$ of CO_2 in the elevated treatment of −7.3‰ and −18.2‰ before and after the source switch, respectively. The $\delta^{13}C$ of ambient and control treatments was −8‰ throughout the experiment.

Seven cover types based on the dominant species were identified in each plot. The final harvested area for each ring was calculated from aerial photographs using image-processing software (ENVI, Exelis Visual Information Solutions). Vegetation and soils to 1 m depth were destructively harvested from two-thirds of each plot at the end of the 2007 growing season. Aboveground biomass was determined by cutting all plants at ground level and summing biomass for all individuals of each species. Belowground biomass was measured for each cover type using two approaches. First, root biomass was determined from excavated soil collected in association with specific cover types. Second, roots were collected from transects through the plot. Fine-root data were obtained from minirhizotron tubes[6]. Soils were collected under the canopies of the five most abundant plant-cover types and in plant interspaces to 1 m in depth at 0.2 m increments. Soils were collected from two microsites, centre and edge of aboveground vegetation canopies, under all cover types except *Pleuraphis rigida* (a C_4 bunchgrass). Rock and soil volumes and soil bulk densities were measured by excavation. Two square pits (0.5 × 0.5 m projected area) in each plot were excavated to 1 m in 0.2 m increments. Samples were passed through 2 mm mesh screens to separate rocks (>2 mm) from soils (≤ 2 mm). Rock volume was quantified by measuring the amount of water displaced in a 20 l plastic container. Bulk densities were used to scale soil content measurements to an aerial basis. The mean rock and soil volumes for all plots by depth were used to correct for rock content. Plant C and N contents and stable isotope compositions were determined at the Washington State University Stable Isotope Core Facility (Pullman) using an ECS 4010 elemental analyser (Costech Analytical, Valencia) interfaced with an isotope ratio mass spectrometer (Delta PlusXP, Thermo Finnigan). Soil samples for organic C content and stable isotope composition were treated with $3NH_3PO_4$ to remove carbonates before analysis.

Final harvest data were analysed at the level of the cover type to address merging of data from the soil, aboveground and belowground samples from each sample location (see Supplementary Information for complete description of the statistical analysis methods). All C and N content data were log transformed for analysis, whereas $\delta^{13}C$ and $\delta^{15}N$ data were not transformed. Data were analysed through a linear mixed-effects model with cover type and [CO_2] treatment as fixed effects, and ring within treatment as a random effect. Separate models were fitted to each response variable to obtain pool and isotope estimates for each ring-cover type combination. Change in the relative proportion of the cover types was not detected during the experiment, so landscape-level estimates were calculated by summing values for soil, root and aboveground estimates for each cover type, yielding cover-type pool totals and computing weighted averages of these cover type totals to obtain the plot-level totals. All statistical models were simultaneously implemented in a Bayesian framework that allowed us to propagate uncertainty in the cover type × pool type × ring estimates, yielding accurate estimates (posterior means and credible intervals) of the ring, cover type by ring and treatment-level total pool estimates. The fixed effect coefficients and standard deviation terms were assigned relative standard priors and a semi-informative prior was used for the ring random effect standard deviations due to the small number of rings per treatment.

Received 24 June 2013; accepted 5 March 2014; published online 6 April 2014

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Acknowledgements

The authors gratefully acknowledge grant support from the Department of Energy's Terrestrial Carbon Processes Program (DE-FG02-03ER63650, DEFG02-03ER63651) and the NSF Ecosystem Studies Program (DEB-98-14358 and 02-12819). We also acknowledge the DOE's National Nuclear Security Administration for providing utility services and undisturbed land at the Nevada National Security Site (formerly Nevada Test Site) to conduct the FACE experiment. We also thank S. Chung at WSU for advice on current emission inventories.

Author contributions

S.S. and R.N. conceived the study. R.E., S.S., R.N., T.C., B.N. and L.F. designed the final harvest. R.E. and A.K. collected soils data, S.S., T.C. and B.N. collected aboveground plant data and R.N. collected belowground plant data. L.F. and T.C. determined plot area and species composition. B.H. provided elemental and isotopic analyses, and D.S. and K.O. analysed the data. All authors wrote the paper.

Additional information

Supplementary information is available in the online version of the paper. Reprints and permissions information is available online at www.nature.com/reprints. Correspondence and requests for materials should be addressed to R.D.E.

Competing financial interests

The authors declare no competing financial interests.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

B10-27
(for entire attachment)

NEWS OF THE DESERT FROM SIERRA CLUB CALIFORNIA & NEVADA DESERT COMMITTEE MARCH 2019

DESERT REPORT

BY ROBIN KOBALY

THE DESERT UNDER OUR FEET

An extraordinary biological web that serves us in countless ways

WE ARE WITNESS TO ASSAULTS ON OUR DESERT LANDSCAPE EVERY day, but we usually recognize only what we see above ground. In fact, these surface alterations result in critical changes below ground that have far-reaching implications that are mostly unnoticed or unappreciated. If we could see the intricate systems that hum along invisibly underground, we would likely fight even harder to protect our desert landscapes from unnecessary disturbance.

Research around the world is showing that the biggest contributors to soil stability in deserts are the smallest of microorganisms. Tiny microbes hold our desert landscape together. The valuable role of hidden microorganisms in keeping our air cleaner, preventing dust storms, controlling erosion, and helping us reduce carbon dioxide levels in our atmosphere is enormous, but that role is mostly overlooked when we make land-use decisions in our desert.

Biological Soil Crusts: Stabilizing Soil and Influencing Water Runoff

Across arid soils, a thin crust often forms within the top few centimeters of the soil surface. Surprisingly, these crusts are not exclusively formed from excess minerals, as is often thought, but are created by microscopic and somewhat larger macroscopic organisms that live together in a tiny but profound world.

Whenever it rains, a cast of soil creatures (including cyanobacteria, formerly called blue-green algae, plus bacteria, fungi, and other microbes) that have been patiently sleeping wakes up like a scene in Sleeping Beauty's castle. Released from the spell of drought, these microscopic creatures start making food and creating miniature subway tunnels as they move through the soil, reproducing as long as the soil is moist. Tunnels of sticky mucilage around algae filaments allow the algae to move into new frontiers while moisture paves their way.

As the soil dries out after rain, a slumber again falls over the entire

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Deep roots, evening primrose.
2018 © Robin Kobaly

Comment Set B10 – Morongo Basin Conservation Association (cont.)

THE DESERT UNDER OUR FEET

→ PAGE 1

community, and the soft, gluey tunnels start to dry out – but not before tightly binding all the soil grains they have touched. The value of this thin, living "skin" across our desert soil is not only expressed during its wet "waking hours," but also during its dry dormant time when it performs the critical role of gluing soil particles together against wind and water erosion.

During the following months or years of drought, these sticky tunnels continue to bind soil grains together. The result of this microscopic community is a protective seal across the soil surface called a biological soil crust that keeps dust, particulate matter (PM10s and PM2.5s), and harmful fungal spores like valley fever from being blown up into the air wherever soil has not been disturbed. These living soil crusts take hundreds of years to develop into effective soil sealants, but when they are allowed to remain intact, they not only hold back wind and water erosion, but also supply nutrients to neighboring higher plants, improve water infiltration, prevent choking dust storms, and help keep our air clean and healthy. Plus, they do all this for us while they are sleeping.

Mycorrhizae: A Strategic Partnership Between Plants and Fungi

Working both above and below this marvelous crust, plants are breathing in massive amounts of carbon dioxide from the air, reassembling the carbon into sugar, then transporting it underground to grow roots. Byproducts from this growth (photosynthesis) become locked in hidden carbon storage vaults underground, both living and non-living, for many hundreds of years. Small shrubs like Blackbrush can live at least 400 years, while Mormon Tea can live over 250 years. Our Mojave Yuccas are youngsters at 500 years old, and may live to several thousand years old. And even more impressive are Nolinas, Desert Ironwood trees, and California junipers that may live to over 1000 years.

Roots from these carbon-eating plants reach far underground, some as much as 150 feet deep (roots of succulents like cacti and yuccas are not as deep; they have other survival tricks). Roots this deep are essential to reach soils still moist from rains that may have fallen many years ago, and these deep, living "straws" create an upside-down forest of craggy wood, resulting in a greater mass of living tissue below ground than what we see above ground.

All these deep roots are not separate and alone in their quest to gather water and nutrients to survive. Eons ago, they struck upon a partnership with fungus that helps them absorb moisture and nutrients from an arid soil that is almost devoid of either. Over 90% of plants on earth belong to this "root partners' club," a lifelong membership that grants participating plants special privileges.

Moisture and valuable resources like phosphorus and nitrogen are all gathered and delivered to the plant partner through thin threads of widely dispersed fungal hyphae called mycelium. In exchange, the plant host supplies sugars to their "mycorrhizal" fungal root partners, which, for all their near-magical powers, cannot make their own food. A good trade indeed. This partnership has been called a "subterranean swap meet."

But the fungal partner offers more to this relationship; it offers immune-boosting compounds and antibiotics and bitter-tasting chemicals that deter animals and insects from eating its host's leaves. Even more mind-boggling, fungal threads from neighboring plants can merge with adjacent fungal threads to connect plant to plant in a massive community network that "exchanges information" between plants for the good of the whole community.

Without seeing anything above ground, the mycelia below ground transmit information about dangers like insect attacks and initiate the production of pest-repelling compounds in the leaves of the plants connected to this "root partner's club." No single plant has to fight an intruder on its own. This information-sharing network of fungi has been dubbed "nature's internet" or the "Wood Wide Web."

Mycorrhizal Mushrooms. 2018 © Robin Kobaly

Comment Set B10 – Morongo Basin Conservation Association (cont.)

The benefits of this hidden relationship extend beyond the exchange of resources between plants and fungi. Both the root and the fungus are breathing out carbon dioxide in the dark (plants breathe *in* carbon in the light, and breathe *out* carbon in the dark). Right at the point where a tiny fungal thread connects to the plant root, some of the carbon dioxide exhaled by roots and fungi reacts with calcium in the soil to form crystals of calcium carbonate, or what is called caliche. Carbon in these crystals becomes locked into the soil.

Over time, large chunks or even vast layers of caliche are built up underground, capturing carbon from our atmosphere in an underground lock-box and reducing its potential escape into the atmosphere. This transfer of carbon from air to leaf to root to fungal partner and into caliche deposits is one of nature's ways to sequester carbon and hold it in natural storage underground.

All that we need to do to keep the carbon safely stored in the underground caliche is to allow the desert plants to keep living and sequestering carbon. It is thought that some of the vast caliche beds in our southwest desert soils may have been formed over thousands of years. Some of our longest-lived desert plants may have germinated right after the last ice age receded 10,000 years ago and are still growing today, capturing carbon underground over millennia (King Clone, a cloning creosote in Johnson Valley, estimated to be almost 11,000 years old, is one example).

Glomalin: Hiding Place for a Third of the World's Carbon

There is still more to this incredible story. Every hyphae (the thread-like "root" of a fungus) of the most common kind of root-partnering fungus in our desert (arbuscular mycorrhizal fungi) is coated with a waterproof sealant called "glomalin." This coating of sticky protein around each fungal thread prevents leakage when water and nutrients move through the hyphae. Glomalin is made directly from carbon gathered by its plant partner, so again atmospheric carbon is being moved from air into soil for long-term storage.

Remarkably, each hyphae's *coating of glomalin* persists in the soil after the fungal thread dies (when the growing root section matures and barks over). For another 30 to 100 years, the sloughed off glomalin glues soil grains together in packets containing carbon, nitrogen, phosphorus, and other valuable nutrients. This waxy coating of glomalin helps to form tiny soil clumps called "aggregates," and prevents nutrients vital to plant growth from being leached out of the soil. Glomalin will continue to hold carbon underground long after death of the hyphae that produced it – helping us in our quest to reduce greenhouse gases in our atmosphere.

This entire kingdom of incredible creatures works twenty-four hours a day, year after year, without any input from humans, unseen by us and mostly unappreciated by us. These life-forms in mutual partnership will continue to glue our soils together and capture our excess carbon in perpetuity . . . *unless we remove the plants and disturb the soil that makes all this magic work.*

We are now faced with decisions about whether to allow thousands of acres of functioning desert systems to be sacrificed for solar energy developments – on the premise of reducing carbon dioxide levels in the atmosphere. Scientists estimate that after the removal of desert vegetation and disturbance of the top soil, the pre-existing plant community requires about fifty to three hundred years before it returns to pre-disturbance cover and biomass, but requires about three thousand years before the disturbed area returns to the function it had before disturbance. The ancient nature of both the plants and the living soil crust organisms make this a credible prediction.

We once thought that carbon was held in meaningful amounts only in ocean creatures and forest trees and humus. Now we know that soils, including desert soils, are a significant storage facility for carbon. Without these biological partnerships, significant amounts of carbon would be released from the soil back into the atmosphere, and no additional carbon would be sequestered. Not only are desert soils holding carbon in caliche deposits, they also store vast amounts of organic carbon in soil organisms, including root-partnering fungi with their coating of glomalin. The importance of glomalin's carbon storage capacity is stated by a USDA scientist this way:

"As carbon gets assigned a dollar value in a carbon commodity market, it may give literal meaning to the expression that good soil is black gold. And glomalin could be viewed as its 'golden seal.' "
– Don Comis, USDA Agricultural Research Service, (2002) in *"Hiding Place for a Third of the World's Stored Soil Carbon"*

Wherever possible, we need to steer developments, especially large-scale projects like utility-scale solar facilities, to pre-disturbed, severely impacted soils or pre-developed sites such as parking lots and roofs. Then, we get the best of all options: progress with preservation.

Leave these microscopic soil magicians alone to do their work. The desert's underground life-support systems can only function if the aboveground systems (desert plants and living soil crusts) are kept alive and intact. We must be their voice and their champion in protecting them – so they can silently continue to protect our potential for carbon sequestration, our air quality, our health, our economy, our landscape, our ecotourism, our property values, and our quality of life. To ensure our own sustainable future, we need to keep our desert soils intact and alive . . . it benefits everyone. The choice is ours.

With a Master's Degree in biology, Robin Kobaly had a twenty-year career as a botanist with the BLM, and continues to work in botany, wildlife biology, and natural history interpretation. She is currently executive director of the SummerTree Institute, a 501(c)3 nonprofit corporation dedicated to providing responsible viewpoints toward our environment, our place in it, and our responsibility to it.

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

B10-28
(for entire attachment)

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

Terrestrial Carbon Sequestration in National Parks

Values for the Conterminous United States

Natural Resource Report NPS/NRSS/EQD/NRR—2014/880

Comment Set B10 – Morongo Basin Conservation Association (cont.)

ON THE COVER
Great Smoky Mountains National Park. Photograph courtesy of Robert Crootof, NPS Photo.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Terrestrial Carbon Sequestration in National Parks

Values for the Conterminous United States

Natural Resource Report NPS/NRSS/EQD/NRR—2014/880

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November 2014

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
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Comment Set B10 – Morongo Basin Conservation Association (cont.)

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Report Series is used to disseminate high-priority, current natural resource management information with managerial application. The series targets a general, diverse audience, and may contain NPS policy considerations or address sensitive issues of management applicability.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

This report received formal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data, and whose background and expertise put them on par technically and scientifically with the authors of the information.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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Please cite this publication as:

Richardson, L., C. Huber, Z. Zhu, and L. Koontz. 2014. Terrestrial carbon sequestration in national parks: Values for the conterminous United States. Natural Resource Report NPS/NRSS/EQD/NRR—2014/880. National Park Service, Fort Collins, Colorado.

NPS 999/127137, November 2014

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Contents

Figures and Tables

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Executive Summary

Lands managed by the National Park Service (NPS) provide a wide range of beneficial services to the American public. This study quantifies the ecosystem service value of carbon sequestration in terrestrial ecosystems within NPS units in the conterminous United States for which data were available. Combining annual net carbon balance data with spatially explicit NPS land unit boundaries and social cost of carbon estimates, this study calculates the net metric tons of carbon dioxide sequestered annually by park unit under baseline conditions, as well as the associated economic value to society. Results show that, in aggregate, NPS lands in the conterminous United States are a net carbon sink, sequestering more than 14.8 million metric tons of carbon dioxide annually. The associated societal value of this service is estimated at approximately $582.5 million per year. While this analysis provides a broad overview of the annual value of carbon sequestration on NPS lands averaged over a five year baseline period, it should be noted that carbon fluxes fluctuate from year to year, and there can be considerable variation in net carbon balance and its associated value within a given park unit. Future research could look in-depth at the spatial heterogeneity of carbon flux within specific NPS land units.

Acknowledgments

The authors would like to acknowledge Bruce Peacock, Bret Meldrum, Tim Larson, and Bob Waltermire, who contributed greatly to the completion of this report.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Introduction

Lands managed by the National Park Service (NPS) provide a wide range of economic and social benefits. These lands serve as unique recreational and tourist destinations, generating considerable economic activity within park gateway communities (Cullinane Thomas et al., 2014). In addition to this direct use, ecosystems protected by NPS lands support a number of beneficial services depended on by the broader American public, such as water purification, habitat for endangered species, and nutrient cycling. Assessing the economic value derived from these "ecosystem services" contributes to an understanding of the role that NPS plays as a steward of our Nation's natural capital and the broad contribution these lands make to societal well-being. Recent guidance from a report put forward by the President's Council of Advisors on Science and Technology highlights the importance for Federal agencies to incorporate this type of information into planning and management decisions (PCAST, 2011).

In a collaborative effort between the NPS and the U.S. Geological Survey (USGS), this study quantifies the economic value of one specific ecosystem service provided by NPS lands – the benefits of climate regulation resulting from terrestrial carbon sequestration. While some land units within the National Park System are carbon sources, meaning they release more carbon dioxide (CO_2) into the atmosphere than they absorb and store in vegetation and soils, many are carbon sinks, sequestering more CO_2 than they emit. For any given land unit, the carbon balance depends on various factors, including land cover type (e.g., barren compared to forested), soil type, land uses, wildfire and other disturbances, and hydrologic and climatic conditions. The remainder of this report summarizes the net CO_2 flux within NPS units where data were available, and calculates the associated economic value of this service to society.

Methods and Data Sources

Valuing Ecosystem Services

Monetizing the economic value of an ecosystem service first requires connecting an ecological function to a clearly defined end product that is valued by people (National Research Council, 2004). NPS lands comprise various ecosystems (e.g., forests, grasslands) that often sequester more CO_2 in their soil and vegetation than they release into the atmosphere. This ecological process leads to climate regulation, an ecosystem service that contributes to many aspects of human well-being (Millennium Ecosystem Assessment, 2005). Tying an appropriate measure of economic value to the quantity of CO_2 sequestered at a given point in time on a given land unit reveals the societal benefits provided by this process. Therefore, two key pieces of information are required to quantify the value of carbon sequestration on NPS lands: 1) The annual rate of carbon storage within each park unit (net carbon balance) and 2) The economic value associated with the net carbon balance. The data sources used in this analysis are described below.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Quantifying Net Carbon Balance on NPS Lands

The USGS has conducted a national carbon sequestration assessment as required by Congress under the Energy Independence and Security Act (EISA) of 2007. The main objectives of this assessment are to estimate the amount of carbon stored in ecosystems, the capacity of the ecosystems to sequester carbon, and the effects of natural and anthropogenic processes that control ecosystem carbon balances. The USGS has completed this assessment for the conterminous United States (see Zhu et al., 2011; Zhu and Reed, 2012; Zhu and Reed, 2014) and is nearing completion for Alaska and Hawaii. This research uses a combination of models, statistical methods, remote sensing data, and field input data to estimate carbon stock (how much carbon is stored for a given land unit), net carbon balance (either sink or source as the rate of annual change in carbon stock), and various emissions, such as that of wildfires. The methodology framework and constraints are described in detail in Zhu et al. (2010). The majority of the data produced in the USGS national carbon assessment are presented as digital maps (250 meter spatial resolution) derived over a baseline (2001-2005) and projected (through 2050) time dimension for major terrestrial ecosystems, such as forests, agricultural lands, wetlands, and grasslands.

To better understand the value of carbon sequestration on lands managed by the NPS, this effort utilizes the above-discussed baseline data on modeled annual net carbon balance produced in the USGS carbon sequestration assessment for the conterminous United States. By overlaying a spatial map of net ecosystem carbon balance averaged over the five year baseline period (2001-2005) with a spatial map of NPS land unit boundaries, we are able to estimate the average annual net carbon balance on 293 land units within the National Park System. It should be noted that net carbon balance can vary in both magnitude and sign over time (positive or negative). Data were not available for land units that include primarily human-made features, such as the Lincoln Memorial or the Vietnam Veterans Memorial, or those outside of the conterminous United States, such as the National Park of American Samoa or Hawai'i Volcanoes National Park. Annual net carbon balance is multiplied by 3.667 to convert to metric tons of carbon dioxide (CO_2) per year.

Applying the Social Cost of Carbon

Over time, the accumulation of CO_2 and other greenhouse gases in the atmosphere can affect sea level, temperature, and precipitation (IPCC, 2013). These climate changing effects can impact society in numerous ways (Figure 1). NPS lands play an important role in mitigating climate change impacts by protecting healthy ecosystems that function as a carbon sink. This net carbon uptake benefits society by helping to reduce overall atmospheric concentrations of CO_2 and the associated economic damages. Understanding the economic benefit of these avoided impacts contributes to a more comprehensive understanding of the overall value of NPS lands.

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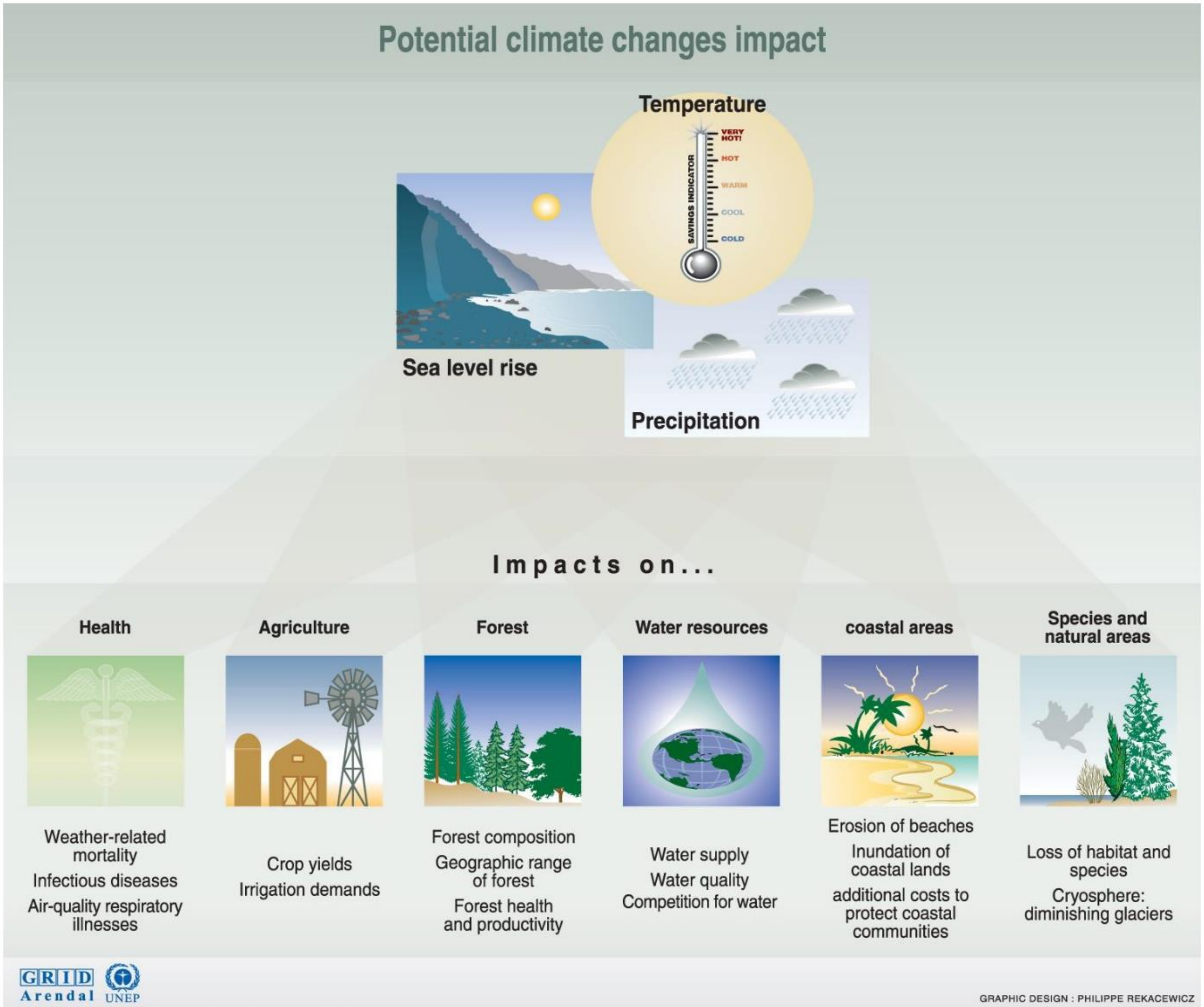

Source: United States environmental protection agency (EPA).

Figure 1. The potential impacts of climate change.

Atmospheric CO_2 concentrations from current emissions will persist far into the future (IPCC, 2013), meaning the release of one metric ton of CO_2 has damaging effects to society that extend through time. Individuals often place a higher value on avoided damages that occur closer to the present than impacts that occur further into the future. Therefore, the economic value of cumulative damages that occur in future years must be discounted to obtain their present value. The economic value associated with a metric ton of CO_2 released into the atmosphere is reflected by the "social cost of carbon" (SCC) estimates published by a U.S. government interagency working group (Interagency Working Group on Social Cost of Carbon, 2013). Based on three integrated assessment models (IAMs), the SCC estimates capture future changes in the value of agricultural productivity, human health, damages from increased flooding, and the value of certain ecosystem services due to climate change. The interagency group selected four SCC

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estimates recommended for use in regulatory analyses; three of these estimates are based on the average SCC from the three IAMs, at discount rates of 2.5%, 3% and 5%, while the fourth represents the 95th percentile SCC estimate across the three IAMs at a 3% discount rate, and is included to represent higher than anticipated damages from climate change further out in the tails of the SCC distribution (Interagency Working Group on Social Cost of Carbon, 2013). The interagency group recommends including all four estimates in regulatory impact analyses.

In this study, we apply SCC estimates per one metric ton of carbon dioxide emitted in the year 2013, and inflate these values to 2013 dollars using the Consumer Price Index, as they were originally reported in 2007 dollars. This results in a SCC average value of $39.32 per metric ton of CO_2 based on the central 3% discount rate. To demonstrate sensitivity to the discount rate, the majority of the results are also presented using average SCC estimates of $61.79 and $12.36 per metric ton of CO_2, based on discount rates of 2.5% and 5%, respectively. The fourth 95th percentile SCC estimate of $113.47 (3% discount rate) is also included in this analysis, and reflects higher than anticipated damages from climate change. It should be noted that the SCC estimates do not reflect all potential damages from climate change, and may be viewed as a lower bound of the full benefits associated with reduced CO_2 emissions (Howard, 2014). See Appendix 1 for more information on the SCC estimates used in this analysis.

Results

Based on available data, results of this analysis demonstrate that collectively, NPS lands in the conterminous United States are a net carbon sink. As a whole, approximately 14.8 million metric tons of CO_2 are sequestered annually on average under baseline conditions, and this has an associated value of approximately $582.5 million based on a 3% discount rate in 2013. Results by park unit are presented in Table A in Appendix 2. Of the 293 park units with available data, 78% were found to function as net carbon sinks on average over the five year baseline period. These lands sequester more than 15.7 million metric tons of CO_2 annually, valued at $618.6 million with a 3% discount rate. Alternatively, the remaining 22% of land units that function as carbon sources were found to emit 918.2 thousand metric tons of CO_2 annually, at a cost to society of $36.1 million.

Figure 2 highlights the twenty park units within the conterminous United States that were estimated to have the largest societal value associated with carbon sequestration. Great Smoky Mountains National Park was found to sequester the largest amount of CO_2, valued at nearly $64.4 million in 2013 with a 3% discount rate. At first glance, it may be surprising that park units composed largely of a desert environment, such as Mojave National Preserve and Death Valley National Park, ranked among the top twenty park units in terms of carbon sequestration value during the baseline period. However, recent studies provide evidence to suggest that desert

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ecosystems have the ability to store much more carbon dioxide than previously thought (Evans et al., 2014; Wohlfahrt et al., 2008). In addition, the results in Figure 2 are influenced by the total size of the park unit. Table B in Appendix 2 presents a normalized, per hectare net quantity of CO_2 stored or released by park unit. In general, these results show that park units with a predominantly desert environment have relatively low sequestration per hectare compared to some of the more forested parks.

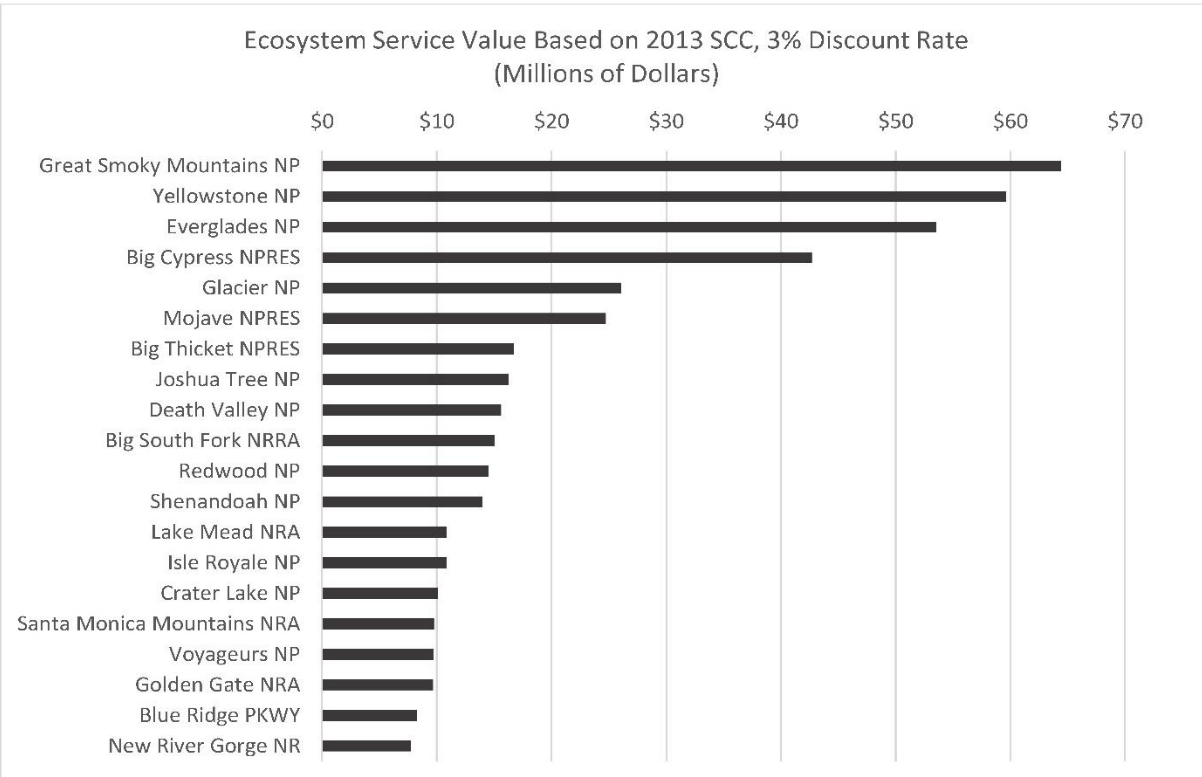

Figure 2. Top 20 NPS Units by Carbon Sequestration Value.

Park units such as Mount Rainier National Park and North Cascades National Park were found to be net carbon sources (Table A in Appendix 2), which could be due to factors such as major wildfires, insect outbreaks, and permanent ice and snow occurring during the years of the assessment data. These results are consistent with previous research which has shown that certain regions of the United States tend to function as carbon sinks, whereas others tend to function as carbon sources. For instance, Potter et al. (2007) found that terrestrial ecosystems in the southern Appalachian Mountains, the western Gulf Coast states, the northern Rocky Mountains, and the Sierra Nevada Mountains show consistently high carbon sink fluxes on an annual basis, whereas terrestrial ecosystems in regions such as the Pacific Northwest consistently show periodically high carbon source fluxes on an annual basis. While the estimates presented in Figure 2 and

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Table A in Appendix 2 reflect an aggregation across an entire NPS unit, considerable variability in net carbon balance within a given unit likely exists. In addition, the analysis is constrained to five years of baseline data. If conditions change over time—for example, if a given park unit experiences less wildfires than usual and the vegetation there begins to recover—that park unit could potentially transition from a net source to a net sink.

Table 1 shows the quantity of CO_2 uptake and the associated carbon sequestration value for all park units within each NPS region. Collectively, NPS units within the Southeast region were found to sequester the largest amount of CO_2, with more than 5.3 million metric tons of CO_2 sequestered annually under baseline conditions and an associated value of $210.2 million with a 3% discount rate in 2013. Data were not available for park units outside of the conterminous United States, such as those in Alaska and Hawaii.

Table 1. Average Annual Net Ecosystem Balance (metric tons of CO_2) and Associated Net Economic Value, Summarized by NPS Region.

Region	Annual Metric Tons of CO_2	Value by Discount Rate ($ Millions)			
		2.5%	3%	5%	3% (95th)*
Intermountain	3,482,323	$215.2	$136.9	$43.0	$395.1
Midwest	1,527,841	$94.4	$60.1	$18.9	$173.4
National Capital	87,509	$5.4	$3.4	$1.1	$9.9
Northeast	1,139,938	$70.4	$44.8	$14.1	$129.3
Pacific West	3,230,205	$199.6	$127.0	$39.9	$366.5
Southeast	5,345,302	$330.3	$210.2	$66.1	$606.5
Total	**14,813,118**	**$915.3**	**$582.5**	**$183.1**	**$1,680.8**

*The 3% (95th) value accounts for higher than anticipated damages from climate change.

Conclusions

Lands within the National Park System play an important role in reducing climate related damages by sequestering CO_2. This report summarizes the baseline net carbon balance and associated 2013 societal value supported by NPS lands in the conterminous United States for which data were available. Comparable data on net carbon balance for land units outside of the conterminous United States, such as those in Alaska and Hawaii, were not available at the time of this analysis, but will be available in the future. The results of this study demonstrate that, as a whole, NPS lands within the conterminous United States serve as a large net sink of CO_2, sequestering 14.8 million metric tons of CO_2 in terrestrial ecosystems in a single year, which is estimated to be valued at $582.5 million with a 3% discount rate. In the absence of NPS

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designation, some of this value would likely still be realized, but it is not possible to assess the alternative land use scenario and carbon sequestration potential of these lands with any certainty. While this analysis has provided a broad overview of the value of carbon sequestration on NPS lands under current conditions, it should be noted that net carbon balance can fluctuate from year to year, and there can be considerable variation in this metric within a given park unit. Future research could look in-depth at the spatial heterogeneity of carbon flux within specific NPS land units, but would require significant research investment.

The USGS national carbon sequestration assessment was used in this effort to demonstrate the annual ecosystem service value of carbon sequestration on NPS lands under current conditions. The USGS assessment also projects net carbon balances through the year 2050, based on numerous greenhouse-gas-emissions scenarios documented in a report published by the Intergovernmental Panel on Climate Change (Nakicenovic et al., 2000). While these projections are associated with greater uncertainty than baseline conditions, they could be used to conduct a similar analysis of the forecasted ecosystem service value of carbon sequestration on NPS lands. The USGS national assessment is best used to answer broad-scale questions, such as how much carbon is stored in different ecosystems across the entire United States, or how much does the carbon storage change over space and time. However, management actions have the potential to greatly impact the amount of CO_2 released or sequestered on the nation's public lands (Olander et al., 2012). For example, restoration activities focused on returning the water flows of the central Everglades to a more natural state is expected to greatly increase the ecosystem service value of carbon sequestration in Everglades National Park (Richardson et al., 2014). The USGS is conducting more targeted studies in support of land management planning by the Department of the Interior. These studies focus on evaluation of carbon sequestration potential and the effect of land management practices at a management-unit scale. For example, the USGS, in cooperation with the University of Maryland and Yellowstone National Park, is supporting a study that examines differences in land management and the associated impact on carbon stored in ecosystems within the Greater Yellowstone Ecosystem. This type of information could be used to evaluate the effect on societal well-being from changes in park management and carbon sequestration potential.

While this effort has focused on the value of carbon sequestration on NPS lands, these lands provide a wide range of additional ecosystem services that provide considerable value to the American public. There is ample opportunity for future research to continue to explore the value of ecosystem services provided by lands within the National Park System.

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Appendix 1

The social cost of carbon (SCC) estimates used in this analysis reflect the damages caused by the climate changing effects over the lifecycle of one metric ton of CO_2 emitted into the earth's atmosphere, and were designed to be used in regulatory analyses to analyze the benefits of projects that reduce CO_2 emissions (Interagency Working Group on Social Cost of Carbon, 2013). The SCC estimates are based on three complex integrated assessment models, which were parameterized using projected future socioeconomic conditions as well as expected atmospheric accumulations of CO_2. These predicted damages over the lifecycle of an additional ton of CO_2 include, but are not limited to, the change in value of net agricultural productivity, human health, damages from increased flooding, and the value of certain ecosystem services. These SCC estimates do have limitations, particularly with respect to incomplete treatment of both non-catastrophic and catastrophic damages from climate change (Interagency Working Group on Social Cost of Carbon, 2010), and the omission of other potential climate impacts and effects (Howard, 2014). Thus, the SCC may be viewed as a lower bound estimate of the full benefits associated with reduced CO_2 emissions.

The SCC published by the working group represents the societal damages caused by the climate changing effects of emitting an additional metric ton of CO_2 into the earth's atmosphere. Conversely, as is the case with many of the NPS units in this study, the SCC estimates represent the societal benefits realized from an additional metric ton of CO_2 removed from the atmosphere. It is important to highlight the fact that these SCC estimates are time and discount rate specific. For example, a metric ton of CO_2 emitted in 2013 has a different SCC value compared to a metric ton of CO_2 emitted in 2014. Additionally, a metric ton of CO_2 emitted in 2013 will have a different SCC estimate depending on whether a 3% or 5% discount rate is used.

This analysis is based on SCC estimates specific for the year 2013. Inflating these estimates to 2013 dollars from 2007 dollars using the Consumer Price Index results in a SCC of $39.32 per metric ton of CO_2, which coincides with a central discount rate of 3%. This value per metric ton of CO_2 was calculated as the average expected damages across the working group's three integrated assessment models, which included the 3% discount rate as a model parameter. This 3% discount rate reflects the real rate of return on long-term government debt, and is recommended by the Office of Management and Budget for use in regulatory analyses to reflect the 'social rate of time preference,' that is, the rate at which society discounts future consumption flows to their present value (OMB, 2003). Also included in this present analysis, for sensitivity purposes, are 2013 SCC estimates of $61.79 and $12.36 per metric ton of CO_2, coinciding with model parameter discount rates of 2.5% and 5%. A fourth SCC estimate of $113.47 is included in this analysis, also for sensitivity purposes, to account for higher than anticipated damages from climate change. This fourth SCC estimate coincides with a discount rate of 3%, but was calculated at the 95th percentile of the damages output distribution from the working group's three integrated assessment models, as opposed to the average output for the

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previously mentioned SCC estimates. The 95th percentile SCC estimate does not account for additional sources of damages beyond what is included in the three average SCC estimates, but instead accounts for larger, yet less-likely damages associated with a higher intensity of effects from climate change.

The discount rate and time specific nature of these SCC estimates cannot be overstated. SCC estimates for 2013 are used in this analysis, along with coinciding discount rates; therefore, the results presented in this analysis should be interpreted as the baseline value of CO_2 sequestered or released by NPS units in 2013, and cannot be used to estimate future economic values or the net present value of carbon sequestration on any given NPS unit. This is because the working group's SCC estimates increase nonlinearly over time due to the nature of the lifecycle and projected future accumulations of CO_2 in the earth's atmosphere. This means that future emissions of CO_2 are more damaging due to the higher projected accumulation of CO_2 stock in the atmosphere relative to years prior. One implication of this is that the value of carbon sequestration on NPS lands is expected to increase over time.

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Appendix 2

Table A. Average Annual Net Ecosystem Balance (metric tons of CO_2) and Associated Net Economic Value by NPS Unit*

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Abraham Lincoln Birthplace NHS	902	$55.7	$35.5	$11.1	$102.4
Acadia NP	105,540	$6,521.3	$4,149.8	$1,304.5	$11,975.6
Adams NHP	-11	-$0.7	-$0.4	-$0.1	-$1.2
African Burial Ground NM	-	-	-	-	-
Agate Fossil Beds NM	1,287	$79.5	$50.6	$15.9	$146.0
Alagnak WR	-	-	-	-	-
Alibates Flint Quarries NM	660	$40.8	$26.0	$8.2	$74.9
Allegheny Portage Railroad NHS	2,200	$136.0	$86.5	$27.2	$249.7
American Memorial P	-	-	-	-	-
Amistad NRA	9,259	$572.1	$364.1	$114.4	$1,050.6
Andersonville NHS	1,863	$115.1	$73.2	$23.0	$211.4
Andrew Johnson NHS	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Aniakchak NM&PRES	-	-	-	-	-
Antietam NB	2,380	$147.1	$93.6	$29.4	$270.0
Apostle Islands NL	70,637	$4,364.7	$2,777.5	$873.1	$8,015.2
Appomattox Court House NHP	3,861	$238.6	$151.8	$47.7	$438.1
Arches NP	-7,976	-$492.8	-$313.6	-$98.6	-$905.0
Arkansas Post NMEM	920	$56.9	$36.2	$11.4	$104.4
Arlington House, The Robert E. Lee Memorial NMEM	66	$4.1	$2.6	$0.8	$7.5
Assateague Island NS	20,513	$1,267.5	$806.6	$253.5	$2,327.6
Aztec Ruins NM	150	$9.3	$5.9	$1.9	$17.1
Badlands NP	66,343	$4,099.4	$2,608.6	$820.0	$7,528.0
Bandelier NM	23,707	$1,464.9	$932.2	$293.0	$2,690.1
Bent's Old Fort NHS	367	$22.7	$14.4	$4.5	$41.6
Bering Land Bridge NPRES	-	-	-	-	-
Big Bend NP	138,576	$8,562.6	$5,448.8	$1,712.8	$15,724.2
Big Cypress NPRES	1,085,905	$67,098.1	$42,697.8	$13,421.8	$123,217.6
Big Hole NB	1,272	$78.6	$50.0	$15.7	$144.4
Big South Fork NRRA	383,209	$23,678.5	$15,067.8	$4,736.5	$43,482.7
Big Thicket NPRES	424,950	$26,257.7	$16,709.0	$5,252.4	$48,219.1
Bighorn Canyon NRA	56,728	$3,505.3	$2,230.6	$701.2	$6,437.0
Biscayne NP	9,736	$601.6	$382.8	$120.3	$1,104.7
Black Canyon of the Gunnison NP	9,930	$613.6	$390.5	$122.7	$1,126.8
Blue Ridge PKWY	210,372	$12,998.9	$8,271.8	$2,600.2	$23,870.9

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Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Bluestone NSR	12,721	$786.0	$500.2	$157.2	$1,443.4
Booker T. Washington NM	726	$44.9	$28.5	$9.0	$82.4
Boston African American NHS	-	-	-	-	-
Boston Harbor Islands NRA	1,459	$90.2	$57.4	$18.0	$165.6
Boston NHP	-	-	-	-	-
Brices Cross Roads NBS	-	-	-	-	-
Brown v. Board of Education NHS	-	-	-	-	-
Bryce Canyon NP	9,395	$580.5	$369.4	$116.1	$1,066.0
Buck Island Reef NM	-	-	-	-	-
Buffalo NR	152,368	$9,414.8	$5,991.1	$1,883.3	$17,289.1
Cabrillo NM	-	-	-	-	-
Canaveral NS	48,393	$2,990.2	$1,902.8	$598.1	$5,491.2
Cane River Creole NHP	59	$3.6	$2.3	$0.7	$6.7
Canyon de Chelly NM	-1,023	-$63.2	-$40.2	-$12.6	-$116.1
Canyonlands NP	-2,809	-$173.6	-$110.4	-$34.7	-$318.7
Cape Cod NS	37,381	$2,309.8	$1,469.8	$462.0	$4,241.7
Cape Hatteras NS	20,891	$1,290.8	$821.4	$258.2	$2,370.5
Cape Krusenstern NM	-	-	-	-	-
Cape Lookout NS	16,333	$1,009.2	$642.2	$201.9	$1,853.3
Capitol Reef NP	33,384	$2,062.8	$1,312.7	$412.6	$3,788.1
Capulin Volcano NM	458	$28.3	$18.0	$5.7	$52.0
Carl Sandburg Home NHS	660	$40.8	$26.0	$8.2	$74.9
Carlsbad Caverns NP	8,896	$549.7	$349.8	$110.0	$1,009.4
Carter G. Woodson NHS	-	-	-	-	-
Casa Grande Ruins NM	-44	-$2.7	-$1.7	-$0.5	-$5.0
Castillo de San Marcos NM	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Castle Clinton NM	-	-	-	-	-
Catoctin Mountain P	13,590	$839.7	$534.4	$168.0	$1,542.0
Cedar Breaks NM	-851	-$52.6	-$33.5	-$10.5	-$96.5
Cedar Creek & Belle Grove HP	3,865	$238.8	$152.0	$47.8	$438.6
César E. Chávez NM	154	$9.5	$6.1	$1.9	$17.5
Chaco Culture NHP	11,078	$684.5	$435.6	$136.9	$1,257.0
Chamizal NMEM	-18	-$1.1	-$0.7	-$0.2	-$2.1
Channel Islands NP	157,754	$9,747.6	$6,202.9	$1,949.8	$17,900.4
Charles Pinckney NHS	-7	-$0.5	-$0.3	-$0.1	-$0.8
Charles Young Buffalo Soldiers NM	-7	-$0.5	-$0.3	-$0.1	-$0.8
Chattahoochee River NRA	-17,525	-$1,082.8	-$689.1	-$216.6	-$1,988.5
Chesapeake & Ohio Canal NHP	35,871	$2,216.4	$1,410.4	$443.4	$4,070.2

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Chickamauga and Chattanooga NMP	23,417	$1,447.0	$920.8	$289.4	$2,657.2
Chickasaw NRA	7,712	$476.5	$303.2	$95.3	$875.0
Chiricahua NM	-1,584	-$97.9	-$62.3	-$19.6	-$179.8
Christiansted NHS	-	-	-	-	-
City of Rocks NRES	95	$5.9	$3.7	$1.2	$10.8
Clara Barton NHS	-	-	-	-	-
Colonial NHP	8,584	$530.4	$337.5	$106.1	$974.1
Colorado NM	3,641	$225.0	$143.2	$45.0	$413.2
Congaree NP	88,661	$5,478.3	$3,486.1	$1,095.8	$10,060.3
Coronado NMEM	458	$28.3	$18.0	$5.7	$52.0
Cowpens NB	2,560	$158.2	$100.6	$31.6	$290.4
Crater Lake NP	256,881	$15,872.7	$10,100.5	$3,175.0	$29,148.3
Craters of the Moon NM&PRES	-11,716	-$723.9	-$460.7	-$144.8	-$1,329.4
Cumberland Gap NHP	94,488	$5,838.4	$3,715.3	$1,167.9	$10,721.5
Cumberland Island NS	78,866	$4,873.1	$3,101.0	$974.8	$8,948.9
Curecanti NRA	9,839	$607.9	$386.9	$121.6	$1,116.4
Cuyahoga Valley NP	45,045	$2,783.4	$1,771.2	$556.8	$5,111.3
Dayton Aviation Heritage NHP	-117	-$7.3	-$4.6	-$1.5	-$13.3
De Soto NMEM	-	-	-	-	-
Death Valley NP	396,421	$24,494.9	$15,587.3	$4,899.8	$44,981.9
Delaware Water Gap NRA	162,620	$10,048.3	$6,394.2	$2,010.0	$18,452.5
Denali NP&PRES	-	-	-	-	-
Devils Postpile NM	125	$7.7	$4.9	$1.5	$14.1
Devils Tower NM	561	$34.7	$22.1	$6.9	$63.7
Dinosaur NM	-3,183	-$196.7	-$125.2	-$39.3	-$361.2
Dry Tortugas NP	-	-	-	-	-
Edgar Allan Poe NHS	-	-	-	-	-
Effigy Mounds NM	3,245	$200.5	$127.6	$40.1	$368.2
Eisenhower NHS	583	$36.0	$22.9	$7.2	$66.2
El Malpais NM	4,206	$259.9	$165.4	$52.0	$477.3
El Morro NM	829	$51.2	$32.6	$10.2	$94.0
Eleanor Roosevelt NHS	-180	-$11.1	-$7.1	-$2.2	-$20.4
Eugene O'Neill NHS	37	$2.3	$1.4	$0.5	$4.2
Everglades NP	1,361,447	$84,123.8	$53,532.1	$16,827.5	$154,483.4
Federal Hall NMEM	-	-	-	-	-
Fire Island NS	1,701	$105.1	$66.9	$21.0	$193.1
First Ladies NHS	-	-	-	-	-
First State NM	2,486	$153.6	$97.8	$30.7	$282.1

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Flight 93 NMEM	2,959	$182.9	$116.4	$36.6	$335.8
Florissant Fossil Beds NM	5,299	$327.4	$208.3	$65.5	$601.3
Ford's Theatre NHS	-	-	-	-	-
Fort Bowie NHS	-326	-$20.2	-$12.8	-$4.0	-$37.0
Fort Caroline NMEM	-7	-$0.5	-$0.3	-$0.1	-$0.8
Fort Davis NHS	220	$13.6	$8.7	$2.7	$25.0
Fort Donelson NB	2,890	$178.5	$113.6	$35.7	$327.9
Fort Frederica NM	-59	-$3.6	-$2.3	-$0.7	-$6.7
Fort Laramie NHS	304	$18.8	$12.0	$3.8	$34.5
Fort Larned NHS	293	$18.1	$11.5	$3.6	$33.3
Fort Matanzas NM	488	$30.1	$19.2	$6.0	$55.3
Fort McHenry NM&SHRINE	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Fort Necessity NB	1,536	$94.9	$60.4	$19.0	$174.3
Fort Point NHS	-	-	-	-	-
Fort Pulaski NM	-565	-$34.9	-$22.2	-$7.0	-$64.1
Fort Raleigh NHS	1,049	$64.8	$41.2	$13.0	$119.0
Fort Scott NHS	-44	-$2.7	-$1.7	-$0.5	-$5.0
Fort Smith NHS	-22	-$1.4	-$0.9	-$0.3	-$2.5
Fort Stanwix NM	-29	-$1.8	-$1.2	-$0.4	-$3.3
Fort Sumter NM	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Fort Union NM	433	$26.7	$17.0	$5.3	$49.1
Fort Union Trading Post NHS	374	$23.1	$14.7	$4.6	$42.4
Fort Vancouver NHS	154	$9.5	$6.1	$1.9	$17.5
Fort Washington P	440	$27.2	$17.3	$5.4	$49.9
Fossil Butte NM	293	$18.1	$11.5	$3.6	$33.3
Franklin Delano Roosevelt MEM	-	-	-	-	-
Frederick Douglass NHS	-	-	-	-	-
Frederick Law Olmsted NHS	-	-	-	-	-
Fredericksburg & Spotsylvania NMP	24,730	$1,528.1	$972.4	$305.7	$2,806.1
Friendship Hill NHS	1,753	$108.3	$68.9	$21.7	$198.9
Gates of the Arctic NP&PRES	-	-	-	-	-
Gateway NRA	-473	-$29.2	-$18.6	-$5.8	-$53.7
Gauley River NRA	34,774	$2,148.7	$1,367.3	$429.8	$3,945.8
General Grant NMEM	-	-	-	-	-
George Rogers Clark NHP	-11	-$0.7	-$0.4	-$0.1	-$1.2
George Washington Birthplace NM	693	$42.8	$27.3	$8.6	$78.6
George Washington Carver NM	158	$9.7	$6.2	$1.9	$17.9
George Washington MEM PKWY	-5,523	-$341.2	-$217.1	-$68.3	-$626.6

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Gettysburg NMP	7,800	$481.9	$306.7	$96.4	$885.0
Gila Cliff Dwellings NM	462	$28.5	$18.2	$5.7	$52.4
Glacier Bay NP&PRES	-	-	-	-	-
Glacier NP	662,704	$40,948.5	$26,057.5	$8,191.0	$75,197.0
Glen Canyon NRA	123,072	$7,604.6	$4,839.2	$1,521.2	$13,965.0
Golden Gate NRA	245,425	$15,164.8	$9,650.1	$3,033.5	$27,848.4
Golden Spike NHS	268	$16.5	$10.5	$3.3	$30.4
Governors Island NM	-	-	-	-	-
Grand Canyon NP	-70,443	-$4,352.7	-$2,769.8	-$870.7	-$7,993.2
Grand Portage NM	1,595	$98.6	$62.7	$19.7	$181.0
Grand Teton NP	156,753	$9,685.8	$6,163.5	$1,937.5	$17,786.8
Grant-Kohrs Ranch NHS	796	$49.2	$31.3	$9.8	$90.3
Great Basin NP	75,702	$4,677.6	$2,976.6	$935.7	$8,589.9
Great Sand Dunes NP&PRES	68,085	$4,207.0	$2,677.1	$841.5	$7,725.6
Great Smoky Mountains NP	1,637,935	$101,208.0	$64,403.6	$20,244.9	$185,856.5
Greenbelt P	-5,702	-$352.3	-$224.2	-$70.5	-$647.0
Guadalupe Mountains NP	40,836	$2,523.2	$1,605.7	$504.7	$4,633.6
Guilford Courthouse NMP	-231	-$14.3	-$9.1	-$2.9	-$26.2
Gulf Islands NS	14,254	$880.7	$560.5	$176.2	$1,617.4
Hagerman Fossil Beds NM	3,330	$205.7	$130.9	$41.2	$377.8
Haleakala NP	-	-	-	-	-
Hamilton Grange NMEM	-	-	-	-	-
Hampton NHS	33	$2.0	$1.3	$0.4	$3.7
Harpers Ferry NHP	7,235	$447.1	$284.5	$89.4	$821.0
Harry S Truman NHS	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Hawai'i Volcanoes NP	-	-	-	-	-
Herbert Hoover NHS	18	$1.1	$0.7	$0.2	$2.1
Hohokam Pima NM	-249	-$15.4	-$9.8	-$3.1	-$28.3
Home of Franklin D Roosevelt NHS	-1,470	-$90.9	-$57.8	-$18.2	-$166.9
Homestead NM	73	$4.5	$2.9	$0.9	$8.3
Hopewell Culture NHP	1,415	$87.5	$55.7	$17.5	$160.6
Hopewell Furnace NHS	1,705	$105.4	$67.0	$21.1	$193.5
Horseshoe Bend NMP	6,168	$381.1	$242.5	$76.2	$699.9
Hot Springs NP	5,310	$328.1	$208.8	$65.6	$602.5
Hovenweep NM	70	$4.3	$2.7	$0.9	$7.9
Hubbell Trading Post NHS	59	$3.6	$2.3	$0.7	$6.7
Independence NHP	-	-	-	-	-
Indiana Dunes NL	12,658	$782.2	$497.7	$156.5	$1,436.4

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Isle Royale NP	275,355	$17,014.2	$10,827.0	$3,403.4	$31,244.5
James A Garfield NHS	-	-	-	-	-
Jean Lafitte NHP&PRES	8,647	$534.3	$340.0	$106.9	$981.2
Jefferson NEM	-	-	-	-	-
Jewel Cave NM	2,101	$129.8	$82.6	$26.0	$238.4
Jimmy Carter NHS	238	$14.7	$9.4	$2.9	$27.0
John D. Rockefeller, Jr. MEM PKWY	19,065	$1,178.0	$749.6	$235.6	$2,163.3
John Day Fossil Beds NM	8,192	$506.2	$322.1	$101.3	$929.6
John Fitzgerald Kennedy NHS	-	-	-	-	-
John Muir NHS	444	$27.4	$17.4	$5.5	$50.3
Johnstown Flood NMEM	319	$19.7	$12.5	$3.9	$36.2
Joshua Tree NP	412,464	$25,486.2	$16,218.1	$5,098.1	$46,802.3
Kalaupapa NHP	-	-	-	-	-
Kaloko-Honokohau NHP	-	-	-	-	-
Katmai NP&PRES	-	-	-	-	-
Kenai Fjords NP	-	-	-	-	-
Kennesaw Mountain NBP	-22,233	-$1,373.8	-$874.2	-$274.8	-$2,522.8
Keweenaw NHP	638	$39.4	$25.1	$7.9	$72.4
Kings Canyon NP	18,467	$1,141.1	$726.1	$228.3	$2,095.5
Kings Mountain NMP	5,739	$354.6	$225.7	$70.9	$651.2
Klondike Gold Rush NHP	-	-	-	-	-
Knife River Indian Villages NHS	352	$21.8	$13.8	$4.4	$39.9
Kobuk Valley NP	-	-	-	-	-
Korean War Veterans MEM	-	-	-	-	-
Lake Chelan NRA	68,496	$4,232.4	$2,693.3	$846.6	$7,772.2
Lake Clark NP&PRES	-	-	-	-	-
Lake Mead NRA	275,762	$17,039.3	$10,843.0	$3,408.4	$31,290.7
Lake Meredith NRA	14,664	$906.1	$576.6	$181.3	$1,664.0
Lake Roosevelt NRA	24,569	$1,518.1	$966.0	$303.7	$2,787.8
Lassen Volcanic NP	28,463	$1,758.7	$1,119.2	$351.8	$3,229.7
Lava Beds NM	21,228	$1,311.7	$834.7	$262.4	$2,408.8
Lewis and Clark NHP	7,352	$454.3	$289.1	$90.9	$834.3
Lincoln Boyhood NMEM	491	$30.4	$19.3	$6.1	$55.8
Lincoln Home NHS	-	-	-	-	-
Lincoln MEM	-	-	-	-	-
Little Bighorn Battlefield NM	858	$53.0	$33.7	$10.6	$97.4
Little River Canyon NPRES	42,350	$2,616.8	$1,665.2	$523.4	$4,805.5
Little Rock Central High School NHS	-	-	-	-	-

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Longfellow NHS	-	-	-	-	-
Lowell NHP	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Lower Saint Croix NSR	7,022	$433.9	$276.1	$86.8	$796.8
Lyndon B Johnson NHP	1,118	$69.1	$44.0	$13.8	$126.9
Lyndon Baines Johnson Memorial Grove on the Potomac NMEM	-	-	-	-	-
Maggie L Walker NHS	-	-	-	-	-
Mammoth Cave NP	186,221	$11,506.6	$7,322.2	$2,301.7	$21,130.5
Manassas NBP	8,848	$546.7	$347.9	$109.4	$1,004.0
Manzanar NHS	-194	-$12.0	-$7.6	-$2.4	-$22.1
Marsh-Billings-Rockefeller NHP	1,217	$75.2	$47.9	$15.0	$138.1
Martin Luther King Jr NHS	-	-	-	-	-
Martin Luther King, Jr. MEM	-	-	-	-	-
Martin Van Buren NHS	-70	-$4.3	-$2.7	-$0.9	-$7.9
Mary McLeod Bethune Council House NHS	-	-	-	-	-
Mesa Verde NP	7,250	$448.0	$285.1	$89.6	$822.6
Minidoka NHS	147	$9.1	$5.8	$1.8	$16.6
Minute Man NHP	2,505	$154.8	$98.5	$31.0	$284.2
Minuteman Missile NHS	18	$1.1	$0.7	$0.2	$2.1
Mississippi NRRA	-5,721	-$353.5	-$224.9	-$70.7	-$649.1
Missouri NRR	34,781	$2,149.1	$1,367.6	$429.9	$3,946.7
Mojave NPRES	628,619	$38,842.4	$24,717.3	$7,769.7	$71,329.4
Monocacy NB	2,318	$143.2	$91.1	$28.6	$263.0
Montezuma Castle NM	18	$1.1	$0.7	$0.2	$2.1
Moores Creek NB	304	$18.8	$12.0	$3.8	$34.5
Morristown NHP	5,251	$324.5	$206.5	$64.9	$595.8
Mount Rainier NP	-227,574	-$14,061.8	-$8,948.2	-$2,812.8	-$25,822.8
Mount Rushmore NMEM	2,303	$142.3	$90.5	$28.5	$261.3
Muir Woods NM	3,656	$225.9	$143.8	$45.2	$414.8
Natchez NHP	55	$3.4	$2.2	$0.7	$6.2
National Capital Parks	-1,063	-$65.7	-$41.8	-$13.1	-$120.7
National Capital Parks - Central	-271	-$16.8	-$10.7	-$3.4	-$30.8
National Capital Parks - East	-4,327	-$267.4	-$170.1	-$53.5	-$491.0
National Park of American Samoa	-	-	-	-	-
Natural Bridges NM	2,043	$126.2	$80.3	$25.2	$231.8
Navajo NM	103	$6.3	$4.0	$1.3	$11.7
New Bedford Whaling NHP	-	-	-	-	-
New River Gorge NR	195,796	$12,098.2	$7,698.7	$2,420.0	$22,216.9
Nez Perce NHP	2,274	$140.5	$89.4	$28.1	$258.0

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Nicodemus NHS	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Ninety Six NHS	3,806	$235.2	$149.7	$47.0	$431.9
Niobrara NSR	13,572	$838.6	$533.6	$167.7	$1,540.0
Noatak NPRES	-	-	-	-	-
North Cascades NP	-384,492	-$23,757.8	- $15,118.2	-$4,752.3	-$43,628.3
Obed W&SR	15,838	$978.6	$622.7	$195.8	$1,797.1
Ocmulgee NM	-2,343	-$144.8	-$92.1	-$29.0	-$265.9
Olympic NP	33,868	$2,092.7	$1,331.7	$418.6	$3,843.0
Oregon Caves NM	1,276	$78.9	$50.2	$15.8	$144.8
Organ Pipe Cactus NM	-31,921	-$1,972.4	-$1,255.1	-$394.5	-$3,622.1
Ozark NSR	89,544	$5,533.0	$3,520.9	$1,106.8	$10,160.6
Padre Island NS	51,877	$3,205.5	$2,039.8	$641.2	$5,886.5
Palo Alto Battlefield NHP	2,369	$146.4	$93.1	$29.3	$268.8
Pea Ridge NMP	5,812	$359.1	$228.5	$71.8	$659.5
Pecos NHP	8,346	$515.7	$328.2	$103.2	$947.0
Pennsylvania Avenue NHS	-	-	-	-	-
Perry's Victory & Intl. Peace MEM	-	-	-	-	-
Petersburg NB	-3,014	-$186.3	-$118.5	-$37.3	-$342.0
Petrified Forest NP	-8,962	-$553.8	-$352.4	-$110.8	-$1,016.9
Petroglyph NM	290	$17.9	$11.4	$3.6	$32.9
Pictured Rocks NL	190,911	$11,796.4	$7,506.6	$2,359.7	$21,662.7
Pinnacles NP	36,003	$2,224.6	$1,415.6	$445.0	$4,085.2
Pipe Spring NM	7	$0.5	$0.3	$0.1	$0.8
Pipestone NM	-84	-$5.2	-$3.3	-$1.0	-$9.6
Piscataway P	10,275	$634.9	$404.0	$127.0	$1,165.9
Point Reyes NS	184,622	$11,407.8	$7,259.4	$2,281.9	$20,949.1
Port Chicago Naval Magazine NMEM	-	-	-	-	-
Poverty Point NM	1,030	$63.7	$40.5	$12.7	$116.9
President William Jefferson Clinton Birthplace Home NHS	-	-	-	-	-
Presidio of San Francisco	161	$10.0	$6.3	$2.0	$18.3
Prince William Forest P	33,025	$2,040.6	$1,298.5	$408.2	$3,747.3
Pu'uhonua O Hōnaunau NHP	-	-	-	-	-
Pu'ukoholā Heiau NHS	-	-	-	-	-
Rainbow Bridge NM	37	$2.3	$1.4	$0.5	$4.2
Redwood NP	369,106	$22,807.0	$14,513.2	$4,562.1	$41,882.4
Richmond NBP	-473	-$29.2	-$18.6	-$5.8	-$53.7
Rio Grande W&SR	15	$0.9	$0.6	$0.2	$1.7

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
River Raisin NBP	51	$3.2	$2.0	$0.6	$5.8
Rock Creek P	-9,787	-$604.8	-$384.8	-$121.0	-$1,110.6
Rocky Mountain NP	177,578	$10,972.6	$6,982.4	$2,194.9	$20,149.8
Roger Williams NMEM	-	-	-	-	-
Ronald Reagan Boyhood Home NHS	-	-	-	-	-
Rosie the Riveter WWII Home Front NHP	-7	-$0.5	-$0.3	-$0.1	-$0.8
Ross Lake NRA	-37,667	-$2,327.5	-$1,481.1	-$465.6	-$4,274.1
Russell Cave NM	869	$53.7	$34.2	$10.7	$98.6
Sagamore Hill NHS	-	-	-	-	-
Saguaro NP	-37,378	-$2,309.6	-$1,469.7	-$462.0	-$4,241.3
Saint Croix Island HIS	-	-	-	-	-
Saint Croix NSR	79,372	$4,904.4	$3,120.9	$981.0	$9,006.4
Saint Paul's Church NHS	-	-	-	-	-
Saint-Gaudens NHS	488	$30.1	$19.2	$6.0	$55.3
Salem Maritime NHS	-	-	-	-	-
Salinas Pueblo Missions NM	583	$36.0	$22.9	$7.2	$66.2
Salt River Bay NHP&EP	-	-	-	-	-
San Antonio Missions NHP	1,041	$64.3	$40.9	$12.9	$118.2
San Francisco Maritime NHP	-	-	-	-	-
San Juan Island NHP	-623	-$38.5	-$24.5	-$7.7	-$70.7
San Juan NHS	-	-	-	-	-
Sand Creek Massacre NHS	7,059	$436.2	$277.6	$87.2	$801.0
Santa Monica Mountains NRA	247,933	$15,319.8	$9,748.7	$3,064.5	$28,133.0
Saratoga NHP	5,882	$363.4	$231.3	$72.7	$667.4
Saugus Iron Works NHS	-4	-$0.2	-$0.1	> -$0.1	-$0.4
Scotts Bluff NM	2,032	$125.5	$79.9	$25.1	$230.5
Sequoia NP	145,994	$9,021.0	$5,740.5	$1,804.5	$16,566.0
Sewall-Belmont House NHS	-	-	-	-	-
Shenandoah NP	355,336	$21,956.2	$13,971.8	$4,392.0	$40,320.0
Shiloh NMP	9,010	$556.7	$354.3	$111.4	$1,022.3
Sitka NHP	-	-	-	-	-
Sleeping Bear Dunes NL	159,793	$9,873.6	$6,283.1	$1,975.0	$18,131.7
Springfield Armory NHS	-	-	-	-	-
Statue Of Liberty NM	-	-	-	-	-
Steamtown NHS	-	-	-	-	-
Stones River NB	2,193	$135.5	$86.2	$27.1	$248.8
Sunset Crater Volcano NM	1,349	$83.4	$53.1	$16.7	$153.1
Tallgrass Prairie NPRES	2,285	$141.2	$89.8	$28.2	$259.2

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Thaddeus Kosciuszko NMEM	-	-	-	-	-
Theodore Roosevelt Birthplace NHS	-	-	-	-	-
Theodore Roosevelt Inaugural NHS	-	-	-	-	-
Theodore Roosevelt Island NM	385	$23.8	$15.1	$4.8	$43.7
Theodore Roosevelt NP	24,965	$1,542.6	$981.6	$308.6	$2,832.8
Thomas Edison NHP	-15	-$0.9	-$0.6	-$0.2	-$1.7
Thomas Jefferson MEM	-	-	-	-	-
Thomas Stone NHS	546	$33.8	$21.5	$6.8	$62.0
Timpanogos Cave NM	176	$10.9	$6.9	$2.2	$20.0
Timucaun EHP	16,615	$1,026.7	$653.3	$205.4	$1,885.3
Tonto NM	198	$12.2	$7.8	$2.4	$22.5
Tumacácori NHP	290	$17.9	$11.4	$3.6	$32.9
Tupelo NB	-	-	-	-	-
Tuskegee Airmen NHS	356	$22.0	$14.0	$4.4	$40.4
Tuskegee Institute NHS	114	$7.0	$4.5	$1.4	$12.9
Tuzigoot NM	150	$9.3	$5.9	$1.9	$17.1
Ulysses S Grant NHS	-7	-$0.5	-$0.3	-$0.1	-$0.8
Upper Delaware NSR&NRR	129,867	$8,024.5	$5,106.4	$1,605.2	$14,736.0
Valley Forge NHP	7,228	$446.6	$284.2	$89.3	$820.1
Vanderbilt Mansion NHS	854	$52.8	$33.6	$10.6	$97.0
Vicksburg NMP	5,302	$327.6	$208.5	$65.5	$601.7
Vietnam Veterans MEM	-	-	-	-	-
Virgin Islands Coral Reef NM	-	-	-	-	-
Virgin Islands NP	-	-	-	-	-
Voyageurs NP	247,445	$15,289.7	$9,729.6	$3,058.4	$28,077.6
Walnut Canyon NM	3,088	$190.8	$121.4	$38.2	$350.4
War in the Pacific NHP	-	-	-	-	-
Washington Monument	-	-	-	-	-
Washita Battlefield NHS	92	$5.7	$3.6	$1.1	$10.4
Weir Farm NHS	198	$12.2	$7.8	$2.4	$22.5
Whiskeytown NRA	84,235	$5,204.9	$3,312.1	$1,041.1	$9,558.1
White House	-	-	-	-	-
White Sands NM	-3,058	-$189.0	-$120.3	-$37.8	-$347.0
Whitman Mission NHS	66	$4.1	$2.6	$0.8	$7.5
William Howard Taft NHS	-7	-$0.5	-$0.3	-$0.1	-$0.8
Wilson's Creek NB	1,999	$123.5	$78.6	$24.7	$226.8
Wind Cave NP	31,283	$1,933.0	$1,230.1	$386.7	$3,549.7
Wolf Trap NP for the Performing Arts	150	$9.3	$5.9	$1.9	$17.1

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2**	Value by Discount Rate ($ thousands)			
		2.5%	3%	5%	3% (95th)
Women's Rights NHP	-29	-$1.8	-$1.2	-$0.4	-$3.3
World War II Memorial	-	-	-	-	-
World War II Valor in the Pacific NM	-	-	-	-	-
Wrangell-St. Elias NP&PRES	-	-	-	-	-
Wright Brothers NMEM	-326	-$20.2	-$12.8	-$4.0	-$37.0
Wupatki NM	-4,298	-$265.6	-$169.0	-$53.1	-$487.7
Yellowstone NP	1,515,696	$93,654.8	$59,597.2	$18,734.0	$171,986.0
Yosemite NP	151,110	$9,337.1	$5,941.6	$1,867.7	$17,146.4
Yucca House NM	11	$0.7	$0.4	$0.1	$1.2
Yukon-Charley Rivers NPRES	-	-	-	-	-
Zion NP	26,637	$1,645.9	$1,047.4	$329.2	$3,022.5

*A dash represents missing data. Due to rounding, monetary values listed as '> -$0.1' represents an estimate between -$50 and $0.
**A negative value denotes a net carbon source.

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Table B. Average Annual Net Ecosystem Balance (metric tons of CO_2) per Hectare by NPS Unit*

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Abraham Lincoln Birthplace NHS	6.6
Acadia NP	6.7
Adams NHP	-2.1
African Burial Ground NM	-
Agate Fossil Beds NM	1.0
Alagnak WR	-
Alibates Flint Quarries NM	1.2
Allegheny Portage Railroad NHS	4.1
American Memorial P	-
Amistad NRA	0.4
Andersonville NHS	8.8
Andrew Johnson NHS	-0.8
Aniakchak NM&PRES	-
Antietam NB	1.8
Apostle Islands NL	2.5
Appomattox Court House NHP	5.4
Arches NP	-0.3
Arkansas Post NMEM	3.0
Arlington House, The Robert E. Lee Memorial NMEM	10.3
Assateague Island NS	1.0
Aztec Ruins NM	1.2
Badlands NP	0.7
Bandelier NM	1.7
Bent's Old Fort NHS	1.1
Bering Land Bridge NPRES	-
Big Bend NP	0.4
Big Cypress NPRES	3.7
Big Hole NB	4.7
Big South Fork NRRA	7.7
Big Thicket NPRES	9.4
Bighorn Canyon NRA	1.2
Biscayne NP	0.1
Black Canyon of the Gunnison NP	0.8
Blue Ridge PKWY	5.7
Bluestone NSR	7.2

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Booker T. Washington NM	7.4
Boston African American NHS	-
Boston Harbor Islands NRA	2.3
Boston NHP	-
Brices Cross Roads NBS	-
Brown v. Board of Education NHS	-
Bryce Canyon NP	0.6
Buck Island Reef NM	-
Buffalo NR	4.0
Cabrillo NM	-
Canaveral NS	2.0
Cane River Creole NHP	0.7
Canyon de Chelly NM	0.0
Canyonlands NP	0.0
Cape Cod NS	2.3
Cape Hatteras NS	1.7
Cape Krusenstern NM	-
Cape Lookout NS	1.4
Capitol Reef NP	0.3
Capulin Volcano NM	1.4
Carl Sandburg Home NHS	6.0
Carlsbad Caverns NP	0.5
Carter G. Woodson NHS	-
Casa Grande Ruins NM	-0.2
Castillo de San Marcos NM	-0.3
Castle Clinton NM	-
Catoctin Mountain P	5.8
Cedar Breaks NM	-0.3
Cedar Creek & Belle Grove HP	2.8
César E. Chávez NM	3.2
Chaco Culture NHP	0.8
Chamizal NMEM	-0.9
Channel Islands NP	1.6
Charles Pinckney NHS	-0.6
Charles Young Buffalo Soldiers NM	-0.2
Chattahoochee River NRA	-5.0
Chesapeake & Ohio Canal NHP	4.2
Chickamauga and Chattanooga NMP	7.0

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Chickasaw NRA	1.9
Chiricahua NM	-0.3
Christiansted NHS	-
City of Rocks NRES	0.0
Clara Barton NHS	-
Colonial NHP	2.3
Colorado NM	0.4
Congaree NP	9.0
Coronado NMEM	0.2
Cowpens NB	7.6
Crater Lake NP	3.5
Craters of the Moon NM&PRES	-0.1
Cumberland Gap NHP	9.4
Cumberland Island NS	5.3
Curecanti NRA	0.6
Cuyahoga Valley NP	3.4
Dayton Aviation Heritage NHP	-2.5
De Soto NMEM	-
Death Valley NP	0.3
Delaware Water Gap NRA	5.9
Denali NP&PRES	-
Devils Postpile NM	0.4
Devils Tower NM	1.0
Dinosaur NM	0.0
Dry Tortugas NP	-
Edgar Allan Poe NHS	-
Effigy Mounds NM	3.2
Eisenhower NHS	2.1
El Malpais NM	0.1
El Morro NM	1.6
Eleanor Roosevelt NHS	-2.5
Eugene O'Neill NHS	6.6
Everglades NP	2.2
Federal Hall NMEM	-
Fire Island NS	0.2
First Ladies NHS	-
First State NM	5.3
Flight 93 NMEM	3.2

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Florissant Fossil Beds NM	2.2
Ford's Theatre NHS	-
Fort Bowie NHS	-0.8
Fort Caroline NMEM	-0.1
Fort Davis NHS	1.1
Fort Donelson NB	8.3
Fort Frederica NM	-0.5
Fort Laramie NHS	0.8
Fort Larned NHS	1.0
Fort Matanzas NM	4.4
Fort McHenry NM&SHRINE	-0.2
Fort Necessity NB	4.1
Fort Point NHS	-
Fort Pulaski NM	-0.3
Fort Raleigh NHS	16.4
Fort Scott NHS	-6.3
Fort Smith NHS	-1.2
Fort Stanwix NM	-4.3
Fort Sumter NM	0.0
Fort Union NM	1.5
Fort Union Trading Post NHS	1.8
Fort Vancouver NHS	1.8
Fort Washington P	3.2
Fossil Butte NM	0.1
Franklin Delano Roosevelt MEM	-
Frederick Douglass NHS	-
Frederick Law Olmsted NHS	-
Fredericksburg & Spotsylvania NMP	5.9
Friendship Hill NHS	6.4
Gates of the Arctic NP&PRES	-
Gateway NRA	0.0
Gauley River NRA	7.7
General Grant NMEM	-
George Rogers Clark NHP	-0.9
George Washington Birthplace NM	3.8
George Washington Carver NM	1.8
George Washington MEM PKWY	-2.0
Gettysburg NMP	3.2

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Gila Cliff Dwellings NM	1.9
Glacier Bay NP&PRES	-
Glacier NP	1.6
Glen Canyon NRA	0.2
Golden Gate NRA	7.7
Golden Spike NHS	0.2
Governors Island NM	-0.2
Grand Canyon NP	-0.1
Grand Portage NM	5.6
Grand Teton NP	1.2
Grant-Kohrs Ranch NHS	1.2
Great Basin NP	2.4
Great Sand Dunes NP&PRES	0.5
Great Smoky Mountains NP	7.8
Greenbelt P	-12.3
Guadalupe Mountains NP	1.2
Guilford Courthouse NMP	-2.7
Gulf Islands NS	0.3
Hagerman Fossil Beds NM	1.9
Haleakala NP	-
Hamilton Grange NMEM	-3.3
Hampton NHS	1.4
Harpers Ferry NHP	4.8
Harry S Truman NHS	-0.6
Hawai'i Volcanoes NP	-
Herbert Hoover NHS	0.2
Hohokam Pima NM	-0.4
Home of Franklin D Roosevelt NHS	-4.0
Homestead NM	0.8
Hopewell Culture NHP	2.0
Hopewell Furnace NHS	5.0
Horseshoe Bend NMP	7.3
Hot Springs NP	2.4
Hovenweep NM	0.2
Hubbell Trading Post NHS	0.9
Independence NHP	-
Indiana Dunes NL	2.0
Isle Royale NP	1.2

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
James A Garfield NHS	-
Jean Lafitte NHP&PRES	1.0
Jefferson NEM	-
Jewel Cave NM	4.1
Jimmy Carter NHS	7.4
John D. Rockefeller, Jr. MEM PKWY	2.0
John Day Fossil Beds NM	1.4
John Fitzgerald Kennedy NHS	-
John Muir NHS	3.2
Johnstown Flood NMEM	4.4
Joshua Tree NP	1.3
Kalaupapa NHP	-
Kaloko-Honokohau NHP	-
Katmai NP&PRES	-
Kenai Fjords NP	-
Kennesaw Mountain NBP	-19.0
Keweenaw NHP	0.8
Kings Canyon NP	0.1
Kings Mountain NMP	3.6
Klondike Gold Rush NHP	-
Knife River Indian Villages NHS	0.5
Kobuk Valley NP	-
Korean War Veterans MEM	-
Lake Chelan NRA	2.7
Lake Clark NP&PRES	-
Lake Mead NRA	0.5
Lake Meredith NRA	0.9
Lake Roosevelt NRA	0.6
Lassen Volcanic NP	0.7
Lava Beds NM	1.1
Lewis and Clark NHP	5.1
Lincoln Boyhood NMEM	6.1
Lincoln Home NHS	-
Lincoln MEM	-
Little Bighorn Battlefield NM	2.7
Little River Canyon NPRES	6.8
Little Rock Central High School NHS	-
Longfellow NHS	-

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Lowell NHP	0.0
Lower Saint Croix NSR	1.5
Lyndon B Johnson NHP	1.8
Lyndon Baines Johnson Memorial Grove on the Potomac NMEM	-
Maggie L Walker NHS	-
Mammoth Cave NP	8.9
Manassas NBP	4.3
Manzanar NHS	-0.6
Marsh-Billings-Rockefeller NHP	4.7
Martin Luther King Jr NHS	-
Martin Luther King, Jr. MEM	-
Martin Van Buren NHS	-0.6
Mary McLeod Bethune Council House NHS	-
Mesa Verde NP	0.3
Minidoka NHS	1.1
Minute Man NHP	6.0
Minuteman Missile NHS	1.1
Mississippi NRRA	-0.3
Missouri NRR	1.2
Mojave NPRES	1.0
Monocacy NB	3.5
Montezuma Castle NM	0.0
Moores Creek NB	8.2
Morristown NHP	7.7
Mount Rainier NP	-2.4
Mount Rushmore NMEM	4.5
Muir Woods NM	16.3
Natchez NHP	1.3
National Capital Parks	-3.2
National Capital Parks - Central	-1.0
National Capital Parks - East	-7.7
National Park of American Samoa	-
Natural Bridges NM	0.7
Navajo NM	0.7
New Bedford Whaling NHP	-
New River Gorge NR	6.9
Nez Perce NHP	1.6

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Nicodemus NHS	-2.9
Ninety Six NHS	9.8
Niobrara NSR	1.2
Noatak NPRES	-
North Cascades NP	-1.9
Obed W&SR	7.4
Ocmulgee NM	-8.4
Olympic NP	0.1
Oregon Caves NM	6.7
Organ Pipe Cactus NM	-0.2
Ozark NSR	2.7
Padre Island NS	1.0
Palo Alto Battlefield NHP	1.7
Pea Ridge NMP	3.4
Pecos NHP	3.1
Pennsylvania Avenue NHS	-
Perry's Victory & Intl. Peace MEM	-
Petersburg NB	-2.7
Petrified Forest NP	-0.1
Petroglyph NM	0.1
Pictured Rocks NL	6.4
Pinnacles NP	3.3
Pipe Spring NM	0.5
Pipestone NM	-0.7
Piscataway P	5.5
Point Reyes NS	6.3
Port Chicago Naval Magazine NMEM	-
Poverty Point NM	2.8
President William Jefferson Clinton Birthplace Home NHS	-
Presidio of San Francisco	0.3
Prince William Forest P	7.4
Pu'uhonua O Hōnaunau NHP	-
Pu'ukoholā Heiau NHS	-
Rainbow Bridge NM	0.6
Redwood NP	7.9
Richmond NBP	-0.8
Rio Grande W&SR	0.1
River Raisin NBP	3.0

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Rock Creek P	-8.9
Rocky Mountain NP	1.6
Roger Williams NMEM	-
Ronald Reagan Boyhood Home NHS	-
Rosie the Riveter WWII Home Front NHP	-0.1
Ross Lake NRA	-0.8
Russell Cave NM	7.4
Sagamore Hill NHS	-
Saguaro NP	-1.0
Saint Croix Island HIS	-
Saint Croix NSR	2.8
Saint Paul's Church NHS	-
Saint-Gaudens NHS	6.4
Salem Maritime NHS	-
Salinas Pueblo Missions NM	1.3
Salt River Bay NHP&EP	-
San Antonio Missions NHP	3.1
San Francisco Maritime NHP	-
San Juan Island NHP	-0.9
San Juan NHS	-
Sand Creek Massacre NHS	1.4
Santa Monica Mountains NRA	4.1
Saratoga NHP	4.3
Saugus Iron Works NHS	-0.8
Scotts Bluff NM	1.6
Sequoia NP	0.9
Sewall-Belmont House NHS	-
Shenandoah NP	4.5
Shiloh NMP	5.5
Sitka NHP	-
Sleeping Bear Dunes NL	5.6
Springfield Armory NHS	-
Statue Of Liberty NM	-
Steamtown NHS	-
Stones River NB	7.7
Sunset Crater Volcano NM	1.1
Tallgrass Prairie NPRES	0.5
Thaddeus Kosciuszko NMEM	-

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
Theodore Roosevelt Birthplace NHS	-
Theodore Roosevelt Inaugural NHS	-
Theodore Roosevelt Island NM	9.5
Theodore Roosevelt NP	0.9
Thomas Edison NHP	-1.5
Thomas Jefferson MEM	-
Thomas Stone NHS	4.1
Timpanogos Cave NM	1.8
Timucaun EHP	0.9
Tonto NM	0.4
Tumacácori NHP	2.0
Tupelo NB	-
Tuskegee Airmen NHS	9.9
Tuskegee Institute NHS	4.4
Tuzigoot NM	0.5
Ulysses S Grant NHS	-2.2
Upper Delaware NSR&NRR	5.8
Valley Forge NHP	5.2
Vanderbilt Mansion NHS	10.1
Vicksburg NMP	7.9
Vietnam Veterans MEM	-
Virgin Islands Coral Reef NM	-
Virgin Islands NP	-
Voyageurs NP	3.0
Walnut Canyon NM	2.1
War in the Pacific NHP	-
Washington Monument	-
Washita Battlefield NHS	0.7
Weir Farm NHS	6.7
Whiskeytown NRA	4.9
White House	-
White Sands NM	-0.1
Whitman Mission NHS	1.2
William Howard Taft NHS	-4.2
Wilson's Creek NB	2.1
Wind Cave NP	2.3
Wolf Trap NP for the Performing Arts	2.8
Women's Rights NHP	-10.1

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

Park Unit	Annual Metric Tons of CO_2 Per Hectare**
World War II Memorial	-
World War II Valor in the Pacific NM	-
Wrangell-St. Elias NP&PRES	-
Wright Brothers NMEM	-1.9
Wupatki NM	-0.3
Yellowstone NP	1.7
Yosemite NP	0.5
Yucca House NM	0.6
Yukon-Charley Rivers NPRES	-
Zion NP	0.4

*A dash represents missing data.
**A negative value denotes a net carbon source.

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 999/127137, November 2014

Comment Set B10 – Morongo Basin Conservation Association (cont.)

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

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Comment Set B10 – Morongo Basin Conservation Association (cont.)

B10-29
(for entire attachment)

WSU NEWS
Posts

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Research: Arid areas absorb unexpected amounts of carbon

PUBLISHED ON APRIL 6, 2014

By Eric Sorensen, WSU science writer

PULLMAN, Wash. – Researchers led by a Washington State University biologist have found that arid areas, among the biggest ecosystems on the planet, take up an unexpectedly large amount of carbon as levels of carbon dioxide increase in the atmosphere. The findings give scientists a better handle on the earth's carbon budget – how much carbon remains in the atmosphere as CO2, contributing to global warming, and how much gets stored in the land or ocean in other carbon-containing forms.

news.wsu.edu/2014/04/06/research-arid-areas-absorb-unexpected-amounts-of-carbon/#.U0bxCuYYZCN

Comment Set B10 – Morongo Basin Conservation Association (cont.)

“It has pointed out the importance of these arid ecosystems,” said R. Dave Evans, a WSU professor of biological sciences specializing in ecology and global change. “They are a major sink for atmospheric carbon dioxide, so as CO_2 levels go up, they’ll increase their uptake of CO_2 from the atmosphere. They’ll help take up some of that excess CO_2 going into the atmosphere. They can’t take it all up, but they’ll help.”

Published in Nature Climate Change

The findings, published in the journal Nature Climate Change, come after a novel 10-year experiment in which researchers exposed plots in the Mojave Desert to elevated carbon-dioxide levels similar to those expected in 2050. The researchers then removed soil and plants down to a meter deep and measured how much carbon was absorbed.

“We just dug up the whole site and measured everything,” said Evans.

The idea for the experiment originated with scientists at Nevada’s universities in Reno and Las Vegas and the Desert Research Institute. Evans was brought in for his expertise in nutrient cycling and deserts, while researchers at the University of Idaho, Northern Arizona University, Arizona State University and Colorado State University also contributed.

Comment Set B10 – Morongo Basin Conservation Association (cont.)

Funding came from the U.S. Department of Energy's Terrestrial Carbon Processes Program and the National Science Foundation's Ecosystem Studies Program.

Vast lands play significant role

The work addresses one of the big unknowns of global warming: the degree to which land-based ecosystems absorb or release carbon dioxide as it increases in the atmosphere.

Receiving less than 10 inches of rain a year, arid areas run in a wide band at 30 degrees north and south latitude. Along with semi-arid areas, which receive less than 20 inches of rain a year, they account for nearly half the earth's land surface.

Forest soils have more organic matter and, square foot for square foot, hold much more carbon. But because arid soils cover so much area, they can have an outsize role in the earth's carbon budget and in how much the earth warms as heat-trapping gases accumulate in the atmosphere.

15-28 percent of uptake

Researchers led by WSU's Dave Evans analyzed how much carbon is taken from the air when exposed to carbon-dioxide levels expected in 2050. (Photo from Desert Research Institute/UNLV)

Working on the Nevada National Security Site, the researchers marked off nine octagonal plots about 75 feet in diameter. Air with 380 parts-per-million concentrations of CO2, the current CO2 levels, was blown over three plots. Three received no extra air. Three were exposed to concentrations of 550 parts per million, the CO2 levels expected in 2050.

The CO2 was fed through PVC pipes ringing the plots and had a specific chemical fingerprint that could be detected when the soil, plants and other biomass were analyzed.

The analysis, done by Benjamin Harlow in WSU's Stable Isotope Core Laboratory, suggests that arid lands may increase their carbon uptake enough in the future to account for 15 to 28 percent of the amount currently being absorbed by land surfaces.

Overall, said Evans, rising CO2 levels may increase the uptake by arid lands enough to account for 4 to 8 percent of current emissions.

The experiment did not account for other possible changes stemming from climate change, like varying precipitation and warming temperatures.

Large carbon gain in short time

Still, said Evans, "I was surprised at the magnitude of the carbon gain, that we were able to detect it after 10 years, because 10 years isn't very long in the life of an ecosystem."

Harlow, left, and Evans analyze soil samples. (Photo by Shelly Hanks, WSU Photo Services)

While forest ecosystems tend to store carbon in plant matter, the Mojave researchers found most carbon was being taken up by increased activity in the rhizosphere, a microorganism-rich area around the roots.

From an optimistic point of view, the research suggests that, come 2050, arid ecosystems will be doing more than their fair share of taking earth-warming carbon out of the atmosphere. But a potential cause for concern is what happens to these ecosystems as the planet's population grows and people look for places to develop and live.

"Land is extremely valuable," said Evans. "A lot of growth may occur in these areas that are fairly arid and we don't know what that's going to do then to the carbon budget of these systems."

Comment Set B10 – Morongo Basin Conservation Association (cont.)

R. Dave Evans, WSU professor of biological sciences, 509-335-7466,
rdevans@wsu.edu

Categorized Press Releases, Research, Sustainability, Top Stories

Tagged arid, carbon, carbon dioxide, desert, global warming, research

Comment Set E1 – Brad Hicks

Email: Stagecoach Solar Project Team

From: Brad Hicks <47deadeye@gmail.com>
Sent: Sunday, October 18, 2020 5:34 AM
To: Comments, CEQA@SLC <CEQA.Comments@slc.ca.gov>
Subject: Stagecoach Solar

NO INDSTRIAL SCALE SOLAR INLUCERNE VALLEY! E1-1

Sent from Mail for Windows 10

cjf

Comment Set E2 – Bill Lembright

Email: Stagecoach Solar Project Team

From: Bill Lembright <billlembright@gmail.com>
Sent: Friday, November 13, 2020 5:10 PM
To: Mongano, Sarah@SLC <Sarah.Mongano@slc.ca.gov>; Comments, CEQA@SLC <CEQA.Comments@slc.ca.gov>
Subject: Stagecoach Solar NOP comments

I'm Bill Lembright, a 39 year resident of Lucerne Valley. I am the president of Church of Our Lord and Savior and have been employed by Hitchin Lucerne, Inc., dba: Lucerne Valley Market and Hardware for just over 50 years. I am an avid conservationist and a promoter of eco tourism in Lucerne Valley. Lucerne Valley is particularly scenic due to its geographical setting. It is a portion of the Mojave Desert at 3000 foot elevation. It's a punchbowl between the San Bernardino, Granite, Sidewinder, Ord, Rodman, and Fry Mountains. It is home to seven scenic and usually dry lakes. The area is so beautiful that State Highway 247 is being considered by the State to become the next State Scenic Highway. E2-1

It is home to endangered desert tortoises, fairy shrimp, herds of bighorn sheep, mule deer, golden and bald eagles, turkey buzzards, numerous owl species (great horned, ground, barn, and long-eared), roadrunners, Mojave ground squirrels, chuckwalla lizards, kit and red foxes, mountain lions, blackbears, bobcats, timber wolves, Joshua trees, Mojave yuccas (including the ancient yucca rings), Cushenbury buckwheat, creosote bushes (including the ancient King Clone creosote ring). E2-2

Lucerne Valley is home to nearly twenty natural springs that preserve our wildlife. We are the home of a number of petroglyph sites and were the winter home of nomadic Indian tribes. Water was ample, plus native vegetation (including pinon pine, junipers, and Mojave yucca) was plentiful along with plenty of edible animals. This valley is a living museum of historic sites and artifacts. E2-3

The soil is bound by mycorrhizal fungi which distributes water and nutrients to various soil stabilizing plants which prevents blowing dust and sand which are a threat to nearly all of our living species.When the soil surface is scraped and graded the blowing dust and sand become dangerous health hazards to plants and animals, we human animals included. We live in a nature preserve and seek to maintain its integrity and survival. We pressure residents and visitors to respect this fragile balance of nature. E2-4

Comment Set E2 – Bill Lembright (cont.)

That all being said, we support the need of Calpers to fund itself, just not at the expense of our fragile environment and in our eco friendly desert community. Plus, the proposed siting of Stagecoach Solar is adjacent to some of our lowest income residents who are dismayed that what little they now own will soon become worth even less. They don't have the luxury of pulling up stakes and moving on since their meager life savings is tied up in their property. E2-5

Now let me proceed with other specific environmental concerns. There is documented concern of the possibility of dramatic toxic pollution to the surrounding area in the event of a fire or explosion in the 200MW battery storage facility. It has been happening occasionally at other sites and nothing guarantees that such an ecological disaster will not happen here. E2-6

The new nine miles of transmission lines will also bring more soil and ecological disturbance, plus devalue properties along its entirety and detract from the pristine views currently enjoyed from scenic Highway 247. E2-7

The CEQA guidelines say the cumulative environmental detrimental impacts must be considered. In the case of Stagecoach Solar and the resulting construction of the Calcite Substation will likely be exponential! Before San Bernardino County voted to stop industrial renewable energy projects from being constructed within residential communities, a number of solar developers submitted plans for projects in Lucerne Valley and other high desert communities. These are on hold because they have no convenient local substation available to serve their needs. The construction of the Calcite substation would change all that and create a deluge of environmentally damaging projects. E2-8

Along with the flood of many more environmentally destructive solar projects into ecologically sensitive northern Lucerne Valley would be Edison's likely renewed effort to construct the highly controversial and environmentally unfriendly Coolwater-Lugo transmission line which would create more ecological and economic harm. North Lucerne Valley, the area threatened by Stagecoach and the other threatening projects is a biological connector corridor for endangered species that migrate between the Granite, Sidewinder, and Ord Mountains. This will disrupt the lifestyles of these endangered species.

The EIR must address the amount of damage that the construction of this project and the other projects it will most likely trigger to be built and spell out how it must be mitigated. It must NOT, as other EIRs have done, state that

Comment Set E2 – Bill Lembright (cont.)

nothing significant can be done to avoid the problems and thereby be approved because the problems were written out to fulfill the legal minimum requirement. Such legal sidestepping of responsibility must not be allowed in this case! E2-8 cont.

The EIR should quantify the amount of soil that would be disturbed, the volume of dust pollution, the number of plants destroyed, and the number of humans and other creatures that will be negatively affected. A sample acre on the proposed site that is fully exposed to the prevailing wind should be scraped with an appropriate dust monitor located downwind to measure the detrimental effects of Stagecoach Solar. E2-9

Also, the EIR should evaluate the negative visual impacts of the project to the community and to tourists out to enjoy the desert's beauty and scenic views. E2-10

The EIR should also quantify the water needed to build and maintain this project since our desert aquifer has little to spare above what is needed to sustain existing water usage. E2-11

The EIR should specifically deal with the challenge of downstream flash flooding and damage from stormwater runoff. The natural healthy structure of the desert's surface soil absorbs water runoff, but once disturbed, it loses that beneficial trait and becomes a conduit for downstream flooding and destruction to wildlife and property. E2-12

The community would receive zero benefit from the project, and suffer all the environmental consequences. The State already has designated Lucerne Valley as a severely economically disadvantaged community and should NOT knowingly impose more economic and environmental damage to it than has already occurred to it in the past due to unthought out government-approved development. E2-13

Please seriously consider relocating this project to the already massive solar energy facilities at the non-residential Harper Dry Lake facilities west and out of sight of Hinkley, or beyond the residential zones near El Mirage or south of Searles Dry Lake. These areas will not so negatively affect plants, animals, and humans. I believe you will find the County and Bureau of Land Management eager to cooperate with such a switch of locations, including the possibility of land swaps. E2-14

Thank you,
Bill Lembright, Lucerne Valley

Comment Set E3 – Neil B. Nadler

November 12, 2020

By Email: Sarah.Mongano@slc.ca.gov
and CEQA.comments@slc.ca.gov
Ms. Sarah Mongano
Senior Environmental Scientist/
CSLC Project Manager
Suite 100-South
100 Howe Avenue
Sacramento, Calif. 95825

Re: Stagecoach Solar NOP Comments

Dear Ms. Mongano:

My name is Neil Nadler and I am a resident of Lucerne Valley. I am focusing my comments to one specific area that needs to be seriously evaluated in the Draft EIR for the "Proposed Project" (Stagecoach Solar). The CEQA area of Alternatives in the past has been sloughed off and minimized as discussion comments only in many Draft EIRs. The Proposed Project, which includes three other Solar Projects (Ord Mountain,Calcite, Sienna, Phase II (of Stagecoach Solar) and Calcite Substation, Generation Transmission Lines and herein after called Cumulative or "Related Development", Draft EIR must thoroughly and accurately evaluate the Project Alternatives as stated below.

(1) The EIR Must Contain a CEQA-Mandated Consideration of Project Alternatives.

E3-1

Section 15126.6(a) of the CEQA Guidelines requires that an EIR describe a range of reasonable alternatives to the project, or a range of reasonable alternatives to the location of the project, that could feasibly attain the basic objectives of the project. An EIR does not need to consider every conceivable alternative project, but it does have to consider a range of potentially feasible alternatives that will facilitate informed decision-making and public participation.

According to CEQA Guidelines Section 15126.6(a), the discussion of alternatives must include several different issues. The discussion of alternatives must focus on alternatives to the project, or to the project location, which will avoid or substantially reduce any significant effects of the project, even if the alternatives would be costlier or hinder to some degree the attainment of the project objectives.

Pursuant to CEQA, the "policy of the state" is that projects with significant environmental impacts may not be approved "if there are feasible alternatives or feasible mitigation measures available which would substantially lessen the significant environmental effects…" (Pub. Res. Code § 21002; Guidelines § 15021(a)(2).) A Project should not be approved if environmentally superior alternatives exist "even if these alternatives would impede to some degree the attainment of the project objectives, or would be

1

Comment Set E3 – Neil B. Nadler (cont.)

more costly." (Pub. Res. Code §§ 21002; Guidelines §§ 15021(a)(2), 15126.6.) The Project must be rejected if an alternative available for consideration would accomplish "most [not all] of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects." (Guidelines § 15126.6(c).) E3-1 cont.

The project objectives frame the alternatives analysis which is critical to an adequate CEQA process. The agency must consider a range of reasonable alternatives based on properly framed project objectives. (Guidelines, § 15126.6(a).) A project's underlying purpose should be included in the objectives and a lead agency "'may not give a project's purpose an artificially narrow definition'" in order to exclude alternatives. *North Coast Rivers Alliance v. Kawamura* (2015) 243 Cal.App.4th 647, 668 [quoting *In re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings* (2008) 43 Cal.4th 1143, 1166] [finding that a draft EIR concerning control of light brown apple moths failed to include the underlying purpose as an objective of the project and because stated objective was "artificially narrow" the EIR did not sufficiently consider the full range of potential alternatives].)

"An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation." (Guidelines, § 15126.6(a).) The CEQA Guidelines expressly provide that a feasible alternative may impede achievement of the project objectives to some degree, or may be more costly. (*See* Guidelines, § 15126.6(a), (b).) This is reasonable because if applicants could thwart consideration of all potentially feasible alternatives simply by adopting overly narrow objectives, CEQA would be rendered meaningless. (*See Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 736-37 [holding that applicant's prior commitments could not foreclose analysis of alternatives].) Accordingly, the EIR must consider a range of alternatives that would achieve the basic objectives of the project while avoiding or substantially lessening significant environmental effects, and it is essential that the "EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project." (CEQA Guidelines § 15126.6.)

<u>TRONA ALTERNATIVE:</u>

The "Trona Alternative is a 30,000 acre Development Focus Area (DFA) owned and managed by the BLM. The Trona Alternative must also be evaluated under CEQA rules, particularly given that, any serious EIR will have a lengthy list of "Mandatory Findings of Significance." A Trona alternative would have the further benefit of promoting the policies behind Executive Order N-82-20, which requires the state to preserve at least thirty percent of its public lands and waters, with a specific emphasis on establishing and implementing carbon sequestration in natural vegetation and soils. The Trona Alternative soils are disturbed, depleted and degraded and is "Environmentally Superior" to the Proposed Project site. (Code § 21002; Guidelines § 15021(a)(2).) (Guidelines § 15126.6(c).)

The Trona Alternative could be analyzed in three ways. (1) As a land exchange between the CSLC and the BLM, (2) The CSLC could lease the lands from the BLM (3) The BLM could lease directly to the

Comment Set E3 – Neil B. Nadler (cont.)

Solar developer. Essentially, this added flexibility is something that adds value to the project site that the CSLC lands (Proposed Project site) does not have. **E3-1 cont.**

In fact, a land exchange Trona Alternative between the CSLC and the BLM would make a "Trona" alternative by far the most appropriate and appealing alternative, one that would produce a "win-win" for all parties concerned. Such an exchange would work as follows: the CSLC would exchange the land comprising the Proposed Project site for some or all of the BLM land in Trona. This Trona Site (up to 30,000 acres of disturbed lands) has been adopted as a Development Focus Area (DFA) in the DRECP/BLM Land Use Plan Amendment (LUPA), 2016 Record of Decision.

Trona is truly a "Least Conflicts" Alternative and is designated by Policy 5.4.2 of the County of San Bernardino Renewable Energy and Conservation Element (RECE), and in the County's Resolution (2016-20), as being available for utility-scale renewable energy development. This Exchange would enable the CSLC to generate renewable energy leasing revenue from an already environmentally disturbed location that is far enough away from established communities, without trammeling on Executive Order N-82-20.

With or without a land exchange, Trona, deserves especially thorough consideration and analysis in the EIR as an alternate site for the Proposed Project as set forth in the CEQA Guidelines listed above:

(a) Trona has low and very low conservation values according to the DRECP/BLM, CDFW and USFWS. There are very few, if any, conflicts that cannot be easily mitigated or resolved. It is disturbed lands and has been mined for approximately 100 years. (Code § 21002; Guidelines § 15021(a)(2).) (Guidelines § 15126.6(c).)

(b) Trona has a Federal Energy Section 368 Corridor located approximately 10 miles to the Southwest (Corridor Marker 23-25). This is near Hwy 395. The Trona area is presently served by Southern California Edison (SCE).

(c) Trona is up to 30,000 acres in size, and will easily support 200 MW up to 5,000MW of Solar and Energy Storage. (Size is no issue).

(d) The BLM will directly or indirectly (Lease to CSLC and sublease to developers) lease the developers an adequate amount of land to justify the 10 or so miles of Generation Transmission Lines (Gen-Tie Lines).

(e) The Trona site meets all of the Executive Order N-82-20 compliance issues, and Stagecoach does not. (Guidelines § 15126.6(c).)

(f) There is very minimal Visual Impacts because the site has been degraded mining for scores of years.

(g) There is one, or very limited "Covered Species" present or possible on the Trona Site. The USFWS, 2016 has an approved Biological Opinion for this property. (Code § 21002; Guidelines § 15021(a)(2).) (Guidelines § 15126.6(c).)

Comment Set E3 – Neil B. Nadler (cont.)

E3-1 cont.

(h) Because Trona is a DFA in the DRECP/BLM, this Alternative project is available for streamlined and expedited processing. It is "Environmentally Superior" when compared to Stagecoach Solar. The Proposed Project has none of this at present. Further, the biological, environmental issues and challenges are almost impossible given the existing scientific evidence. (CEQA Code § 21002; Guidelines § 15021(a)(2).) (Guidelines § 15126.6(c).)

(i) Trona site soils are depleted and degraded, versus the Proposed Project and Related Development are located within high conservation valued lands, and are very stable intact habitat for the Desert Tortoise, Bighorn Sheep and for many other "Covered Species". In addition, the Proposed Project is located within established Wildlife linkages and connectivity corridors for the future generations. (Code § 21002; Guidelines § 15021(a)(2).) (Guidelines § 15126.6(c).)

The Trona Alternative must also include an in depth analysis including cumulative impacts. Also an analysis discussion of the existing conditions and what would reasonably be expected to occur in the foreseeable future if the Proposed Project (Stagecoach) were to be built, or relocated to Trona. The Proposed Project future impacts must be compared and contrasted to the Trona Alternative. The Proposed Project and Related Development which include, the other 3 Solar Projects comprising over 8,100 acres and Calcite Substation, in Northern Lucerne Valley, must be evaluated on a truly level playing field without bias or prejudice. (Code § 21002; Guidelines § 15021(a)(2).) (Guidelines § 15126.6(c).)

In short, in order to comply with such requirements, the EIR would have to consider and report that there are so many "substantial and avoidable" impacts associated with the Proposed Project solar farms, transmission lines and substation – in terms of visual aesthetics, biological resources, wildlife corridors, important linkages, groundwater, health, air quality, EJ and cumulative growth-inducing effects, among others – that building the Proposed Project in Northern Lucerne Valley would be ill-advised and destructive to the west Mojave desert region.

I am attaching a letter dated 11/12/2020 as a reference from the two County of San Bernardino County Desert Supervisors who are reiterating my objections and concerns for the Stagecoach Solar Project on CSLC lands in Lucerne Valley and support for the Trona Alternative.

Respectfully submitted,

Neil B. Nadler

Neil B. Nadler

8697 High Road

Lucerne Valley, 92356

Comment Set E3 – Neil B. Nadler (cont.)

sbcounty.gov/bosD3

Dawn ROWE THIRD DISTRICT SUPERVISOR

County of San Bernardino

November 12, 2020

Sarah Mongano
Senior Environmental Scientist
California State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825

Dear Ms. Mongano,

As members of the San Bernardino County Board of Supervisors, we write to express our concern and opposition to the proposed Stagecoach Solar Project (Project) in the unincorporated community of Lucerne Valley. It is our understanding that this project will be sited on undeveloped state property, and the California State Lands Commission (CSLC) will serve as the lead agency under the California Environmental Quality Act (CEQA). This letter is submitted in response to the CSLC solicitation for public and agency comments as to the scope and content of the environmental analysis. E3-2

Renewable energy development has been a major issue in San Bernardino County for over a decade. After a three-year public process which relied heavily on stakeholder input from our communities, the Board of Supervisors on August 8, 2017, adopted a Renewable Energy and Conservation Element (RECE) into our General Plan, incorporating our citizens' vision for renewable energy development in San Bernardino County policies.

In 2019, the Board of Supervisors adopted Policy 4.10 into the RECE. Under the provisions of this policy, development of utility-scale renewable energy projects within Community Planning areas is prohibited. The proposed location of the Project is in direct conflict with this established land use policy in San Bernardino County, as it would be developed in the Lucerne Valley Community Planning Area. We request that CSLC take into account this significant conflict when conducting the CEQA environmental analysis for the Project.

We were dismayed to learn that the Project will interfere with critical wildlife linkages identified in a Multi-Species Habitat Conservation Plan (MSHCP) for the Town of Apple Valley. The MSHCP Plan Area is strategically located at the intersection of three important wildlife linkages that are not only important to the immediate region, but also to the Mojave Desert as a whole. The identification and protection of these linkages will facilitate wildlife movement and gene flow across a wider regional landscape, making the entire region more resilient to the effects of climate change by ensuring the long-term viability of six Areas of Critical Environmental Concern.

The proposed project site is also problematic for the designation of State Route 247 (SR-247) as a State Scenic Highway by the California Department of Transportation. The close proximity of the Project to SR-247 disturbs the iconic viewshed of Lucerne Valley and jeopardizes efforts to obtain this highly coveted designation. This undertaking is a critical priority for Lucerne Valley and residents in nearby desert communities, thus the proposed location of this project will receive considerable backlash from our constituents if it moves forward as intended.

Comment Set E3 – Neil B. Nadler (cont.)

We also cannot overlook our citizens' concerns about visual impacts of renewable energy development on rural communities. The scenic quality of desert open space attracts highly valued tourism and contributes greatly to the quality of life in our desert communities. It is essential that this quality is considered by CSLC during the project review and decision process.

E3-2 cont.

It is important to note that the County does support the development of utility-oriented renewable energy projects in defined areas. The Board of Supervisors adopted in RECE Policy 5.4.2 the following: "Encourage utility-oriented RE generation to occur in the five Desert Renewable Energy Conservation Plan (DRECP) Development Focus Areas (DFAs) that were supported by the Board of Supervisors on February 17, 2016, Resolution No. 2016-20 and on adjacent private lands (North of Kramer Junction, Trona, Hinkley, El Mirage, and Amboy)." These defined areas were determined through a meticulous process undertaken by the County of San Bernardino, taking into consideration our stakeholder input and citizens' vision for renewable energy development.

The proposed Project conflicts with our County's current land use policies, would interfere with critical wildlife linkages, and significantly impacts the viewshed of the unincorporated community of Lucerne Valley. For these reasons, we cannot support the application submitted by Aurora Solar, LLC and respectfully request that it be withdrawn. If the CSLC and/or project applicant are interested in exploring alternative options within San Bernardino County that meet our policy requirements, our county staff will gladly assist with identifying locations that are suitable for this type of development.

Thank you for the opportunity to express our views on this project. We look forward to receiving a response to our comments.

Sincerely,

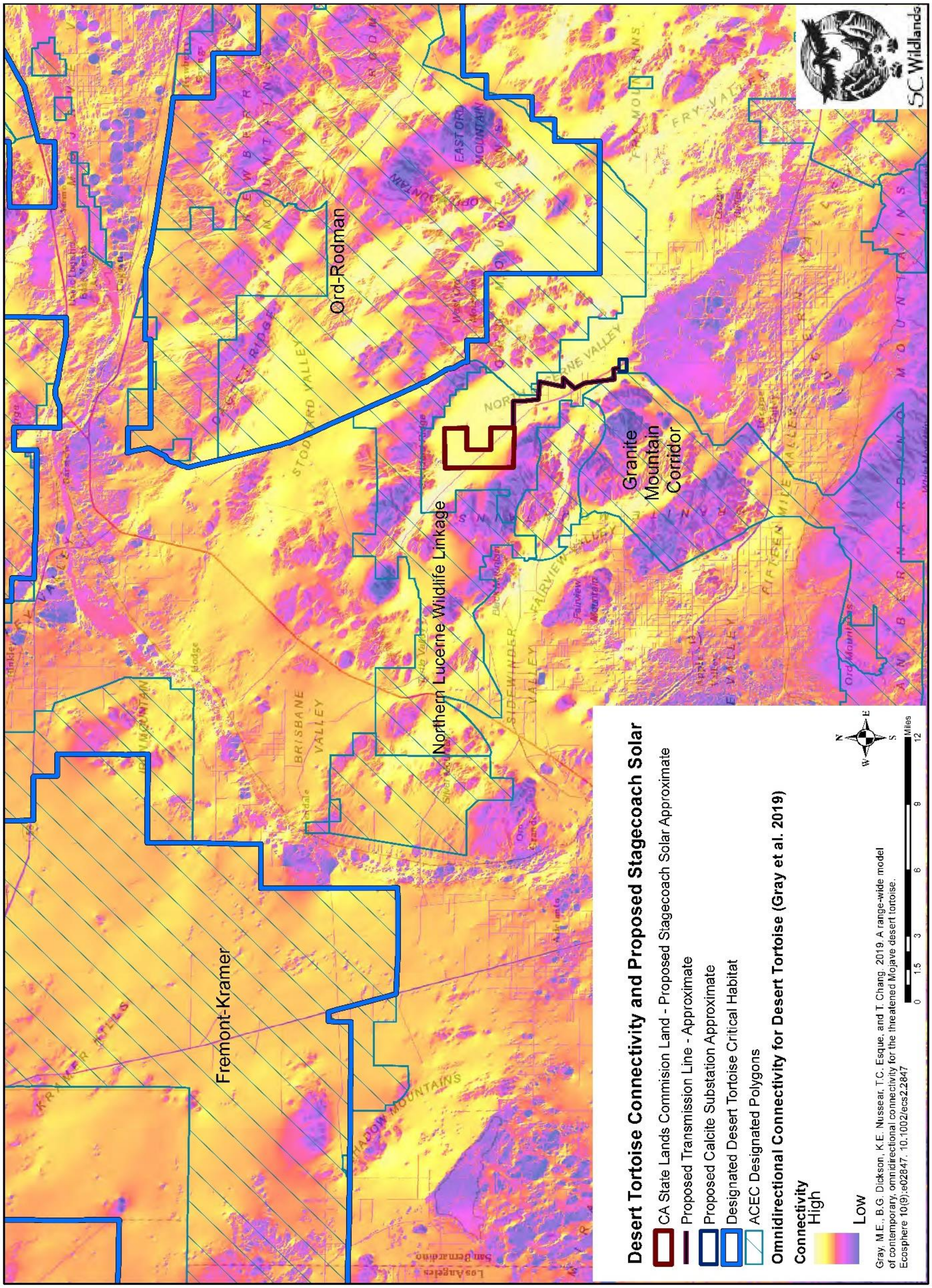
Dawn Rowe

Dawn Rowe
3rd District Supervisor
County of San Bernardino

Robert A. Lovingood
1st District Supervisor
County of San Bernardino

CC: Paul Cook, Congressman, 8th District of California
Jay Obernolte, State Assemblyman, 33rd State Assembly District
Shannon Grove, State Senator, 16th State Senate District

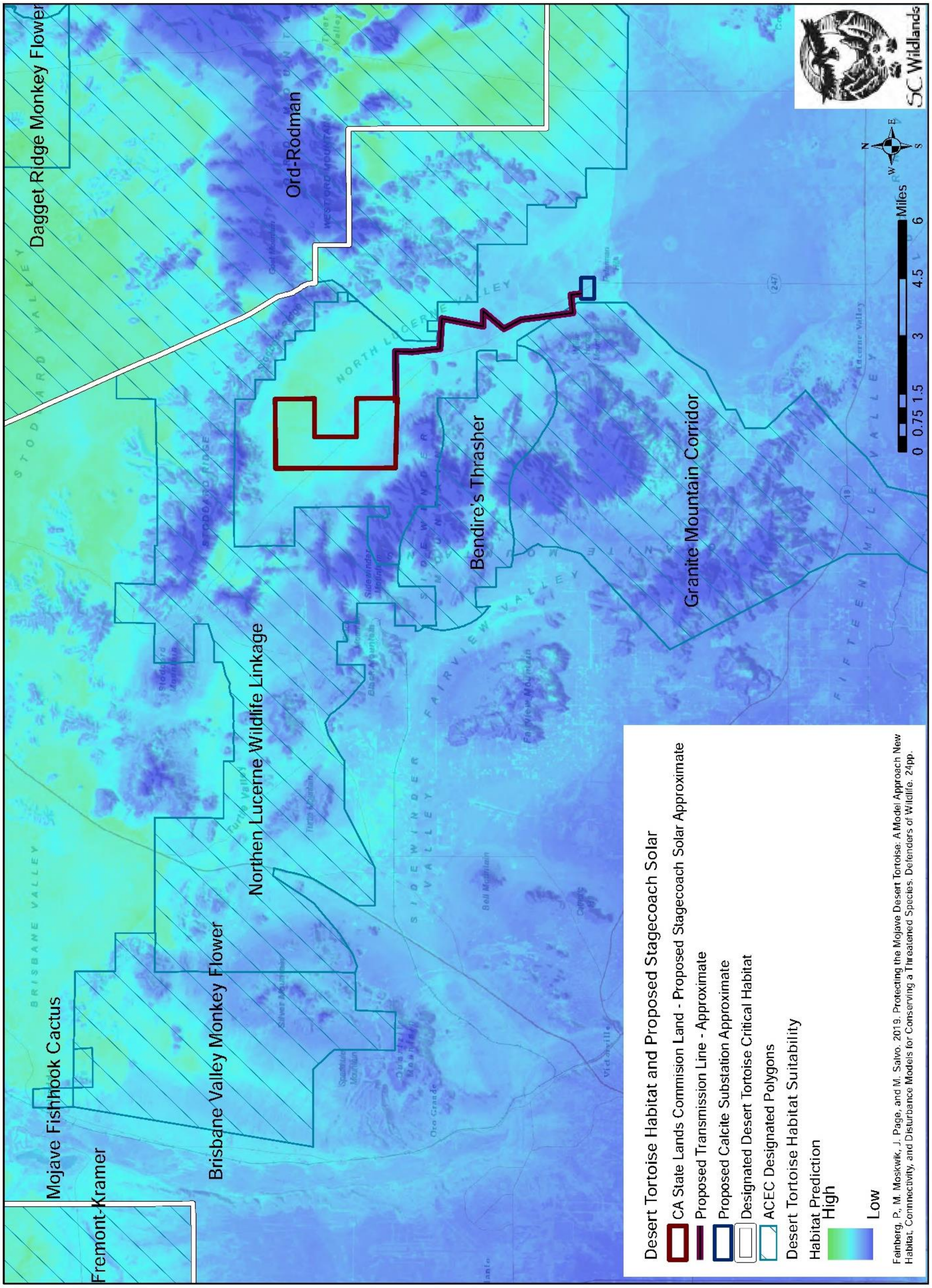
Comment Set E3 – Neil B. Nadler (cont.)



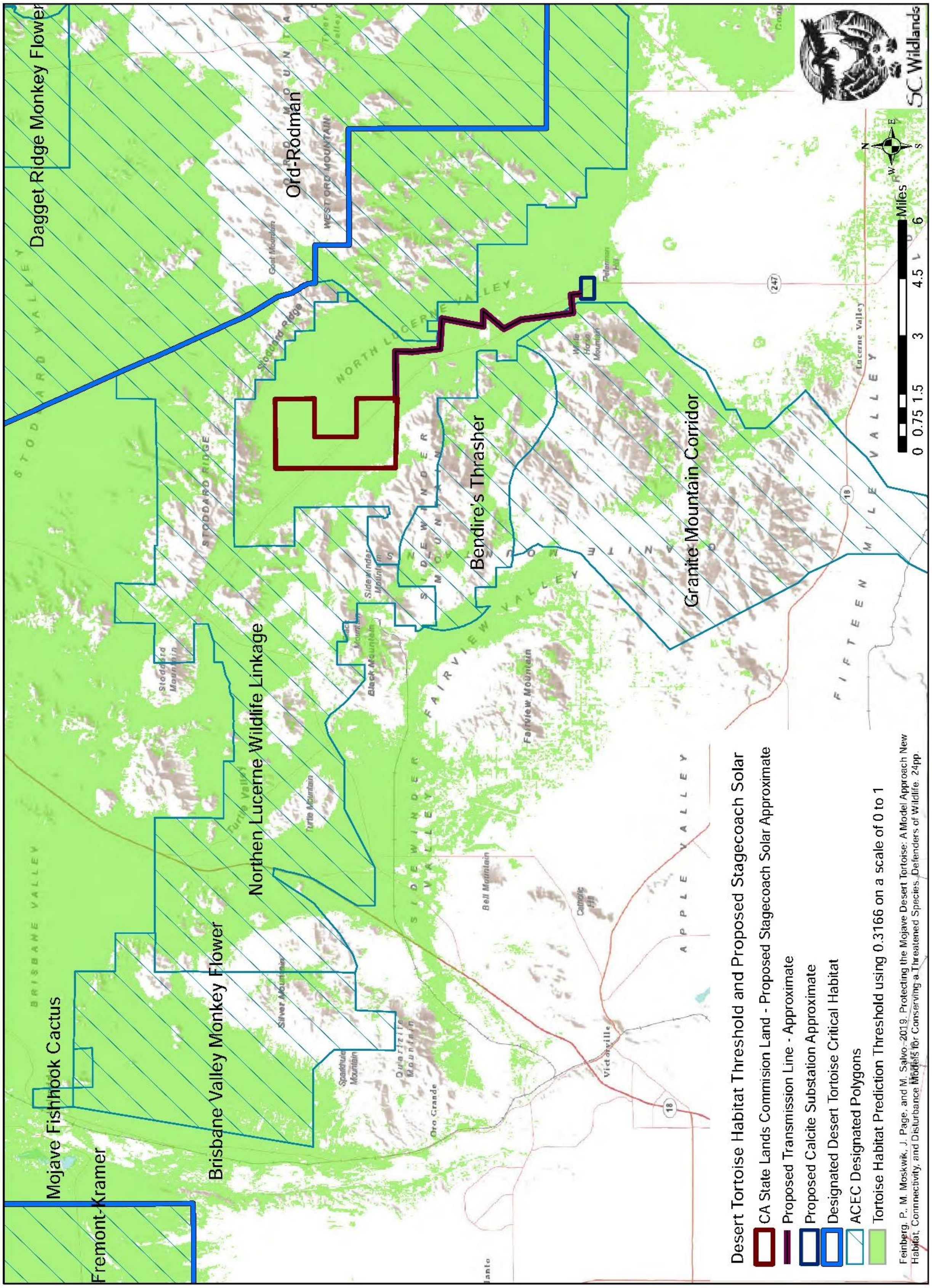
E3-2 cont.

Comment Set E3 – Neil B. Nadler (cont.)

E3-2 cont.



Comment Set E3 – Neil B. Nadler (cont.)



E3-2 cont.

Comment Set E4 – Brian and Sue Hammer

Brian and Sue Hammer
bhammer@mojavewater.org
33261 Haynes Rd Lucerne Valley, CA
P. O. Box 74 Adelanto, CA 92301

Conveyed via email to: Sarah.Mongano@slc.ca.gov and CEQA.comments@slc.ca.gov

Ms. Sarah Mongano
Senior Environmental Scientist/CSLC Project Manager
100 Howe Avenue Suite 100-South
Sacramento, CA 95825

Stagecoach Solar NOP Comments

Dear Ms. Mongano:

My name is Brian Hammer, I am a Data/GIS Analyst, an Adjunct Professor, and a Morongo Basin Conservation Association Board Member. My wife Sue is a Nurse, and a Nursing Educator.
We are homeowners in North Lucerne Valley.
We have grave concerns about the social, economic, and environmental consequences of the proposed project.

Our community has spoken often and loudly; We do not want industrial solar in Lucerne Valley. We have sought protection through repeated negative responses to each and every industrial solar development. We worked with the County for passage of the Renewable Energy Conservation Element 4.10 to exclude industrial solar sites from Community Plan areas. Citizens have completed and have submitted a comprehensive application for State Route 247 to become a California Scenic Highway.

Despite what was stated at the Scoping Meeting (10/28/20 2:00 PM) CEQA **does require consideration of community social and economic factors.**[1] We expect a full and complete assessment of primary and secondary impacts to the residents and visitors of the human consequences to the proposed site region. E4-1

This proposed project conflicts with our Community character, rural lifestyle and our values as stewards of the desert at the urban rural interface. E4-2

We have a series of concerns that must be addressed in this EIR.

1. Dust and the dust palliatives that may be used on the proposed site. Fugitive dust impacts from grading. What is the plan to control enduring long-term fugitive dust due to soil disturbance? Soils under the proposed sites have a known high eolian potential. Currently there is no air quality monitoring in the North Lucerne Valley area. E4-3

[1] 2012 Fact Sheet Environmental Justice at the Local and Regional Level, Legal Background presented by Kamala D. Harris, Attorney General https://oag.ca.gov/sites/all/files/agweb/pdfs/environment/ej_fact_sheet.pdf

Comment Set E4 – Brian and Sue Hammer (cont.)

Brian and Sue Hammer
bhammer@mojavewater.org
33261 Haynes Rd Lucerne Valley, CA
P. O. Box 74 Adelanto, CA 92301

Regional sites typically used for baseline air quality for site evaluations are AQMD sites in Victorville and/or Barstow. Be forewarned that these sites are wholly disconnected from the conditions at the proposed project site. Does the applicant plan on establishing an onsite air quality monitoring station for a period of one or more years to collect baseline and ongoing data? E4-3 cont.

2. What is the source of the water for construction and operation? This proposed project is in the Mojave Basin Area Adjudication's[2] Este Subarea. This area is in overdraft. Whom will supply water during and after construction? Do they have water rights to do so? Is there a will-serve letter or agreement? E4-4

3. Evaluation of the loss of carbon sequestration from disturbing desert soils.[3] This must be compared to the proposed projects estimated carbon savings. This comparison must span from the time of grading to the estimated full vegetation restoration to pre-project conditions after project decommissioning. The project is essentially intact functioning desert so full return to capturing and storing carbon can be hundreds to thousands of years. Will the applicant and its successors follow the guidelines outlined in the Surface Mining Control and Reclamation Act of 1977 (SMCRA)? Will reclamation be bonded? E4-5

4. What is the full carbon footprint of the project from construction to site restoration? The EIR needs to include a quantifiable analysis of all the GHG emissions associated with the manufacture of all the project's facilities (not just panels), construction equipment, equipment fuel use, mining of lithium, etc. This must be compared to the proposed projects estimated carbon savings and loss over centuries, see #3 above E4-6

5. What are the direct and indirect financial and social impacts[1] on desert tourism? People come from all over the world to see our natural living desert – not to see miles of industrial solar sites. E4-7

6. What are the effects of ambient noise associated with the proposed project? Noise travels long distances through typical High Desert ambient air conditions and has to be factored in for residents even 1+ mile away during operation and much further during construction. Ambient noise levels in the area are typically near or under 20dB (my measurements near the proposed site) E4-8

[2] Mojave Basin Area Watermaster https://www.mojavewater.org/watermaster.html

[3] Solar Power in the Desert Michael Allen and Alan McHughen UCR https://www.scribd.com/document/50559956/Solar-Power-in-the-Desert-Michael-Allen

Comment Set E4 – Brian and Sue Hammer (cont.)

Brian and Sue Hammer
bhammer@mojavewater.org
33261 Haynes Rd Lucerne Valley, CA
P. O. Box 74 Adelanto, CA 92301

7. A significant portion of the proposed project's site is inside SBCO CSA-29. How does the project reconcile the inconsistency between the proposed project and Policy 4.10 of SBCO's Renewable Energy and Conservation Element of the General Plan? [4] **E4-9**

8. How does the project reconcile the incompatibility of the proposed project and State Route 247 application to become a Scenic Highway? Which is by statute currently afforded the same protections during the application process as a Scenic Highway.[5] **E4-10**

9. What are the effects of the disruption of wildlife corridors and linkages if the proposed project is built? This includes but is not limited to Bighorn sheep, mountain lions, desert tortoises. All of these have been sighted in the project area. Impacts on wildlife corridors, and the adjacent Ord Mt. Area of Critical Environmental Concern and the Apple Valley Multi-Species Habitat Conservation. Plan need to be included in analysis. Some animals have been observed to migrate through the area. A single season wildlife survey will not detect the periodicity of these migrations. **E4-11**

10. Evaluate the visual blight to the viewshed. Existing projects in the area can be seen for over 20 miles. They are a stark contrast to the native desert terrain. **E4-12**

11. What are the effects of the destruction of thousands of acres of undisturbed desert flora and fauna habitat? This habitat currently supports a living functioning ecosystem. **E4-13**

12. The proposed project is in the Pacific Flyway. What is the estimate of avian fatalities of migratory birds through the "lake effect" and loss of food habitat of the proposed sites solar arrays and ground disturbance? **E4-14**

13. What impacts to home values will occur in the proposed project area in an economically depressed area? This financial stress of loss of value would cause physical and emotional health issues in the Community[6]. This proposed project is a disproportionate burden on a Severely Disadvantaged Community. Reference [1] **E4-15**

[4] SBCO Renewable Energy & Conservation Element https://countywideplan.com/policy-plan/beta/re/
[5] Scenic Highway Guidelines - Caltrans - CA.gov https://dot.ca.gov/-/media/dot-media/programs/design/documents/scenic-hwy-guidelines-04-12-2012.pdf
[6] Predictors of responses to stress among families coping with poverty-related stress Journal of Anxiety, Stress, & Coping Volume 25, 2012 - Issue 3 https://pubmed.ncbi.nlm.nih.gov/21614698/

Comment Set E4 – Brian and Sue Hammer (cont.)

Brian and Sue Hammer
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14. There are multiple rural homesteads scattered throughout the North Valley Community. The proposed project "will physically divide an established community". What will the effects of this division be to the Community? E4-16

15. Evaluation of the probable onsite occurrence of the Coccidioides fungus that causes Valley Fever (coccidioidomycosis) [7]. Valley Fever transmission by dust presents a serious and even fatal health risk to workers and residents of the Valley. [8] E4-17

16. What is the wildfire potential of power transmission infrastructures associated with the proposed project? E4-18

17. Undocumented earthquake faults. The proposed project location is in the California Eastern Shear Zone. Based on the project area's geology and adjacent mapped faults (by CAGS/USGS) there is a strong probability that there is a northwest-southeast trending fault through the project site. Two 7+ magnitude earthquakes have occurred in the area in recent history. Any battery storage buildings, inverter structures, or transformer enclosures could suffer catastrophic failure in the event of an earthquake along a fault. These must be considered "critical or sensitive structures" [9] E4-19

18. What are the effects of the destruction of open space leading to a decline in quality of life for residents? E4-20

19. Glint and glare from industrial solar sites cannot and will not be avoided no matter the coatings utilized. An evaluation of the glint and glare from solar arrays must be performed. This study must include effects on drivers on State Route 247 and area residential homes. [10] E4-21

20. The effects of soil grading and hard surfaces (to be built) to the watershed that provides drinking water for North Lucerne Valley. This would potentially negatively affect both water levels and water quality. E4-22

[7] https://www.cdc.gov/fungal/diseases/coccidioidomycosis/
[8] Coccidioidomycosis among Workers Constructing Solar Power Farms, California, USA, 2011–2014 Jason A. Wilken et al Nov 2015 CDC Emerging Infectious Diseases Volume 21, Number 11—November 2015 https://wwwnc.cdc.gov/eid/article/21/11/15-0129_article
[9] Guidelines for Evaluating the Hazard of Surface Fault Rupture, California Geologic Survey Note 49 https://www.conservation.ca.gov/cgs/Documents/Publications/CGS-Notes/CGS-Note-49.pdf
[10] Potential Impacts of Solar Arrays On Highway Environment, Safety And Operations https://www.codot.gov/programs/research/pdfs/2015-research-reports/solar-arrays

Comment Set E4 – Brian and Sue Hammer (cont.)

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bhammer@mojavewater.org
33261 Haynes Rd Lucerne Valley, CA
P. O. Box 74 Adelanto, CA 92301

21. The effects of soil grading and hard surfaces (to be built) on the blueline streams. Will water be diverted from the bluelines? Will stormwater be impounded onsite? E4-23

22. The creation of the proposed SCE Calcite Substation would act as an attractive nuisance as an invitation to the additional pending solar developments in the area.[11] This proposed project would bear responsibility and must account for and quantify the cumulative impacts of this project and the other proposed projects that would intertie to the substation. E4-24

23. An in-depth serious study, analysis, and consideration of the CEQA "no Project" alternative. E4-25

24. This EIR must be done for the proposed site and its region, it must not "Tier-off" the DRECP E4-26

In conclusion, we request the EIR address the listed concerns (and others not listed here) individually and for cumulative impacts, both temporal and spatial. It must be forthright and honest and through in describing those that cannot be mitigated.
We reserve the right to submit additional comments. E4-27

Sue E Hammer

Brian G Hammer Sr and Sue E Hammer 11/13/2020

[11] SBCO currently proposed industrial solar projects
http://www.sbcounty.gov/uploads/LUS/Renewable/SolarProjectList2020_Maps.pdf

Comment Set E5 – Tina Eyraud

Email: Stagecoach Solar Project Team

From: V.E.W. Enterprise <vewilsservice@hotmail.com>
Sent: Tuesday, June 15, 2021 11:13 AM
To: Bugsch, Brian@SLC <Brian.Bugsch@slc.ca.gov>
Subject: Stage Coach Solar Project Lucerne Valley

To my representatives,

I am a very concerned land owner, who along with the city of Lucerne Valley has been fight a solar project once named Aurora but renamed Stage Coach. This project which has been opposed, from the beginning, by San Bernardino County and Lucerne Valley citizens comes after a previous solar project that was started, promising power and jobs to local citizens. The promise of local jobs and power never materialized. The outcome was instead an influx of newcomers to the area, contamination of land, a population forced to relocate and landowners unable to sell their property. That project has since been abandoned. The new project is located in an undisturbed area, in almost pristine condition, full of wildlife including nine (9) species that are on the endangered species list. Some of these animals include Giant Garden Snake, Coachwhip Snake, Bald eagle, Golden eagle, Kit fox, Swanson hawk, and a small falcon species, Riparian brush rabbit, Big Horn sheep, Mountain Lion, Bobcat, Desert turtle, Western Diamond Back Rattle snake, Mojave green rattlesnake, Kangaroo rats, and Albino kangaroo rats, Antelope squirrels (chipmucks) and various seasonal migrating birds. Gila monsters have also begun migrating through the area. The are also ancient native plant species that are at risk, not to mention the insects including tarantula wasps, tarantulas just to list a couple. E5-1 E5-2

I'm interested in what the environmental impact report will actually say because every biologist that I spoke with who visited that area were not even aware of the natural species in the area. (If I have to explain to a biologist various native species including the Mojave Green is; that's a problem) Biologist should have been out here camping and doing research for at least a week to determine what species are in the area instead they came out once, some didn't even get out of their cars, and others walked a straight line together while using sticks to disturb the land.

I have been contacted numerous times to allow power poles to be put on my property, to which I adamantly denied. They went so far as to telling me that all of my neighbors are allowing it and I was the only one not allowing it. When I contacted my neighbors I found this to be false information as none of my neighbors were allowing the placement of power poles on their properties. E5-3

This morning at 6am a truck from "Quest" which is a subsidiary of Edison was parked at the edge of my property. He informed me that he was checking for utilities because Tri-County out of San Diego is going to be drilling. I informed this gentleman that this is all private property and then informed all of my neighbors who confirmed that they did not give permission to anyone to drill.

I contacted Tri County Drilling who informed me that they have all required permits to drill. I do not see how that is possible when all properties in the area are private and drilling cannot be one on private property. How would they even have obtained the proper permits to do so?
If you as my representative are negligent and allowing such atrocity, not only are you endangering the natural habitat for the native species but you are also making the land unlivable for everyone in the area including myself. If we receive a true environmental report there is no way an environmentalist would allow such a project because it would destroy the natural habitat for the native species.

Thank you, Tina Eyraud 951-903-3140

Appendix C.3

Public Scoping Meeting Transcripts

STAGECOACH SOLAR PROJECT PUBLIC SCOPING MEETING
October 28, 2020 – 2:00 pm

Transcript of Zoom Audio File

PRESENTATION

Sarah Mongano

Good afternoon. At this time we're going to start the public scoping meeting for the Stagecoach Solar project. It's October 28th, 2020 at 2:00 PM. My name is Sarah Mongano and I'm a senior environmental scientist with the California State Lands Commission, Division of Environmental Planning and Management. I'll be overseeing the preparation of the environmental impact report, or EIR for this project, in compliance with the California Environmental Quality Act or CEQA, and I'm going to share my screen with you, and start the presentation.

I'm going to ask you to bear with me for just a second what was working 2 minutes ago is not working right now. now I can advance my slides. Um, all of you that are joining the zoom meeting are currents, currently see a slide showing notes on the format of the meeting. Please note everyone in this meeting is being recorded. If you join by phone, the slide show that I'm sharing will be available on our website project page at www.slc.ca.gov/CEQA, which is C-E-Q-A, slash Stagecoach, hyphen, solar, hyphen projects. This is the same page where you would have viewed our notice of preparation for the project and found the information for this zoom meeting and the phone number. I have a presentation to share with you describing the project and the CEQA process that we will follow for the project. When that presentation is complete, I'll give more detailed instructions on how to comment here in the zoom meeting, or by phone, or by email, and then I'll open the meeting up to public comments.

Briefly, our agenda includes an introduction of the players and the purpose of this meeting, a description of the proposed project, an overview of the California Environmental Quality Act or CEQA process, a receipt of any public comments that are delivered today and then a closing of the meeting. The afternoon and the evening meetings will have exactly the same agenda and presentation. They are just for the convenience of members of the public who may prefer an evening over an afternoon meeting.

Key players in this process, the California State Lands Commission will be acting as the lead agency under CEQA, and preparing an EIR for this project, with the assistance of Aspen Environmental Group. Our applicant is Aurora Solar LLC, a wholly owned subsidiary of Avangrid Renewables, and they've applied for a lease of lands owned by the State Lands Commission on which to construct and operate a solar generation project called the Stagecoach Solar Project. Other parties involved include the California Public Utilities Commission as a responsible agency under CEQA and Southern California Edison Company who is the project proponent for the Calcite Substation, a portion of this project. With me representing our consultant Aspen today are Susan Lee, Hedy Koczwara, Sandra Alarcon-Lopez, and Grace Weeks all helping me in the background. And representing the applicant, Aurora solar are Harley McDonald and Kristen Goland.

The purpose of this meeting is for the public or agencies to provide input and comment on the scoping of the issues, and analysis that the State Lands Commission should consider in this EIR. The testimony we're interested in receiving at this point in the process are your comments on the projects range of actions, potential effects mitigation measures, and the project alternatives that you'd like to see considered in the EIR. Were fairly early in the process, we have a project description, but we are definitely conducting scoping to hear what you think of the project and what you'd like to see considered in the EIR at this time. However, in the interests of time, we're requesting that you limit your testimony to the issues that that we'd like to hear today.

We are accepting comments, but not engaging in extensive question and answer sessions. At this time, we are happy to engage in those by phone or by email, but our purpose today is to capture comments from as much of the public as possible. Comments can also be provided in writing by email or letter, Through November 13th, 2020.

I'll have further instructions later after the main presentation on how exactly you can provide comments by zoom today, but I will let people know that if we have a large number of commenters, we may limit people to 3 minutes of testimony.

So on to the projects. Here's an overview of the project location, the Stagecoach Solar Project area encompasses about 3000 acres of state-owned land in the central portion of San Bernardino County, about 12 miles northwest of Lucerne Valley and 15 miles South of the city of Barstow. The project area is located East of Interstate 15 South of Interstate 40 and about 3 miles West of State Route 247. This C shaped blue area you can see on the map. We also have in yellow the proposed gen-tie or power transmission route, and in red just to the South, the location of the proposed SoCal Edison Calcite Substation. Here's a closer view of the project area. You can see the same C shaped parcel owned by the State Lands Commission, which is the subject of Lee leased to the applicant.

So, the purpose and need for this project is to establish reliable solar power generating facilities in Southern California. Another benefit is for the State Lands Commission and the state in general, is that rents from these facilities generate revenue for the State Teachers Retirement Fund. The project will also assist in achieving the state's renewables portfolio standard and achieve substantial greenhouse gas reduction, assist California in transitioning the transportation sector to zero emission vehicles, and reliably store electricity in an economically feasible and commercially financial manner. This project locates the project, locates the solar generation facilities as close as possible to the facilities that have transmission capabilities. The site is placed in an area with high solar energy resources and its use is proven an available for solar voltaic and energy storage technologies. It's also going to create local employment options and opportunities and boost business activity.

A description of the project. It will produce up to 200 megawatts of solar energy. The applicant is looking to construct a solar facility and its associated infrastructure on 1950 acres of the 3000-acre parcel, including a 5-acre onsite electric substation, about 5 acres for O&M building's septic tank system and other associated facilities. A DC underground collection system, linking the photovoltaic modules to the onsite substation. 50 acres of battery storage facility for up to 200 megawatts for four hours and new access roads, perimeter fencing and security systems. It will also include permanent groundwater wells or an on-site water tank. Both of those water source options are being considered in the EIR. Traveling South from this facility is just over a mile of gen-tie transmission lines to connect this solar field with SoCal Edison's proposed Calcite Substation to bring that power into the main grid. The entire project is looking at approximately an 18-month construction period start to finish.

For the Calcite Substation that is going to be analyzed in this EIR, SoCal Edison is going to be sort of a secondary applicant that will design, construct, own, operate and maintain that substation under the

California Public utility commissions permitting jurisdiction. However, as a part of this main project, even though that Substation is not lit, located on State Lands Commission lands, it is being considered as part of one CEQA project. So that Substation is going to have a 220-kilovolt switchyard on about 7 acres with about four acres for drainage grading and roads, about 5000 feet of new transmission line, creating the Calcite-Lugo and Calcite-Pisgah 220 kilovolt transmission lines and about 700 feet of 12 kilovolt overhead, distribution line and 2100 feet of underground distribution line will provide temporary power. The project also includes installing fiber optic communication cables, equipment and associated structures.

So construction activities for this entire projects are anticipated to involve the following: surveying, staking, and installation of erosion control measures, constructing access roads to the site, site grading and leveling, trenching an installation of an underground electrical system in the solar generation facility. Um, that's placement of the batteries. Assembling the Array foundation and installing the solar array, that's the panels. And constructing a Gen-tie line between the solar generation facility and the Calcite Substation. This construction activity will be followed by testing and commissioning and then restoring any temporarily disturbed areas that won't be needed after construction.

I'm going to give you a brief overview of the CEQA process at this point and let you know where we are in the process. California Environmental Quality Act, or CEQA applies to the projects that require a discretionary approval from a state or local agency. There are exceptions for certain types of projects. This project is not one of those, so the preparation of an environmental impact report or EIR is required when evidence indicates that the proposed project would have a significant impact or impacts on the environment.

Here's a little flow chart of our EIR process. We start with a notice of preparation which most of you should have received a week or so ago. We are in the second blue box here, the scoping period. And holding our scoping meeting during that time. The next step in the process is preparation of the draft EIR, which will be prepared by State Lands Commission with the assistance of Aspen Environmental Group. In mid-2021, a draft EIR will be released for public Review period that will be a minimum of 45 days business days to review, and during that time we will hold more scoping meetings like this one or possibly in person, if COVID situation allows.

To also get the public's input, public and agency input on our draft EIR. At that point, Changes are made to the draft EIR based on comment received and a final EIR is prepared. That EIR will be taken to our Commission for a decision late in 2021. There will be a final public hearing at that decision point, so we're really very early in the process right now. We're interested in hearing all concerns about scoping of this project.

What's in an EIR? The contents include describing the environmental setting of the project area. Describing the project itself disclosing any potential impacts from the project and any of the alternatives that are being considered to the project, including the No Projects Alternative, and proposing measures to reduce or avoid significant environmental impacts called mitigation measures. The purpose of an EIR is to provide technically sound information for the decision makers, which are the State Lands Commission Commissioners to consider in evaluating the proposed projects. Ultimately, the decision our Commissioners will be making is whether or not to lease this area to Aurora solar for the purpose of building solar facility.

Major elements of an EIR include a detailed project description, description of alternatives to the process, there will be some alternatives that have been screened out early, others that will be carried forward and fully analyzed in the document, and one of those alternatives ultimately, will be chosen by the Commissioners, one of those alternatives is always the no projects alternative. Then in EIR will describe the impacts of the proposed project and the impacts of any alternative projects and it will describe any mitigation measures that have been proposed to reduce those impacts. Finally, an EIR includes a discussion of cumulative impacts, direct impacts, growth inducing effects on the area. And then includes a mitigation and monitoring program, listing any mitigations to reduce impacts.

Impacts are based on changes to the environment compared to existing conditions, so the condition of the site as it is now during the scoping period is considered to be a baseline condition. Impacts will be analyzed based on any changes to the site as it is today. CEQA requires that analysis focus on significant impacts and that those significant impacts be avoided or reduced as much as possible with mitigation measures. Social and economic impacts are not considered significant under CEQA.

Just a note for those when you're reviewing the draft environmental impact report: Alternatives are generally not evaluated to quite the same detail as the proposed project, but they will consider every impact area.

So, at a preliminary level, this project has been evaluated and could result in impacts to the following resources. These are resources listed under CEQA and include: aesthetics, agriculture, air quality, biological resources, cultural resources, energy, geology and soils, paleontology, greenhouse gas emissions, hazardous materials, hydrology and water quality, Land use and planning, mineral resources, noise, population and housing, transportation, tribal, cultural resources, utilities and service systems and wildfire. The Commission will also be considering environmental justice issues, which is not an impact required by CEQA, but one required by the Commission itself, we included in the EIR just to have a convenient way to analyze this issue and get public input.

So, alternatives for this project in general are alternatives for an EIR will be determined by CEQA requirements. They need to be consistent with most projects' objectives, they need to be able to reduce or avoid impacts that may come up in the proposed project, and they need to be feasible. Uh, they might include something in the nature of a structure, design, or a change in location within the project right of way. Uh, no project alternative is also always considered. What would happen if this project was denied and no project was built? We welcome scoping comments, suggesting alternatives to the proposed project, and all of them will be looked at and evaluated.

So, our tentative schedule again is we're right here on the second bullet at our scoping meeting on October 28th. Scoping comments, if you choose not to make them today and send them in, by email or by letter are due November 13th, 2020. And we are anticipating preparing the draft EIR and then releasing it about midway through 2021. Anybody who comments on the scoping today will be on the mailing list, and received notification of that EIR, and it will have a minimum of a 45 day public review period and a public meeting, either a live meeting in person near the site, or a zoom meeting as we're doing today and then we're anticipating that the State Lands Commission will take action on a final EIR and project application at a publicly noticed meeting late in 2021.

So, we're getting close to our time for accepting public comments. Just a reminder - helpful scoping comments include: Identifying the location and extent of environmental impacts. If you are aware of an environmental issue or resource that we may not have recognized in our scoping documents, we'd love to hear about it. We'd like you to recommend issues that you feel should be addressed in the EIR and recommend any alternatives that would avoid or reduce impacts from the proposed projects.

OK, some notes on how we're going to do this with zoom. I have Aspen staff behind the scenes helping me out here. If you would like to make a scoping comment here at the meeting, please use the raise hand feature. On most computers you need to go down to either up to the top or down to the bottom of your screen, and you will get a pop-up you can see here inside the red box. It's going to look. You'll see chat and raise hand click on the raise hand feature and it will put you in the queue. Um, you will not be able to use video, but we will call on you individually. You will be unmuted, and then we'll call on you to speak.

If you would prefer to write in your comments rather than speak, you can use the chat feature, and that will give you a chat bar that you can type comments into. You can also email or mail your comments and I will have information for that on the last slide of this presentation. If anybody is joined by telephone only and doesn't want to or can't comment via the zoom meeting, you would press star 9 to raise your hand, and Aspen will get your name or phone number, and when you're called on, you'll press Star 6 to unmute yourself. I'm going to leave these instructions up on the website and at this point we're going to open up for public comment.

COMMENTS RECEIVED

OK. I am seeing 3 hands. Oh Ok, we have quite a number of hands being raised so I am going to limit everybody to 3 minutes. Our first speaker today is, and please correct me if I mispronounce your name, John Zemanek

John Zemanek

Can you hear me now?

Sarah Mongano

Yes, I can hear you. Thank you. Did I pronounce your name correctly?

John Zemanek

Yeah, Zemanek you did.

Sarah Mongano

Zemanek, thank you.

John Zemanek

I'm a member of Royal Way which is a church that owns and operates a spiritual retreat center in Lucerne Valley. Uh, Lucerne Valley has been my spiritual home, and frequently in my literal home for 28 years. The State Lands Commission's environmental Justice policy is that past environmental injustices will not define California's future, and all communities equitably must share in the environmental benefits and burdens resulting from its decision. The State Lands Commission's mission includes the obligation to preserve replaceable natural habitats for wildlife, vegetation, and biological communities. Now judge against these criteria and this project is on State Lands Commission land. So, it has to be judged by these criteria. Stagecoach Solar is a total nonstarter. We have to ask where is the environmental justice in this project? Lucerne Valley is an economically-disadvantaged-community because its residents are substantially older, poorer and sicker than the norm. Therefore, Lucerne Valley deserves special consideration when deciding who should bear the burdens of a new development. This comes straight from the San Bernardino County Environmental Justice background report. We already know that big solar projects and the Lucerne Valley don't mix, and we know because we already have some of those projects we've had them for some years. All they've done is to degrade the environment and pare our health and set back the local economy and we've really gotten nothing in return. I saw the reference to jobs being created, that is never proven to be the case. Unfortunately, these existing projects aren't nearly as big as Stagecoach, and they are not in areas as environmentally critical as Stagecoach, and none of them required a new Edison substation. And also, how about the Land Commission's mission of preserving every place? Will natural habitats for wildlife, vegetation, and biological communities? That's exactly what the Stagecoach Solar site is an undisturbed, irreplaceable natural habitat, and an essential link in a species connectivity corridor. This is where we're going to put a 3000 acres solar project that just doesn't make any sense. It doesn't square with the Line Commission zone criteria. There's one very good alternative to the Stagecoach Solar Project, which is the no project alternative. I'd say build it elsewhere, build with the local community actually wants it, or better yet, build it where there is no local community and where the environmental values are low. The Board of Supervisors of San Bernardino County already identified five such areas close to existing transmission, totaling about 162,000 acres. Thank you for considering my comment.

Sarah Mongano

Thank you Mr. Zemanek. Our next speaker is Steve Mills.

Steve Mills

Sarah, can you hear me?

Sarah Mongano

Yes, I have you go ahead.

Steve Mills

OK good. Again, my name is Steve Mills and I want to talk a little bit about the cumulative effects of growth inducing effects Stagecoach solar would have if approved, the project would be the opening gun to the industrialization of what Mr. Zemanek described was a unique region and it's unique because human and natural communities have long managed to thrive side-by-side there and green lighting Stagecoach Solar would justify - as you mentioned - a new regional electrical substation which Edison is proposing to build about 7 miles South of the Stagecoach site. This new substation would allow thousands of acres of utility scale renewable energy projects which are currently under application for Lucerne Valley with the County to move forward. Now one of the reasons these projects have been stalled is that they don't have a connection to the regional transmission grid. With the Edison Calcite Substation, they would, and these additional new utility scale projects would in turn want to justify themselves by calling Lucerne Valley's once intact and scenic natural habitat “damaged goods” that is no longer worth preserving. Now, together with Stagecoach solar. These new proposed utility scale projects would re purpose as industrial sites over 8136 acres of Lucerne Valley and Edison would likely site approval of Stagecoach Solar and the other utility scale projects is justifying reviving the highly controversial, intensely opposed Coolwater Lugo transmission Project, Edison would no doubt claim that project would be needed to carry all those new megawatts down to Los Angeles. All this development would spur even more large-scale solar projects in Lucerne Valley if allowed to proceed. This would create a self-perpetuating cycle that would soon reach critical mass. And Lucerne Valley will once and for all become Solar Valley and much of its desert floor would be covered with thousands of acres of pivoting solar panels and lots of plumes of blowing dust and miles of new transmission line crackling overhead. It's well established communities and wildlife habitats would be driven out in the process. So, I guess to sum it up, the EIR can't afford to ignore the fact that Stagecoach Solar will have growth inducing cumulative effects that are toxic to the well-being of the entire region. Thank you, that's my comment.

Sarah Mongano

Thank you, Mr. Mills. Our next speaker is John Lehrer.

John Lehrer

Can you hear me?

Sarah Mongano

Yes, I can.

John Lehrer

Thank you very much. Yeah my name is John Lehrer and I've lived in Apple Valley for nine years. Stagecoach solar would be located right in the midst of the Multiple Species' Habitation Conservation Plan and the Natural Community Conservation Plan that's being jointly developed by the County and the town of Apple Valley. This conservation plan covers the Granite Mountains, which are within the town's designated sphere of influence and it extends over the western portion of the Lucerne Valley Community Plan area. The plan balances the community's recreation and economic needs with landscape scale conservation needs, climate change with protection of species diversity. The plan is designed to accomplish this by maintaining connections with multi-generational wildlife linkages that extend across the Mojave Desert. This conservation plan is highly evolved. It's very detailed, is fully formed, and the County and Apple Valley are committed to launching and implementing it. The plan has been in the works for years and is founded on ground truthing and unpublished species connectivity studies that were had been made by recognized wildlife biologists as well as on studies by the United States Fish and Wildlife Service. Apple Valley's been proactive in publishing the plan and the underlying data, going back to 19 or 2011 is submitted detailed scoping protest in comment letters. When the DRECP posed a threat to the integrity of the plant. Now still, Stagecoach solar would directly. And inevitably, conflict with this conservation plan because it would industrialize key portions of his wildlife connectivity corridor and would entirely unravel the plan's carefully calibrated species conservation design. The result would be loss of critical natural habitat and endangered species would be driven out of the region. Stagecoach solar, due to its many adverse environmental impacts, is on a direct and unavoidable collision course with this habitat conservation plan. Project EIR cannot afford to ignore or paper over this irreconcilable conflict. Thank you very much.

Sarah Mongano

Thank you, Mr. Lehrer. Our next speaker is Neal Nadler and please again, correct me if I have mispronounced your name.

Neil Nadler

Can you hear me now, Sarah?

Sarah Mongano

Yes, I can thank you.

Neil Nadler

You got my name correct. My name is Neil Nadler from Lucerne Valley. From an environmental standpoint, Stagecoach Solar has an almost impossible task ahead of it. Most of the project area is ecologically intact land which has high landscape integrity and supports conservation targets which requires a level of protection that will enable it to continue to support ecological processes and provide connectivity. The site is located in the middle of the Northern Lucerne Valley wildlife linkage slash Wild Wash linkage. The 2015 California Department of Fish and Wildlife State Wildlife Action Plan says, and I quote, this linkage has high quality desert tortoise habitat and is critical for migrating the effects, mitigating the effects of climate change. On the desert tortoise populations. It is a multi-generational linkage, between designated critical habitat units for the desert tortoise, the linkage also benefits the movement of other desert plants and animals, allowing them to adjust to climate change. End Quote.

It is impossible to achieve that degree of protection while building and operating a major solar facility on high quality habitat, representing as many as 18 special status threatened or endangered species of plants and animals. The site is completely surrounded by federally protected Areas of Critical Environmental Concern, National Conservation Lands, and adopted wildlife corridors for the DRECP reserve design. Each spring bighorn sheep migrate through this area. There are more than 40 Golden eagle nests located within 10 miles of the site. The site is part of conservation lands in the MSHCP, and NCCP soon to be forthcoming from the town of Apple Valley and the County of San Bernardino. To put a utility scale solar project at this location is antithetical to the MSHCP and NCCP because it would completely sever the northern Lucerne Valley Wildlife linkage design - as acknowledged by the CDFW and the US Fish and Wildlife Service. The State Lands Commission's 2015 strategic plan states that when it comes to renewable energy development, the Commission is to mitigate its effects by avoiding state lands with environmental quote unquote resource value. This is to be accomplished by leasing or exchanging them with other lands with less environmental value. The mandate that the Commission explore also all such alternatives must also be factored into the project's environmental analysis. Lastly. The site is home to 13 NHD intermittent flow lines which cross the site. The project completely disrupts the hydrology of this area, which is relied upon by the species and is key to the survival of the wildlife in this corridor. Thank you.

Sarah Mongano

Thank you, Mr. Nadler. Our next speaker is Bob Howells.

Bob Howells

Hello Sarah, can you hear me?

Sarah Mongano

Yes, I can.

Bob Howells

OK, yes I'm Bob Howells. I'm a fifth generation native of the high desert and a member of the Royal Way community. Stagecoach Solar would disturb thousands of acres of desert soil and eliminate vegetation that would otherwise prevent fugitive dust and Valley fever spores from being emitted. The project would entail extensive grading, scraping and trenching to install solar panels, inverter pads, trackers. The honeycomb of roads needed for construction, maintenance and cleaning poles for a new transmission line. A perimeter security fence and subsurface lines. So the EIR must include an quantification as to acreage that would need to be graded and scraped, the amount of earth that would be disturbed in the process and the volume of dust and spores that would be released during construction and during ongoing operation. This data is crucial because the project site has a high aeolian dust potential for both PM 10 and PM 2.5, and that's according to the DRECP soil sensitivity Maps. And because nearby utility scale solar projects have proven to be particularly bad neighbors in terms of dust release. The results of the study would have to be correlated with an analysis as to how much damage that grading and plant operation would inflict on the health of the community and on the surrounding natural habitat through the release of dust and spores. This analysis would be particularly important because Lucerne Valley has both a vulnerable older population and nearby elementary, middle and high schools. Without such integrated studies, the EIR's assessment of Stagecoach Solar's environmental and excuse me environmental justice impacts would be nothing more than surmise and speculation. We believe that independent assessments will further confirm that there's no way the Stagecoach solar project should be sited in the Lucerne Valley Community plan area. Thank you.

Sarah Mongano

Thank you, Mr. Howells. Our next speaker has only listed a telephone number, but it ends with 0202. We're going to unmute you and I'm going to ask that you state your name and affiliation.

Brian Hammer

OK, can you hear me?

Sarah Mongano

Yes, I can.

Brian Hammer

OK, excellent. My name is Brian Hammer. I'm a data GIS analyst, an adjunct professor, Morongo Basin Conservation Association board member, and my wife and I are homeowners in North Lucerne Valley. Our community has spoken often and loudly that we do not want industrial solar in Lucerne Valley. We have sought protection through repeated negative responses to each and every industrial solar development. We worked with the County for passage of the renewable Energy conservation element 4.10, to exclude industrial solar sites from Community plan areas. The site is partially inside a community plan area. Citizens have completed and submitted a comprehensive application for State Route 247 to become a California Scenic Highway which is immediately adjacent to the project. Your proposed project conflicts with our community character and values. I have a series of concerns that I feel should be addressed in the EIR. This is a brief list, I will be submitting more recent, more written comments. Just an associated health concerns including asthma and Valley fever. Destruction of viewshed. Destruction of the wildlife connectivity and corridors. The social and economic effects on the local residents. The destruction of the existing desert carbon sequestration and the underground soils. The effects on flora and fauna by the destruction of thousands of acres of undisturbed desert that currently supports a living functioning ecosystem. The effects of the proposed project on the watershed that provides drinking water for North Lucerne Valley. I will be submitting more detailed written comments by email. Thank you for this opportunity to speak.

Sarah Mongano

Thank you for your comments. Our next request to speak is Kristeen Penrod.

Kristeen Penrod

Can you hear me now?

Sarah Mongano

Yes, Christine, you are unmuted. Go ahead.

Kristeen Penrod

Thank you for the opportunity to comment. My name is Kristeen Penrod. I'm the director of SC Wildlands, a nonprofit focused on wildlife movement and habitat connectivity. The NOP is supposed to identify potential environmental impacts of the proposed project, as identified through the initial study, which is largely based on the environmental checklist in Appendix G of C of the sequel guidelines under Biological Resources. The NOP stated that the EIR will examine proposed project activities on federally or state listed species or species proposed for listing conflicts with any local policies on biological resources. Any conflicts with local, regional, or state habitat conservation plans, but section six source I'm sorry. Section 4 of the Environmental checklist under CEQA that covers biological resources actually has six different questions that the project proponents must answer. The anticipated project impacts identified in the NOP address three of the six questions A, E, and F, but they neglected to include D. Will the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or wildlife migratory wildlife corridors or impede the use of native wildlife nursery sites? The proposed project, as we've heard, is within areas defined as wildlife corridors by the DRECP, including the Desert Linkage Network delineated by Penrod et a in 2012, the Bighorn Sheep Intermountain Habitat identified by California Department of Fish and Wildlife in 2013, The Desert Tortoise TCA habitat linkage, specifically the Fremont, Kramer-Ord Rodman linkage delineated by Avril Murray et al in 2013, and there's also a recent US Fish and Wildlife Service internal Discussion Draft, which is dated just September 25th of 2020 entitled Connectivity of Mojave Desert Tortoise Populations management implications for maintaining a viable recovery network, which also highlights the importance of the Fremont Kramer Ord Rodman linkage. Another recent analysis, a range-wide model of Omni directional connectivity for the Mojave Desert Tortoise, also shows the proposed project site as being very important for Desert Tortoise movements. As we've heard, the draft Apple Valley MSHCP, NCCP also identifies the State Lands Commission lands as part of their reserve design, specifically the Wild Wash Linkage, which is part of this overall, Fremont Kramer-Ord Rodman linkage. The State Lands Commission also contributes to the San Bernardino Granite Mountains linkage ACEC. The EIR must address impacts to have habitat connectivity and wildlife movement corridors, including desert washes, and not just for listed in candidate species, but for all native species of interest in the region, as called for in the CEQA guidelines. Thank you for the opportunity to comment.

Sarah Mongano

Thank you, Miss Penrod. Our next speaker is Bill Lembright.

Bill Lembright

Hello, hello.

Sarah Mongano

Hello, I can hear you go ahead.

Bill Lembright

OK thanks. Bill Lembright from Lucerne Valley Market and hardware long time Lucerne Valley resident. The name Stagecoach springs to mind pleasant images of our Western history, but there's nothing pleasant about an 8 square mile solar project imposed on our quaint desert community by the state bureaucracy in Sacramento at the expense of the retired low income residents of Lucerne Valley. It's so beautiful here that our Hwy 247 is under consideration to become a state scenic highway. San Bernardino County and its renewable energy conservation element of the County code has already assured US protection from industrialization by renewable energy. We request that the state do the same thing and move this project to other state lands and areas without communities, residential communities. There is some areas surrounding Harper dry lakes existing solar fields that have no residences. Some areas outside El Mirage, some state lands outside the community, lands to Trona and they already industrial a nonresidential district at Kramer Junction. If necessary, BLM may be willing to swap lands with the state to allow Stagecoach solar in a nonresidential area. Now if you offer free or half price power to Lucerne Valley residents, she might be welcomed here. Why is that that the renewable energy developers so often take from the poor to make a profit? The state’s environmental justice guidelines should come to applied here. Taking from the poor to enrich those wealthier than they just seems wrong. Then there's a 7.6-mile transmission line that messes up more low-income property values, which is more economic injustice. Then a new electrical substation would be built, which we're convinced will begin a chain reaction of multiple other industrial solar farms that were applied for before the counties RECE plan was finalized and would be grandfathered in once the new substation is built, not only with this project hurt us economically, it will drastically lessen our air quality and terror. Health in danger are already scarce. Water supply and amateur stellar views. The very survival of our community is at stake, so please build Stagecoach solar elsewhere.

Sarah Mongano

Thank you Mr. Lembright. OK, I apologize where you where you going to keep going?

Bill Lembright

Um, there is someone here at the same at the store who wanted to talk to you but can't get on. And she asked me if I could get permission for her to make her statement also.

Sarah Mongano

Oh absolutely, please ask her to state her name and affiliation and let her know that we are recording all of these comments so that we can transcribe them.

Bill Lembright

OK, I'm gonna walk towards her, 'cause I didn't know I was gonna get permission. OK here she comes. Please take training.

Sarah Mongano

Thank you Miss Goemmell, this is Sara Mongano. I'm a senior environmental scientist with the California State Lands Commission and we would love to hear your comments on scoping for this project. We are limiting comments to 3 minutes because of the number of commenters we have. But please go ahead and state your name, your affiliation with any organization and just know your comment will be recorded at.

Linda Goemmell

Linda Goemmell, Lucerne Valley Market in hardware, President

Sarah Mongano

Go ahead with your statement.

Linda Goemmell

We oppose the Stagecoach solar, for various reasons is an invasion of our beautiful desert Valley. It's going to bring a Substation that's going to bring on hordes of more projects is reducing property values and robbing the people of their value they've put their life's work in. And it's in industrial urban blight that we do not want out here in the rural desert. Nobody that we know wants it. We don't want it. Please, please turn it down. We're against it. Thank you.

Sarah Mongano

Thank you for taking the time to make a comment. OK, at this point I have no other hands raised here in the zoom meeting. I'm going to give everybody just a minute in case somebody changes their mind and wants to put their hand up. And I'm having no takers so We're going to move on. Ah, we have. We have a hand hang on, let me let me get back to that screen. Um, we have Rick Benson who would like to make a comment.

Rick Benson

Yes, hello Sarah, can you hear me?

Sarah Mongano

You can go ahead Mr. Benson.

Rick Benson

Thank you very much. My name is Rick Benson and my wife and I are homeowners in Lucerne Valley for the last 20 years. There's no need for Stagecoach solar to be cited In Lucerne Valley's community plan. The county's Renewable Energy and Conservation Element designates 5 areas as being ripe for utility scale renewable energy development. These five areas are well away from the Community plan districts and consist of hundreds of thousands of acres. They are close to transmission and they are considered already environmentally disturbed. The county's Renewable Energy and Conservation Element, specifically it's Policy 4.10, actually forbids utility scale projects from being located In Community plan areas like Lucerne Valley. And the County Solar Ordinance, the City-Wide Plan in the DRECP policy Letters, among others, support the key objective behind Policy 4.10. Which is to prevent utility scale development from destroying high desert communities. These protections represent a hard-won compromise between the County and its communities - one that balances preserving them with future renewable energy development in the County. You can bet that high desert communities will come out strongly against projects like Stagecoach Solar that try to upend it. The County and the town of Apple Valley also have a big stake in this. They have long been collaborating on a multi species habitat conservation plan that includes the Stagecoach Solar Project site in its wildlife connectivity design. Given that Stagecoach solar so obviously conflicts with crucial protections put in place by the County and would cause so many environmental problems moving forward with it could not possibly be a better alternative than no project alternative. The Stagecoach Solar is clearly the wrong project for a wrong location. Thank you very much.

Sarah Mongano

Thank you, Mr. Benson. Do we have anyone else who would like to speak? OK, so if I can direct everybody's attention back to the slides on your screen. The end of this comment period is Friday, November 13th, 2020. That's the last day for written comments to be received or postmarked. Our preferred option for receiving comments is email to CEQA comments at slc.ca.gov that is on your screen here also on the NOP and email mailing list, some of you have may have received the postcard others if you may have received. You can also send a Mail copy to the California State Lands Commission address here on this slide attention myself. Sarah Mongano. If you email your comments, please send them to the CEQA comments email address rather than to me. It just makes our process for processing the more streamline and write Stagecoach solar project NOP comments in the email subject line. Please be sure to include your name and contact information. And whether you are already on the project notification list or would like to be added.

And, um, I see we have a hand raised. Yes.

Eric

Sorry, correcting the Email - it should be "CEQA dot comments."

Sarah Mongano

Thank you Eric. OK, in case anybody didn't hear um, the email comment on this slide is incorrect. It should be CEQA dot comments at slc.ca.gov. That is correct on all the mailings that have gone out and that will be corrected as soon as this presentation is posted to our website and before we have our 6:00 o'clock meeting tonight before we wrap up. I see that Mr. Nadler has his hand raised, could we unmute him?

Neil Nadler

Can you hear me Sarah?

Sarah Mongano

Yes, I can.

Neil Nadler

Uh yes. Um Kristeen Penrod mentioned some environmental checklists that was required of the notice of preparation. And from what I understand that has not been adhered to. Uh, and I don't know. I don't know to what extent it hasn't been adhered to. I'm not a Uh, environmental biologist like Kristeen so what I do want to understand is, you know, I don't wanna not dot the eyes and cross the T's. Is there anything that the state lands has to do in order to comply with CEQA and maybe even further notifications and things like that because from what I gather, it's a checklist and certain boxes were not checked. Can you, can you respond to that?

Sarah Mongano

Yes, I can. We are very early in in processing this project so the EIR, CEQA does have a checklist of issues that they require us to go through. All of those will be checked in the draft environmental impact report. What we have right now is that you saw in our scoping document and our notice of preparation is the basics of an early project. Um, it is sort of the anticipated major issues that may that we may be facing and moving forward with the analysis on this project, but it certainly is not every issue that is going to be analyzed in the environmental document and this is part of the reason we have these scoping meetings is we want to hear from members of the public and other agencies and groups to see if we've missed anything that should be analyzed. So, we appreciate those comments and yes, they will all be considered moving forward in analysis of the environmental document.

Neil Nadler

Thank you.

CLOSING

Sarah Mongano

Let's see. Oh, I apologize. I thought I saw another raised hand, but it looks like I didn't, so we're going to wrap up this meeting at this point again. Email comments should go to CEQA.comments@slc.ca.gov. Stagecoach Solar Project NOP comments in the email subject line please. On the next slide, you're going to see my contact information. Please let me know, contact me, questions, concerns. Um, with your desires to be put on the mailing list. You know somebody who wants to be put on our notification list. Please let me know. Um, with COVID, at this time, I am working from home so I will say, well, my phone number is on here. The fastest way to reach me is going to be email and it is the preferred way to reach me right now, but. All of this information is also on the project page on our website. At this point I'm going to wrap up this meeting and I want to thank you all for attending.

The next public hearing on this project will be held after the release of the public draft Environmental Impact Report. We anticipate that happening in the first half of 2021, most of the Environmental Impact report still needs to be written. We also are having a second meeting tonight at 6:00 o'clock. The presentation will be the same. It's simply an opportunity for other members of the public to comment. If you commented today, we've recorded and captured your comments and you don't need to comment again. I want to thank you all for your interest in this project and for taking the time to participate and talk with us today and at this time I'm going to close this meeting. Thank you very much.

STAGECOACH SOLAR PROJECT PUBLIC SCOPING MEETING
October 28, 2020 – 6:00 pm

Transcript of Zoom Audio File

PRESENTATION

Sarah Mongano

OK, good evening. This is the Stagecoach Solar Project Scoping meeting presentation. At this time, we're going to go ahead and start the public scoping meeting. It's October 28th, 2020 at 6:00 PM.

Welcome everyone and thank you for your interest in this project. My name is Sarah Mongano. I'm a senior environmental scientist with the California State Lands Commission, Division of Environmental Planning and Management and I'll be overseeing the preparation of an environmental impact report or EIR for this project. In compliance with the California environmental Quality Act or CEQA. So all of you attendees should see my screen right now and we'll get the presentation started.

Just some format issues for this meeting. You should currently be seeing a slide showing notes on the format of the meeting. Please note that this meeting is being recorded. All public comments will be recorded and transcribed to make sure we've captured them all accurately. And if you join by phone and you can't see the slideshow, you're not in zoom the slide show that I'm sharing is available in our website project page, which is www.slc.dot.ca.gov/CEQA/stagecoach-solar-project all lowercase.

You'll be able to take a look at the PowerPoint presentation there. So I have a presentation to share with you describing the project and our CEQA process. That we will follow. And when that's complete, I'll give more detailed instructions on how to comment here in the zoom meeting, or by phone and then open the meeting up to public comments. Our agenda for tonight briefly includes our introduction and the purpose of this meeting, a description of the proposed project, an overview of the CEQA process, and taking receipt of any public comments that you want to deliver today, we've had an afternoon meeting at 2:00 PM. This is the same presentation that we showed at that meeting too. Meetings are purely for the convenience of Commentors. Some people prefer to comment during the work day, others in the evening after work.

So our players in this process include the State Lands Commission acting as the CEQA lead agency for the project. And preparing an EIR with the assistance of Aspen Environmental Group and environmental contractor. Our applicant is Aurora Solar LLC with a wholly owned subsidiary of Avangrid Renewables, who has applied for a lease of lands owned by the State Lands Commission on which to construct and operate a solar generation project called the Stagecoach Solar Project. Other parties include the California Public Utilities Commission as a responsible agency under CEQA, and Southern California Edison Company who is the project proponent of the Calcite substation project, a smaller portion of the project that will be analyzed in the EIR. So with me tonight behind the scenes representing our consultant Aspen are Susan Lee, Hedy Koczwara, Sandra Alarcon Lopez and Grace Weeks in the audience. We also have representatives from the applicant Aurora Solar, Harley McDonald and Kristen Goland.

So our purpose here tonight for this meeting is for the public and agencies and organizations to provide input and comment on the scope of the issues and the analysis that the State Lands Commission should consider in the EIR. The testimony we're interested in receiving at this point in the process is your comments on the project's range of actions, its potential effects, it's mitigation measures and project alternatives that you would like to see considered in the EIR. In the interest of time, we're asking you to limit your testimony and your comments to these issues and we'll be accepting those comments. But again, in the interest of time not engaging in an extensive question and answer session. At this meeting, I'll have contact information at the end of the presentation for you to contact me with any of your questions and concerns about this project. Comments can also be provided in writing by email or letter. Through November 13th, 2020 and I'll have the email address and the mailing address at the end of this presentation.

So let's talk a bit about the project. The Stagecoach Solar Project area encompasses about 3000 acres of state-owned land in the central portion of San Bernardino County, about 12 miles northwest of the unincorporated community of Lucerne Valley and 15 miles South of the city of Barstow. The project area is located East of Interstate 15 South of Interstate 40 and about 3 miles West of State Route 247. It's shown on this map in light blue. The yellow line running South from the project area is the proposed gen-tie route, which will transmit power from the solar facility to the proposed calcite substation. That substation is shown or the proposed site for the substation is shown in red. And here's a slightly closer look of the parcel. Again, you can see the C shaped parcel that's lands owned by the state and lands that Aurora Solar is proposing to use for this project. The purpose in need of this project is foremost to establish reliable solar power generating facilities in Southern California state lands has the additional purpose a mandate to generate revenue for the state Teachers Retirement Fund and any rents associated with this project go towards that fund so we have a multiple mandate both to generate revenue from these. These lands as well as protect the natural resources. In addition, this project will assist in achieving the state's renewable portfolio standard and help achieve greenhouse gas reduction. It will assist California in transitioning the transportation sector to zero emission vehicles. It's a way to reliably store electricity in an economically feasible and commercially financial manner. It locates a project as close as possible to facilities with transmission capability, cites the project in an area with high solar energy resource. Uses proven and available solar photovoltaic and energy storage technologies and will create local employment opportunities and boost business activity. The what of the proposed project is to produce up to 200 megawatts or so of solar energy. The facility will consist of constructing a solar facility and its associated infrastructure on about 1950 of the 3000 acres, including five acres of an onsite electric substation, about a five acre area for a 5000 square feet operations and maintenance building, including a septic tank system, DC underground collection system linking the photovoltaic modules to the onsite substation, a 50 acre battery storage facility which can store up to 200 megawatts for four hours. New access roads, perimeter, perimeter fencing and security systems around the site and permanent groundwater wells or an on-site water tank. Water sources for this project are still being considered and will be fleshed out in the EIR.

In addition, the project will have just over a mile of gen-tie transmission line to connect the solar field with SoCal Edison's proposed calcite substation and will involve about an 18-month construction period. The Calcite Substation is going to be designed and constructed, owned and operated and maintained by SoCal Edison it is considered a separate investment project for the two companies, but as it is part of this project under CEQA we will be considering the substation as well. It involves a 220-kilovolt switchyard on about 7 acres with four acres for drainage grading and creating roads. There's going to be about 5000 feet of new transmission line created and about 700 feet of overhead distribution line and a little over 2000 feet of underground distribution line providing temporary power. The substation is also going to need telecommunications facilities, so fiber optic communication cables, equipment and associated structures will be installed.

Construction activities for this project are anticipated to include surveying, staking, and installation of erosion control measures. Constructing access roads of the sites site. Grading and leveling, trenching and installation of underground electrical systems and solar generation facilities. And assembling an array foundation and installing the solar array. Constructing the gen-tie line between the solar generation facilities and the calcite substation. Testing and commissioning everything and then restoring the temporarily disturbed areas.

So that's a brief description of project. Now we're going to get a bit into how this fits in under the California Environmental Quality Act or CEQA. So CEQA applies to projects that require a discretionary approval from a state or local agency, like the State Lands Commission. Preparation of an environmental impact report or EIR is required when evidence indicates that the proposed project would have a significant, or multiple significant impacts on the environment as state lands has determined this project would have. So a quick breakdown of the process. You can see that we are right at the beginning of the first blue box, is the notice of preparation which most of you would have received either an email or Mail format. Kicking up kicking off this project. We are in the scoping period right now. The second blue box and at our second scoping meeting of the day. Following this, the draft EIR is prepared. The site has been studied to a certain extent, but studies are still ongoing. Feasibility studies are still ongoing. We're anticipating that in mid, maybe second quarter of 2021, a draft EIR would be available for public review that will be circulated for public review for a minimum of 45 days and during that time we'll have draft EIR meetings just as we're holding this scoping meeting, we may have them in person. We may be required for health reasons to continue having them via zoom, but we will have public meetings. After comments are accepted and considered, the project could move on to final EIR preparation, where staff of the State Lands Commission and Aspen, our consultant finish up the EIR. Incorporate any comments that have been made, and make a recommendation to our Commissioners for approval or denial. That will happen at a public hearing publicly noticed hearing that everyone who is on the mailing list will get a notice for potentially in late 2021. So probably towards October or December of next year. So you can see we're very early in the process right now. We're right at the beginning.

So what's in an EIR? EIR should describe the environmental setting of the project area, disclose potential environmental impacts of the project and any of its alternatives and proposed measures to reduce or avoid significant environmental impacts. Those measures are called mitigation measures. The purpose of an EIR is to provide technically sound information for decisionmakers to consider in evaluating a proposed project. Major elements of an EIR include a detailed project description, a description of the alternative screening process, an alternatives carried forward. Those would include a description of alternatives that were determined for a variety of reasons to not be feasible. Um, and they'll be briefly described, and other alternatives that have been determined to be feasible that the alternative ways of achieving the purpose in need of this project, and they'll be carried forward and evaluated in the document. The EIR will then describe the impacts of the proposed project and the impacts of any alternatives that have been carried forward for full analysis and propose mitigation measures to lessen those impacts. An EIR are also discusses cumulative impacts, indirect impacts, growth inducing effects, and in our case not required by CEQA, but also included in our EIR, ours is an evaluation of environmental justice issues for this project. Finally, it will include a list of all of the mitigation measures being proposed for the project.

How do we analyze impact? Impacts are based on changes to the environment compared to the existing conditions. Existing conditions on a site for CEQA projects is generally considered to be the conditions that exist on the site at the time the NOP is published or the notice of preparation so essentially what the site looks like right now. That's considered the existing baseline condition and an analysis is going to be any impact to that existing baseline. CEQA requires that the analysis focus on significant impacts and that measures are required to reduce or avoid those significant impacts that are identified. Social and economic impacts are generally not considered significant, but it is taken case by case and alternatives are generally evaluated in somewhat less detail than the proposed project. For this project or I should say for CEQA projects in general, CEQA lists impacts to the following resource areas. Um, aesthetics, I will go through them in case we have people on the phone who don't have the slideshow. Aesthetics, agriculture and forestry, air quality, biological resources, cultural resources, energy, geology and soils paleontology, greenhouse gas emissions, hazardous materials, hydrology and water quality, land use and planning mineral resources, noise, population and housing, transportation, tribal, cultural resources, utilities and service systems, and wildfire, and then also considered by the Commission but not required by CEQA, environmental justice. All of these issues will be analyzed in the document.

Alternatives for the EIR will be determined by CEQA requirements, which require consistency with most of the project objectives. An alternative would have the ability to reduce or avoid impacts of the proposed project while still substantially meeting the project's purpose in need and still be feasible. Examples of alternatives might include changes to a structural design of a project or changing the location within the project area. The No project alternative is also always considered under CEQA and also analyzed any scoping comments you have suggesting alternatives to the project are welcome.

So just to run through our schedule again, you can see by the we are here sign. We're still very early in the process. We have issued a notice of preparation, which is an indication that the project is gonna be, going to be considered for having the scoping meeting tonight and comments if you choose to send them in by email or writing, are due, or at least postmarked by November 13th, 2020. We're anticipating release of a draft EIR with a minimum 45 day public review period in the second or third quarter of 2021, and there will be public meetings associated with that and the CSLC action, State Lands Commission action on a final EIR, and consideration of the project will happen in most likely fourth quarter 2021, also noticed, and also at a public hearing.

So shortly, I'm going to request comments from attendees. Helpful scoping comments include and. This is this comes from the CEQA guidelines identifying the location and extent of environmental impacts. This would be environmental resources that we as project proponents, have not already considered or might not be aware of. Also recommending issues that need to be addressed in the EIR, specific issues above and beyond the ones listed in CEQA and recommending alternatives that would avoid or reduce impacts of the proposed project. Depending on how many commenters we have, we may limit comments to 3 minutes or less in the interest of time, you can always submit comments by email or in writing.

So the way we're going to run this at a zoom meeting is all of you attendees are muted until we unmute you. If you would like to make a scoping comment, please use the raise hand feature. That's probably down at the bottom of your screen. But on some devices it's up near the top or you need to hover your pointer towards the top or the bottom. We will go through those raised hands 1 by 1. Aspen staff will unmute you and call on you to speak and you won't be sharing your screen or your video, but we will be hearing your voice and recording you. If you would prefer to write your comments rather than speak, you can use the chat feature, which is next to raise hand and type your comments in the chat bar. You can also email or Mail those comments and I'll have all of that information for you in a later slide. If anyone has joined by telephone only and would like to speak you need you would press Star 9 to raise your hand and when you're called on, you'll press Star 6 to unmute yourself.

At this point I am going to open up the floor to comments and it looks like we have. Um, it looks like we have a series of commentors so I am going to ask everyone to try to hold their comments to 3 minutes. We're not going to cut people off hard, but we may not let you run over too far. Um? And please raise your hand at anytime if you want to add comments.

Our first commenter is Karen Watkins. And I'm going to ask you to state your name and your affiliation if you are affiliated with an organization, just to have that captured in the recording. And I'm going to ask for a little patience. Sometimes it takes a moment to get somebody unmuted Miss Watkins. You were unmuted.

COMMENTS RECEIVED

Karen Watkins

I really needed, you can hear me?

Sarah Mongano

I can hear you.

Karen Watkins

OK, thank you very much Sarah. I'm Karen Watkins. I'm planning manager for San Bernardino County and thank you very much for having this scoping meeting and that allowing us to provide comments. We will also be providing written comments to you, but I kind of want to go over a few things. Uh, a couple of years ago, the County adopted the renewable Energy and conservation element for our County. This is a new element not required by in the general plan and one of the things that we prohibit is utility scale projects, renewable energy projects within community planning areas. Lucerne Valley does have a community planning area and the project is within that you can look at the Community planning area at County Wide plan.com and you can go to a mapping feature and see that. In addition, for a number of years we've been working with many communities along State Route 247 and we are working with them and hoping to go early next year. Also, working with Caltrans to try to get 247 designated as a scenic highway so that is coming up and the community spent about 10 years on it. A couple more questions and thank you for going over some of the calcite substation that we definitely want to understand that a little bit better. I understand it's not really part of this project, but it is needed for this project, so we look forward to seeing more of that in the environmental document. And we will definitely be looking at the environmental document and what the potential of growth inducing impacts are from this project. We could have some other comments when we send in our letter but thank you very much for allowing us to provide some tonight.

Sarah Mongano

Thank you for your comments, Miss Watkins, our next speaker is Frazier Haney, and please let me know if I have mispronounced your name.

Frazier Haney

I know you got it just right. My name is Frazier Haney and I'm a lifelong desert resident desert homeowner. I'm a board member at the California Desert Coalition and I'm the executive director at the Wildlands Conservancy and have been dealing with utility scale renewable energy in the California Desert for about 15 years now. Some of the things that I think need to have a good hard look at in the EIR for Stagecoach solar are largely natural resources such as the endangered desert tortoise, migratory birds, bighorn sheep, Golden Eagles, and other species of with the greatest conservation need and sensitive natural communities as identified by the state of California. Also, the Stagecoach Solar project area is surrounded almost entirely by protected federal lands. The people have worked for decades to get into conservation like the Ord Rodman California Desert National Conservation Lands or the Granite Mountains corridor ACEC, so I think that connectivity both on a local and regional basis should be analyzed in the EIR. I think the Stagecoach solar as it's currently configured in the notice of preparation that at first glance looks like it will have severe and unavoidable impacts on those connectivity resources. I'm glad that Karen brought up the San Bernardino County Renewable Energies Conservation Element for the general plan. I think that is absolutely needs to be analyzed in the EIR, especially the socioeconomic impacts on Lucerne Valley. It's increasingly clear in the last 10 years' worth of research that while solar is being placed in the landscape to fight climate change, that desert soils in particular are excellent at sequestering carbon and so I think that a soil, carbon budget or an overall project budget for carbon should be included in the EIR. Groundwater sustainability is a huge issue around Lucerne Valley. Not very far away from this project at all is the oldest clonal creosote at over 11,000 years old and the valley where Stagecoach solar is likely home to ancient creosote rings and ancient Yucca rings. There's also impacts to the scenic view along State Highway 247 and as Karen mentioned, people have been working for a long time to get a designated as a state scenic highway. DRECP identified ample lands to meet state goals for renewable energy development especially in the Riverside East Solar zone, so I think that the EIR should also consider an alternative to meet the same purpose in need for Stagecoach solar where a land exchange with BLM inside of other development focus areas could be considered to move the Stagecoach solar to a more appropriate place and away from a very ecologically sensitive and beautiful valley where it's being proposed. Now, thanks for the opportunity to comment on the notice of preparation and gather scoping comments, and we will be submitting written comments as well.

Sarah Mongano

Thank you Mr. Haney. Our next speaker is Steve Bardwell.

Steve Bardwell

I am.

Sarah Mongano

Go ahead, Mr Bardwell.

Steve Bardwell

Thank you very much. Thanks for the opportunity to speak regarding this project. Hi my name is Steve Bardwell. I live in the high desert area, not far from the project site and I am very, I'm in opposition to this project. I am also the president of the Morongo Basin Conservation Association. I am opposed to this project for multiple reasons. First of all the purpose and need, is this project actually needed? I think an alternative should be considered that utilizes distributed solar as opposed to utility scale. Yeah, project is this being proposed here? Yeah agree with. Also this project needs to be considered in plan in respect to this renewable energies 4.10 analysis by the County of San Bernardino and make sure that that it respects the wishes of the of the community, which is with its placement. The soil type needs to be extremely well categorized as to ensure that this project, the disturbance of this soil does not create deleterious downwind effects to the already disadvantaged community, then that is down there such as that Lucerne Valley, so that should be confirmed. The disturbance to the soil. The discussion about doing some re storing temporary disturbed areas. It should be studied that it's not possible to restore its native desert area with anytime within this project history. Uh, the fact that the project is within an ACEC very close to it. I think the effects of the projects on any endangered species desert tortoise. The effects on Golden Eagles and any other wildlife needs to be considered. I am also would like to see that this project, being with the State Lands Commission, is the being the lead on this, but it is in compliance with the Executive order number 82-20 that talks about the Natural California Natural Resources Agency has to take extreme efforts to prioritize investments and implement actions to increase the pace of scaled environmental restoration lands management efforts. It seems like this is doing the complete opposite thing and that also the effects of this would have on endangered species extinction in general. I think we really need, we analyze this peak sequestration capability of the site as it is now, and the amount of carbon that is it, as it is sequestering it and how much carbon is currently being sequestered needs to be considered in regards to the overall project. So the fact that this is going to be utilizing the Calcite Substation, I think this is a cumulative effect that needs to be considered given the fact this is that there are many other thousands of acres that would be open to development should be Calcite Station be constructed? Water, where is the water coming from? This is the desert. There's very little water. I'm sure you'll drill a well, but even if you don't get it from a well, where is the water coming from? And I think that needs to be very carefully studied. Um, I also the idea of this providing some employment local employment I think, is that, that I think needs to be challenged, I don't believe this is any sort of, at most temporary employment and nothing of any sustainable size. Um? But that. Thank you for this, I appreciate the opportunity or comment. Oh, you know. Additionally, it's great if this site is graded. It is then going to become susceptible to invasion by non native plants. How will that be controlled? Is there going to be controlled by? The use of herbicides, so really short that should be completely evaluated. How that is going to be there. But thanks very much for the opportunity. Looks forward to seeing further. I'll get the written comments to you as well. Goodbye.

Sarah Mongano

Thank you Mr Bardwell. The next commenter we have with hand raised is Pat Flanagan.

Pat Flanagan

Am I unmuted?

Sarah Mongano

You are unmuted, go ahead.

Pat Flanagan

OK, good evening Sarah. My name is Pat Flanagan and I'm a biologist and educator and a board member of the Morongo Basin Conservation Association and a longtime desert resident. I want to thank you for the two scoping meetings today and I will provide written comments to include the references I mentioned this evening. The 3000 Acres Stagecoach Project site is intact, functioning creosote scrub habitat. The plants in this material, creosote scrub are connected underground by a jungle of mycorrhizae, which absorbs and stores carbon dioxide. This complex biological web is described and illustrated in a recently published book by Robin Kaboli,and in the March 2019 Desert Report. Carbon sequestration and storage happens in the desert, but how much? Over a 10-year timeframe, researchers at the University of Las Vegas exposed study plots to elevated carbon dioxide levels similar to those expected in 2050. Rd Evans, a project lead, has stated that overall rising CO2 levels may increase the uptake by arid lands, enough to account for 4 to 8% of current emissions. This research provided the data USGS used in 2013, when calculating terrestrial carbon sequestration in national parks. This report gives a metric, tons of carbon per hectare, being sequestered, as well as the ecosystem service value in millions of dollars. This dollar amount considers the land area covered and reveals that within the top 15 parks are 4 desert parts. The top 15 for nature services are the four desert parks Death Valley, Mojave Preserve, Joshua Tree, and Lake Mead. The desert lands have relatively low sequestration for hectare, but lots of undisturbed, hectares sequestering carbon for the sake of this discussion, let us assume that the project side is similar to the Mojave Preserve to the East. Annually, the preserve stores approximately 1 metric ton of carbon per hectare a year. The Stagecoach projects 3000 acres equal 1214 hectors, so this site sequesters 1214 metric tons of carbon per year. This does not account for the carbon permanently stored in caliche layers at depth. Research indicates for the site to be rehabilitated at the end of use, returning to its full functioning capacity could take from several 100 to 3000 years, so conservatively, if you account for the loss of carbon sequestration over 300 years, you get 364,200 metric tons of carbon not sequestered. This is conservative and does not account for the footprint of the project, which will kill the mycorrhizae for some distance outside of the project perimeter or the carbon stored in the buried caliche. The necessary discussion of carbon sequestration logically falls under the environmental heading of greenhouse gas emissions. And also, I wanted to say I heard that this morning there was a thought that CEQA does not discuss the socio-economic effects of a project, and I will also be sending a paper released by Kamala Harris when she was the Attorney General, which states that yes CEQA should be doing that, that human beings are an integral part of the environment and agency is required to find that a project may have a significant effect on the environment. If, among other things, the environmental effects of a project will cause substantial adverse effects on human beings either directly or indirectly. Sounds like you've got that covered under environmental justice, but I'll send this along anyway. Thank you.

Sarah Mongano

Thank you, Miss Flanagan. Our next speaker is Steve Mills.

Steve Mills

Hello can you hear me Sarah?

Sarah Mongano

Yes, go ahead.

Steve Mills

OK. You might remember I spoke at the 2:00 o'clock meeting. Don't worry, I'm not going to repeat my comment here. I just want to talk briefly about the Lucerne Valley Economic Development Association known as LAVEDA and its position on the project. LAVEDA has long been the preeminent Community Association in Lucerne Valley, and it's been a determined advocate and proponent for the welfare of all of the residents there for quite some time. That's been a pretty important position given all the utility, scale and transmission infrastructure projects that had wanted to put in Lucerne Valley. The president of LAVEDA, who's Chuck Bell - I'm hoping that he's not here, he said he wasn't gonna be but it if he is - I'm stepping on his feet a little bit but I was told earlier he was not going to be able to make the meeting tonight but wanted it to be known that LAVEDA opposes the Stagecoach solar project. And that LAVEDA will be sending a detailed letter with scoping comments. And since LAVEDA is going to be putting these positions in writing, I'm not going to elaborate on them at this point. So thank you very much.

Sarah Mongano

Thank you Mr. Mills. Our next speaker has just a phone number, but it ends with three 118. And you can press Star 6 to unmute yourself. You are unmuted, go ahead and please state your name.

Chuck Bell

Yes, I'm Chuck Bell. I'm from the Lucerne Valley Economic Development Association. I got back in time and I thank Steve for the support and everybody else's comments, we will also be sending in, Steve said we will be sitting in some comments and on this is by phone. I can't use zoom. We support community based solar not industrial. We have a long history of that position. Karen bless her heart from the County talked about our Hwy 247 State scenic designation this but not going long before your application. Your project will dilute probably about 20 mile stretch of the state highway that would be eligible planting oleanders around the base is not going to, not gonna hide, it won't work. The power line to Calcite that will trigger Edison's construction and you need to discuss the intuitive impacts. There are three or four other projects couple on hold, but probably would be back online that are applied for within the County system on private land that would be facilitated by the project that would trigger Calcite substation and those applications are pending. Um and not only the scenic highway issues of the project, but the power lines would wipe out another, probably 6 or 7 miles of scenic designation along the highway. As everybody said, Frazier and everybody else, major tortoise habitat, you're going to need offsite compensation. The ground disturbance you're gonna get PM 10, and 2.5. There's no way to mitigate it. It's going to be blown off miles downstream. And is probably just not just during construction, but also maybe during operation you can't put enough water on it based upon our experiences with two solar projects in Lucerne Valley that are online, couldn't even see across the highway. We have terrible winds. And mowing the vegetation might help a little bit, but scraping it there is no way to put enough water on it to mitigate the impact, you're going to need some background PM 10 monitoring stations downwind so that we have a background, know what occurs now. Compared with the project. The background information, there will be blowouts on it. This is going to happen, and probably for at least one or two years during construction. The water sources we're in adjudicated groundwater basin. Uh, we need a lot of water for a project like that where we have illegal, we have over 250 illegal marijuana grows that are taking a lot of it now. It's a major issue. And so that has to be part of the project. Uh. Steve and others helped us with our environmental justice letter, we are severely disadvantage community state designated. And we thank you though, for at least recognizing that the County doesn't, but you did, and we did respond, and please look at that, you'll see a lot of good information for the NOP in that environmental justice letter. The property owners that I've talked to. Um they are low income and their property values will tank. We don't know how much because the ones that were adjacent to our existing solar projects. They can't even sell a project, they can't even sell a parcel. They can't sell their houses, so we don't know how bad it is, but we know it's devalued their low income and that is an environmental justice issue. Um? The type your transmission right away you might not get the right away from the owners there, from what I've talked to, and condemnation will not sit well with us at all. That's going to be a major issue for you. It'd be nice to know if you have a power purchase agreement with Edison or some CCA somewhere. And I think it's important to know that, so during the summer we are still exporting our solar power to Arizona fact actually paying them to take it. We've got it. Got a problem, we got it, we gotta deal with this holistically and not just keep popping in these industrial solar projects and hoping you got a, you got a buyer for it, so we will be seeing any comments and I and I'm sorry for. I just got in and I didn't get all the issues down, but thank you very much, much appreciated.

Sarah Mongano

Thank you Mr. Bell just in case you missed it at the beginning of the presentation. This this slide show that I have is going to be on our website project page which you have. If you receive the NOP and also have a. Make sure that I have a link to it at the end of the presentation. If it's not there or you have any trouble finding it, my email will be at the end of the presentation. Please reach out to me and let me know.

OK, our next speaker with the hand raised is Sarah Kennington, and it looks like you're unmuted.

Sarah Kennington

Good good hi, I'm Sarah Kennington. I am a member of the Homestead Valley Community Council, Scenic Highway 247 Committee which is working towards State scenic highway recognition by Caltrans for the pristine scenic qualities 247 travelers experience. This has been mentioned by several others. Karen Watkins with the County Land use services, and Frazier and Check Bell. Thank thank you for that Hwy 247 is designated by San Bernardino County as a scenic highway. It's also designated as eligible for the State Scenic Highway status by CalTrans. The Homestead Valley Community Scenic Highway 247 Committee is actively working with both County land use service staff as well as Caltrans staff in Sacramento towards this and they have expressed their support of the application. The 247 committee has submitted the visual description requirement of the proposal, this is a mile by mile analysis of what is seen driving in both directions along the highway, and was painstakingly completed for the committee by a California license landscape architect. A pristine landscape extending from the highway for as far as the traveler can visibly discern into the landscape is required for the designation. The visual impacts of the proposed Stagecoach project were mapped by a GIS engineer for the Scenic 247 committee. The impacts can be seen from a distance of many miles from the highway and driving along the highway. If the Stagecoach project goes forward, it would industrialize a much-loved pristine landscape. Now under consideration for by Caltrans for designation as a state scenic highway, it would be disqualified for consideration. Scenic highway designation does not preclude development altogether. Stagecoach, however, would obliterate the pristine qualities of the landscape that have been fastidiously documented. BLM visual resource classes through the area mapped for the proposed Stagecoach development are also generally consistent with the scenic highway designation. All BLM land in this project area is classified under the California Desert Protection Act as Wilderness. As has been mentioned, ACECs and other special designations adjacent to the project area are in place, in recognition of rare plant and animal life. The industrialization of this area is incompatible with longstanding resident efforts to preserve the natural and scenic qualities of the landscape. CalTrans specifies care should be taken not to destroy areas eligible for state scenic Highway designation. It is also a violation of protections of the San Bernardino County Scenic Highway designation. The project location is incompatible with the preservation of scenic qualities. Thank you for your consideration.

CLOSING

Sarah Mongano

Thank you Miss Kennington at that point. At this point I have no more raised hands. Just wait just a minute to see if anybody else would like to make a comment before we move on. If there are no more commentors, we are pretty much at the end of this meeting and presentation. A reminder is written. Comments must be received or postmarked by Friday, November 13th, 2020. Our preferred option is that you email comments to CEQA.comments@slc.ca.gov. Please write Stagecoach solar project NOP comments in the email subject line and be sure to include your name contact information and requests to be added to the Project notification list if you're not already on it, you can send your comments via Mail to California State Lands Commission at my attention. For any on the phone, that's Sara Mongano 100 Howe Ave, Suite 100 S Sacramento, CA 95825. And I would like to sincerely thank you all for your participation. Next steps are then going to be the next public hearing on this project, which will be held after the release of the public draft of the Environmental Impact Report. Again, we're anticipating that to come out end of first quarter or sometime in the second quarter of 2021 with a minimum of a 45 day review period, but in the meantime, please contact me with any concerns, questions or requests for notification for this project.

Due to COVID concerns I am working at home so email is the most efficient way to reach me. You see here on this side slide sarah.mangano@slc.ca.gov my phone number is also here, but you will get a faster response by email and I certainly can call you back our project website. Where we'll be posting this, we have posted already this slide show, we have the notice of preparation and any further documents that we post will be there is at www.slc.ca.gov/CEQA/stagecoach-solar-project. All lowercase. I want to thank you all again for your comments. Your participation tonight and everybody have a good evening. At this point I will close this public meeting. Thank you.

Appendix C.4

Notice of Preparation

STATE OF CALIFORNIA GAVIN NEWSOM, *Governor*

CALIFORNIA STATE LANDS COMMISSION
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

JENNIFER LUCCHESI, *Executive Officer*
(916) 574-1800 *Fax* **(916) 574-1810**
California Relay Service TDD Phone **1-800-735-2929**
from Voice Phone **1-800-735-2922**

Contact Phone: **(916) 574-1890**

October 13, 2020

NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT AND NOTICE OF PUBLIC SCOPING MEETING

File Ref: SCH No. _______________
CSLC EIR No. 763; W30213; W26868

NOTICE IS HEREBY GIVEN that the California State Lands Commission (CSLC), as lead agency under the California Environmental Quality Act (CEQA), will prepare an Environmental Impact Report (EIR), and that CSLC staff will hold two sessions of a virtual public scoping meeting pursuant to CEQA and the State CEQA Guidelines for the project listed below.[1]

Project Title: Stagecoach Solar Project

Applicant: Aurora Solar, LLC, subsidiary of Avangrid Renewables

Project Location: The Stagecoach Solar Project area encompasses approximately 3,000 acres of State-owned land in the central portion of San Bernardino County, about 12 miles northwest of the unincorporated community of Lucerne Valley and 15 miles south of the City of Barstow. The Project area is located east of Interstate 15, south of Interstate 40, and about 3 miles west of State Route 247 (see Figure 1 in the Attachment).

Meeting Information: **Wednesday, October 28, 2020**
Sessions begin at **2 PM** and **6 PM**

2:00 PM - 3:30 PM	**6:00 PM - 7:30 PM**
Via Zoom at: https://us02web.zoom.us/j/81326903472	Via Zoom at: https://us02web.zoom.us/j/84455027065
or by Phone: **(669) 900-6833** then enter Webinar ID: **813 2690 3472**	or by Phone: **(669) 900-6833** then enter Webinar ID: **844 5502 7065**

1 CEQA is in Public Resources Code section 21000 et seq.; the State CEQA Guidelines are in California Code of Regulations, title 14, section 15000 et seq. The public scoping meeting will be held pursuant to CEQA (§ 21083.9, subd. (a)(2)) and the State CEQA Guidelines (§§ 15082, subd. (c), and 15083).

The CSLC staff has prepared this Notice of Preparation (NOP) to solicit public and agency comments, in writing or at the public meeting, as to the scope and content of the environmental analysis, including the significant environmental issues, reasonable range of alternatives, and mitigation measures to include in the EIR. Applicable agencies will need to use the EIR when considering related permits or other Project approvals. This NOP, along with additional background information and the Project Description included in the Attachment, is also available online at www.slc.ca.gov (under the "Information" tab and "CEQA" link).

Written comments must be received or postmarked by November 13, 2020.[2] Please send your comments at the earliest possible date to:

Sarah Mongano Senior Environmental Scientist California State Lands Commission 100 Howe Avenue, Suite 100-South Sacramento, CA 95825	**E-mail:** CEQA.comments@slc.ca.gov (Subject Line: Stagecoach Solar Project NOP Comments) **Phone:** (916) 574-1889

PROJECT SUMMARY

Aurora Solar LLC, a wholly-owned subsidiary of Avangrid Renewables, has applied to the CSLC for lease of lands owned by the CSLC on which to construct and operate a solar generation project, called the Stagecoach Solar Project (Project). The proposed Project would produce up to 200 megawatts (MW) of solar energy using photovoltaic (PV) technology. The proposed Project area encompasses approximately 3,000 acres, with PV modules and the following associated infrastructure to be constructed on approximately 1,950 acres:

- 5-acre 34.5/220 kilovolt (kV) onsite electric substation and a 5,000-square-foot operations and maintenance (O&M) building.
- Direct current (DC) underground electricity collection system and a 34.5 kV collection system linking the PV modules to the onsite substation.
- Battery storage facility up to 200 MW and 100 acres in size.
- Solar resource and meteorological measurement stations.
- Newly constructed access roads throughout the interior of the proposed Project limits.
- Perimeter fencing and site security systems.
- Septic tank system and leach field serving the O&M building.
- Permanent groundwater wells, or an onsite water tank using water transported from offsite, providing water for the O&M building and to wash the PV panels.

[2] Pursuant to State CEQA Guidelines section 15103, Responsible and Trustee Agencies shall provide a response to a NOP within 30 days after receipt of the notice.

The proposed Project also includes construction of a 9.1-mile-long 220 kV generation intertie (gen-tie) transmission line to carry the electricity generated by the solar facility to the regional transmission system interconnecting at a proposed 7-acre Southern California Edison Calcite Substation. More details of the background and Project Description are provided in the Attachment to this NOP.

VIRTUAL PUBLIC SCOPING MEETING

Each session of the virtual public scoping meeting will be conducted using the online meeting platform Zoom. You may join by entering the web link listed above for the session you would like to join, or by dialing in by telephone at the number listed above. The Zoom meeting links will also be available on the CSLC's website at www.slc.ca.gov (under the "Information" tab and "CEQA" link). You may join from a desktop computer, laptop, mobile device, or telephone. Staff recommends that you test out your device, internet connection, and Zoom app compatibility well before attempting to join the meeting.

The CSLC staff will begin each session of the scoping meeting noticed above with a brief presentation on the proposed Project. The material presented at both sessions will be the same, two sessions are scheduled for the convenience of the attendees. After each presentation, staff will receive comments on the potential significant environmental issues, Project alternatives, and mitigation measures that should be included in the EIR, until all persons present who wish to provide oral comments have done so, at which time staff will close the session. Each session will be recorded and all oral comments will be summarized in a scoping memo. A 3-minute time limit on oral comments may be imposed. No Commission action on the EIR or Project will occur at this time; any such action will occur at a separate noticed public meeting after the EIR is finalized.

IMPORTANT NOTES TO COMMENTERS

1. If you submit written comments, you are encouraged to submit electronic copies by email to CEQA.comments@slc.ca.gov and write "**Stagecoach Solar Project NOP Comments"** in the subject line of your email.

2. Before including your mailing or email address, telephone number, or other personal identifying information in your comment, please be aware that the entire comment—including personal identifying information—may become publicly available, including in the EIR and posted on the Internet. The CSLC will make available for inspection, in their entirety, all comments submitted by organizations, businesses, or individuals identifying themselves as representatives of organizations or businesses.

3. If you represent a public agency, please provide the name, email address, and telephone number for the contact person in your agency for this EIR.

4. If you require a sign language interpreter, or other reasonable accommodation for a disability, as defined by the Federal Americans with Disabilities Act and California Fair Employment and Housing Act, in order to participate in the scoping meeting, please contact the CSLC staff person listed in this NOP at Sarah.Mongano@slc.ca.gov or

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by phone at (916) 574-1889, at least 5 days in advance of the meeting to arrange for such accommodation.

5. Please contact the staff person listed in this NOP by email at Sarah.Mongano@slc.ca.gov or by phone at (916) 574-1889 if you have any questions.

DocuSigned by:
Sarah R Mongano
81AB38B9D9EC433...

Signature:________________________________ Date: 10/13/2020

Sarah Mongano
Senior Environmental Scientist

ATTACHMENT
PROJECT DESCRIPTION

Stagecoach Solar Project

1.0 PROJECT BACKGROUND AND LOCATION

Aurora Solar LLC, a wholly-owned subsidiary of Avangrid Renewables (Applicant), has applied to the California State Land Commission (CSLC) for lease of lands owned by the State on which to construct and operate a solar generation project, called the Stagecoach Solar Project (Project). The proposed Project would produce up to 200 megawatts (MW) of solar energy using photovoltaic (PV) technology.

The proposed Project would be constructed on approximately 1,950 acres within a nearly 3,000-acre Project area in the central portion of San Bernardino County, about 15 miles south of the City of Barstow and 12 miles northwest of the unincorporated community of Lucerne Valley. The Project area boundary encompasses five sections of undeveloped State land under the jurisdiction of the CSLC, as well as 640 adjacent acres of private land owned by Aurora Solar, LLC. Private lands and federal lands managed by the U.S. Bureau of Land Management are adjacent to the Project area. Figure 1 provides a map of the Project location and Project components.

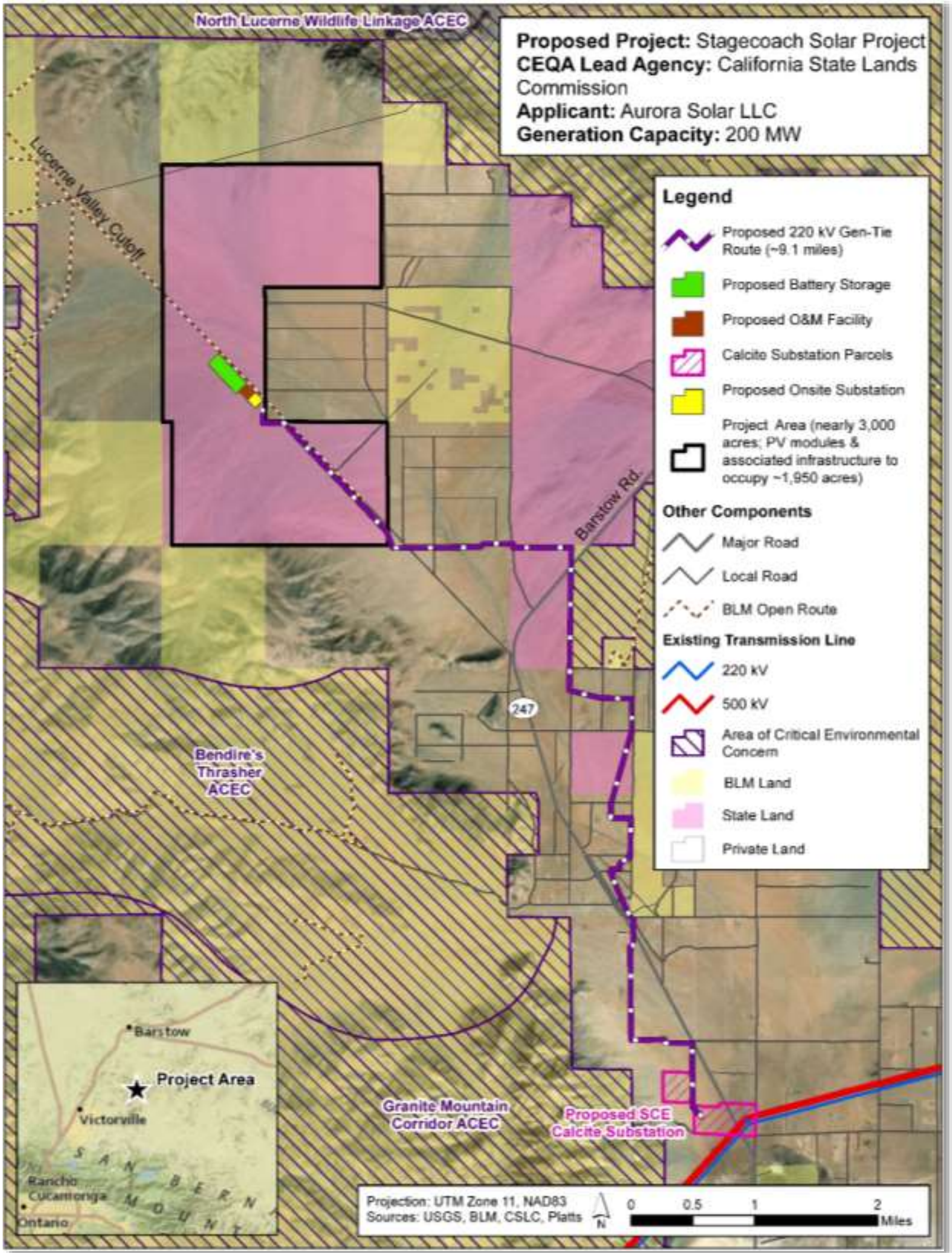
2.0 PROJECT DESCRIPTION

2.1 Project Objectives

The Applicant's objectives for the Stagecoach Solar Project are to:

- Establish reliable solar PV power-generating facilities in an economically feasible and commercially financeable manner that can be marketed to potential power purchasers.
- Develop land managed by the Commission with renewable energy facility leases to generate revenue applied to the State.
- Assist California utilities in meeting their obligations under California's Renewables Portfolio Standard (RPS). In September 2018, Governor Brown signed Senate Bill 100, which requires California electric utilities to generate at least 60% of their power from renewable resources and to mandate that the state obtain all of its electricity from carbon-free sources by 2045.
- Assist California in meeting greenhouse gas (GHG) emissions reduction goal as required by the California Global Warming Solutions Act (AB 32), as amended by SB 32 in 2016, which establishes a target of GHG emissions reductions in the State to be 40% of 1990 levels by 2030.
- Assist California in transitioning the transportation sector to zero-emission vehicles by 2035 under Executive Order N-79-20, signed by Governor Newsom on September 23, 2020.

Figure 1. Project Location



- Co-locate energy storage facilities of sufficient size and configuration to reliably store electricity in an economically feasible and commercially financeable manner to facilitate the integration of solar energy into the CAISO transmission grid.
- Locate solar power plant and associated energy storage facilities as close as possible to electrical transmission facilities with anticipated capacity and available interconnection to the CAISO transmission grid.
- Site the Project in an area with high solar insolation[3] in order to maximize productivity from the PV technology.
- Use proven and available solar PV and energy storage technologies.
- Create local short- and long-term employment and business opportunities in the region.

2.2 Project Facilities

The proposed Project includes PV modules and the following associated infrastructure to be constructed on approximately 1,950 acres within an approximately 3,000-acre Project area:

- A 5-acre 34.5/220 kilovolt (kV) onsite electric substation and a 5,000-square-foot operations and maintenance (O&M) building.
- A direct current (DC) underground electricity collection system and a 34.5 kV collection system linking the PV modules to the onsite substation.
- A battery storage facility up to 200 MW and 100 acres in size.
- Solar resource and meteorological measurement stations.
- Newly constructed access roads throughout the interior of the Project limits.
- Perimeter fencing and site security systems.
- A septic tank system and leach field serving the O&M building.
- Permanent groundwater wells, or an onsite water tank using water transported from offsite, providing water for the O&M building and to wash the PV panels.

A 9.1-mile-long 220 kV generation intertie (gen-tie) transmission line would carry the electricity generated by the Stagecoach Project to the regional transmission system interconnecting at the proposed 7-acre Southern California Edison Calcite Substation.

[3] Insolation is a measure of solar radiation energy received on a given surface in a given time. It is commonly expressed as an average irradiance in watts per square meter (W/m^2) or kilowatt-hours per square meter per day ($kWh/m^2/day$). The region in which the Project is located receives greater than 5.75 $kWh/m^2/day$ of solar radiation energy, giving it a higher degree of solar radiation than most areas within the United States.

2.3 Project Construction

Construction of the proposed Project is anticipated to require approximately 18 months to complete and would require an average daily workforce of up to 175 workers with up to 400 workers per day onsite during the peak construction period (approximately 12 months). During the peak of construction, a typical day at the site would include the transportation and installation of trackers, movement of heavy equipment, and transportation and installation of modules and other materials.

Construction of the PV systems would involve clearing and grubbing of existing vegetation, installing support racks, placing of modules and inverter units, trenching and installation of the underground collection system, and construction of internal service roads.

Construction activities for the associated Project facilities would include: clearing and grading; construction of drainage components; foundation construction; development of staging areas and site access roads; and construction of the electrical substation, energy storage facility, O&M building, and transmission facilities. Security fencing would be installed around the perimeter of the Project infrastructure.

2.4 Operations and Maintenance

Following the construction phase, the O&M building would serve as the Project's office facilities for up to 10 permanent full-time employees. The Project facilities would be monitored during operating (daylight) hours, even though the Project would be capable of automatic start up, shutdown, self-diagnosis, and fault detection. Appropriate levels of security lighting would be installed, and the site would be secured 24 hours per day by onsite private security personnel or remote security services with motion-detection cameras.

Maintenance activities for PV modules would include on-site repairs as required. Panel washing may be conducted as necessary based on site conditions.

On a regular basis personnel would visit the substation to perform routine maintenance including (but not limited to) equipment testing, monitoring, and repair, routine procedures to ensure service continuity, and standard preventative maintenance. The underground cable system and battery storage facility would be inspected, maintained, and repaired as necessary, following construction.

2.5 Closure and Decommissioning

If, at the end of the CSLC lease and/or contract term to sell energy to the utility buyer, no contract extension is available or no other buyer of the energy emerges, the solar plant would be decommissioned and dismantled. After removal of all construction related on-site improvements, remediation and restoration of the area would be performed on the site to its pre-construction condition.

3.0 PERMITS AND AGENCY COORDINATION

In addition to action by the CSLC, the Project may require permits and approvals from other reviewing authorities and regulatory agencies that may have oversight over aspects of the proposed Project activities, including, but not limited to, those listed in Table 1.

Table 1. Potential Responsible, Coordinating, and Consultation Agencies/Entities

State	California Department of Fish and Wildlife (CDFW)
	California Department of Transportation, District 8
	Regional Water Quality Control Board (RWQCB) (Region 7, Colorado River)
	California Public Utilities Commission
	State Office of Historic Preservation (SHPO)
Local	Mojave Desert Air Quality Management District (MDAQMD)
	San Bernardino County
Tribal	Project activities will be coordinated with local tribes consistent with the CSLC's Tribal Consultation Policy adopted in August 2016 (see www.slc.ca.gov).

4.0 SCOPE OF THE EIR

Pursuant to State CEQA Guidelines section 15060, the CSLC staff conducted a preliminary review of the proposed Project and determined that an EIR was necessary based on the potential for significant impacts resulting from the proposed Project. A preliminary list of environmental issues and alternatives to be discussed in the EIR is provided below. Additional issues and alternatives may be identified at the public scoping meeting and in written comments as part of the EIR process. The CSLC invites comments and suggestions on the scope and content of the environmental analysis, including the significant environmental issues, reasonable range of alternatives, and mitigation measures that should be included in the EIR.

The CSLC uses the following designations when examining the potential for impacts.

Potentially Significant Impact	Any impact that could be significant, and for which feasible mitigation must be identified and implemented. If any potentially significant impacts are identified but cannot be mitigated to a less than significant level, the impact would be *significant and unavoidable*; if any potentially significant impacts are identified for which feasible, enforceable mitigation measures are developed and imposed to reduce said impacts to below applicable significance thresholds, the impact would be *less than significant with mitigation*.
Less Than Significant Impact	Any impact that would not be considered significant under CEQA relative to the applicable significance threshold, and therefore would not require mitigation.

No Impact	The Project would not result in any impact to the resource area considered.
Beneficial Impact	The Project would provide an improvement to the associated environment in comparison to the baseline information.

The estimations of impact levels used for this NOP are based solely on preliminary documents. Impact levels may change and additional impacts may be identified during preparation of the EIR as more information is obtained.

4.1 EIR Alternatives Analysis

In addition to analyzing the potential impacts associated with the proposed Project, in accordance with the State CEQA Guidelines, an EIR must:

> *…describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project, but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives* (§ 15126.6).

The State CEQA Guidelines also require that the EIR evaluate a “no project” alternative and, under specific circumstances, designate an environmentally superior alternative from among the remaining alternatives. The EIR will:

- Identify alternatives based on the environmental analysis and information received during scoping
- provide the basis for selecting alternatives that are feasible and that would reduce significant impacts associated with the proposed Project
- provide a detailed explanation of why any alternatives were rejected from further analysis
- evaluate a reasonable range of alternatives including the “no project” alternative.

Examples of possible alternatives, or combinations of alternatives, to be evaluated in the EIR or discussed and eliminated from further consideration based on criteria set forth in the State CEQA Guidelines (e.g., infeasibility), include the following:

- Reduced Footprint Alternative
- Generation-Tie Line Route Alternatives

4.2 Currently Identified Potential Environmental Impacts

Pursuant to CEQA Guidelines section 15060, CSLC staff conducted a preliminary review of the proposed Project and determined that an EIR was necessary based on the potential for significant direct, indirect and/or cumulative impacts resulting from the Project. A preliminary list of environmental issues to be discussed in the EIR is provided below.

Based on initial internal scoping, the Project is not anticipated to affect the following environmental factors identified in State CEQA Guidelines Appendix G (Environmental Checklist Form), which could therefore be eliminated from consideration in the EIR.

- Agricultural and Forestry Resources
- Mineral Resources

Additional issues and/or alternatives may be identified at the public scoping meeting, and in written comments, as part of the EIR process. The CSLC invites comments and suggestions on the scope and content of the environmental analysis, including the significant environmental issues, reasonable range of alternatives, and mitigation measures that should be included in the EIR.

Environmental Topic	**Anticipated Project Impacts**
Aesthetics	The EIR will examine Project impacts resulting from substantial visual contrast (including nighttime lighting and daytime glare) from several representative viewpoints.
Agricultural and Forestry Resources	There are no agricultural or forestry resources within or near the Project area.
Air Quality	The EIR will examine emissions of criteria air pollutants and dust generated from construction and operation activities.
Biological Resources	The EIR will examine potential construction impacts (e.g., permanent loss or temporary disturbance to vegetation and wildlife habitat) as well as operational impacts (e.g., wildlife mortality from vehicle operation within the solar field). The EIR will also examine proposed Project activities on federally or State-listed species or species proposed for listing; conflicts with any local policies on biological resources; and any conflicts with local, regional, or State habitat conservation plans.
Cultural Resources	The EIR will examine Project impacts to historic and architectural resources due to ground disturbance during construction or visual changes to cultural landscapes.
Cultural Resources – Tribal	In accordance with Assembly Bill 52 and CEQA requirements, the EIR will address the presence of and impacts to tribal cultural resources in consultation with Native American Tribes.
Energy	The EIR will examine the potential for wasteful, inefficient, or unnecessary consumption of energy resources during Project construction or operation and the Project’s consistency with state or local plans for renewable energy.
Geology and Soils	The EIR will examine potential construction and operation impacts primarily associated with the potential for soil erosion.
Greenhouse Gas Emissions and Climate Change	The EIR will examine Project emissions of greenhouse gases and the consistency of the proposed Project with applicable plans and programs adopted to reduce greenhouse gas emissions.
Growth Inducement	The EIR will examine whether the Project would foster economic or population growth in the Project’s vicinity.

Environmental Topic	Anticipated Project Impacts
Hazards and Hazardous Materials	The EIR will examine Project hazards and hazardous materials resulting from construction and operation activities (e.g., waste management, potential for accidental release of a hazardous material, transmission line safety and nuisance, and fire hazards).
Hydrology and Water Quality	The EIR will examine potential construction and operational-related impacts to groundwater supplies, drainage and flooding conditions, erosion and sedimentation inducement, and water quality.
Land Use and Planning	The EIR will examine the status of the County's General Plan as it relates to the renewable energy, transmission line right-of-way, State land rights, and proximity of federal lands to the Project.
Mineral Resources	There are no known mineral resources on the site, and it is anticipated the Project would not affect access to nearby resources.
Noise	The EIR will examine Project impacts to ambient noise and vibration levels resulting from construction and operation.
Population and Housing	The EIR will examine Project impacts to the economic and population growth of the surrounding area.
Public Services	The EIR will examine Project impacts on law enforcement, fire protection, schools, and other public services.
Recreation	The EIR will examine Project impacts to recreational opportunities in established federal, State, or local recreation areas.
Transportation and Traffic	The EIR will examine Project construction and operation impacts to transportation and public access to roads and highways and BLM-designated open routes.
Utilities and Service Systems	The EIR will examine Project impacts to the existing capacity and future implementation of water supply, wastewater, solid waste, and energy utility and service systems.
Wildfire	The EIR will examine Project impacts to emergency response and wildfire-related risks.

4.3 Special Impact Areas

4.3.1 Cumulative Impacts

The State CEQA Guidelines require an EIR to discuss the cumulative impacts of a project when the project's incremental effect is "cumulatively considerable" (§ 15130). A cumulative impact is created through a combination of the project being analyzed in an EIR and other projects in the area causing related impacts. The EIR will:

- define the geographic scope of the area affected by cumulative effects ("Cumulative Projects Study Area"), which varies for each resource issue area
- discuss the cumulative impacts of the proposed Project, in conjunction with other approved and reasonably foreseeable projects in the study area
- identify, if appropriate, feasible measures to mitigate or avoid the Project's contribution to cumulative effects.

4.3.2 Growth-Inducing Impacts

CEQA requires a discussion of the ways in which a proposed project could foster economic or population growth, including the construction of additional housing, in the project's vicinity. Under State CEQA Guidelines section 15126.2, subdivision (e), a project is growth-inducing if it fosters or removes obstacles to economic or population growth, provides new employment, extends access or services, taxes existing services, or causes development elsewhere. The EIR will contain a discussion of the potential growth-inducing impacts of the proposed Project.

4.3.3 Environmental Justice

Though not required by CEQA, the EIR will examine whether the Project would have the potential to disproportionately affect area(s) of high minority population(s) and low-income communities, as well as the Project's consistency with the CSLC environmental justice policy.